

REPORT
of
COMMITTEE ON EXAMINATION

This is to certify that we the undersigned, as a Committee of the Graduate School, have given Chester Orlo Tanner final oral examination for the degree of Master of Science in Surgery. We recommend that the degree of Master of Science in Surgery be conferred upon the candidate.

Minneapolis, Minnesota

Dec. 12 1921

W. Shachar
Chairman

W. May

E. T. Bell

Gilbert J. Thomas

THE UNIVERSITY OF MINNESOTA

GRADUATE SCHOOL

Report
of
Committee on Thesis

The undersigned, acting as a Committee of the Graduate School, have read the accompanying thesis submitted by Chester Orlo Tanner for the degree of Master of Science in Surgery. They approve it as a thesis meeting the requirements of the Graduate School of the University of Minnesota, and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science in Surgery.

W. S. Schachauer

Chairman

W. Mann

H. C. Robertson

per C.E.S.

Dec. 12 1918²¹

T H E S I S

TUMORS OF THE TESTICLE

Chester O. Tanner.

* * *

Submitted to the Graduate
Faculty of the University of
Minnesota in partial fulfill-
ment of the requirements for
The Degree of Master of Science
in Surgery.

October, 1921.

MOM
T 15
6

TABLE OF CONTENTS

Chapter I. Introduction
Material

Chapter II. Embryology and Anatomy of the Genital Tract.

Chapter III. History -
Review of Literature with special reference
to identification of various tissue elements
in the tumors.

Chapter IV. Classification -
Detailed Description of Each Type.

Chapter V. Theories of Origin.

Chapter VI. Etiology -

1. Occurrence
2. Location
3. Heredity
4. Trauma
5. Relation to previous inflammation or
other antecedent pathologic conditions.
6. Side Involved
7. Age
8. Relation to Undescended Testicle

Chapter VII. Changes in the Genital Tract.

Chapter VIII. Generalization.

Chapter IX. Symptoms and Diagnosis.

Chapter X. Prognosis.

Chapter XI. Treatment -

1. Ordinary Castration Operation
2. Ordinary Castration Operation supple-
mented by radium, X-ray, etc.
3. Radical Operation.
4. Non-operative Measures

Chapter XII. Report of One Hundred Original Cases.

Chapter XIII. Conclusions.

Chapter XIV. Bibliography.

OCT 6 '22 13-21-60

290300

TUMORS OF THE TESTICLE.

Chapter I.

Introduction:

From early historical times to the present day, diseases of the testicle have received an undue amount of attention in medical literature. The exposed position of these organs, the ease with which they may be investigated by surgical operation and the early manifestations which any enlargements present, all tend to bring prominently to the attention of physicians definite data for diagnosis and treatment of the varied pathologic conditions which may involve these organs.

In respect to the inflammatory enlargements, our knowledge is fairly definite, means of diagnosis clearly determined and methods of treatment placed on a rational and well standardized basis. Neoplasms of the testis, however, present an altogether different picture. Not only is their diagnosis often difficult and made unreasonably late in the disease, but also the procedures in regard to treatment are still followed oftentimes with a blind disregard of a knowledge of the fundamental pathology and mode of extension of these tumors. Even pathologists, in all the years past in which these new growths have been studied and classified, are by no means agreed as to their ontology, classification, or proper interpretation. The result of this confusion is that, as a rule, the patient's welfare is being jeopardized while the surgeon, for the time being, is content with simple orchidectomy and the pathologist with some sort of a diagnosis of a malignant tumor of the testicle.

Malignant disease of any organ or tissue of the body always presents so varied a group of growth processes that strict classification and clear-cut prognosis, is often difficult or impossible.

In tumors of the testes, not only are found the usual grounds for variability, but in addition, we are dealing with a gland whose function is peculiarly adapted to the production of germ cells, whose toto-potentiality increases manifold the possibilities of neoplastic differentiation when compared with the exceedingly restricted potentiality of ordinary glandular tissue cells. Thus the theoretical classification of tumors of these organs embodies the widest possible range of new pathologic formations. Fortunately the actual tumor formations which occur, do not entirely fulfill the theoretical possibilities, otherwise our problem would pass beyond the limits of profitable study. Strangely enough, that other germ cell gland, the ovary, whose function is often given an analogous place to that of the testicle, does not present in any closely comparable degree similar problems in tumor ontogenesis. In general, it may be confidently affirmed that tumors of the ovary are more often benign and even when malignant, of a lesser degree of malignancy than tumors of the testicle. Moreover, the structure of these two classes of tumors has little in common. Those of the ovary are usually quite simple and for the most part, rapidly adapted to a recognized standard of classification. In the testis, on the other hand, new growths are usually exceedingly complex in structure, not easily traced back to any one type of cell anlage and in pattern and structure curiously outside of the usual tumors found in other regions of the body. They constitute very decidedly tumors sui generis and hence, any rational study of them must largely disregard the general conceptions of tumor growth and confine itself to the elucidation of these neoplasms as a peculiar group. Hence my suggestion as to the nomenclature and my extensive study of so many examples of these growths has seemed fully justi-

fied.

With these points in mind, it was thought that the collecting and reviewing of a considerable number of these tumors, together with their follow-up histories, might help in settling some of the problems of this important subject. Approximately fifty cases were obtained at the Mayo Clinic, thirty cases from the University of Minnesota Pathologic Museum and various Twin City hospitals and twenty cases from various Chicago hospitals.

The writer wishes to express his appreciation to Dr. H.E. Robertson for many helpful suggestions and criticisms in this work and to Dr. L.B. Wilson for his suggestions and for placing at his disposal so much valuable material. He is also indebted to Dr. O. T. Schultz, pathologist to the Michael Reese Hospital of Chicago, for permitting the use of the material and records of that hospital.

Each tumor was first carefully examined grossly and then sectioned so that numerous microscopic sections could be obtained from various areas. In this way all portions of the tumor were examined. Follow-up letters were written to all patients or their relatives when possible and questions asked as to recurrence following operation, subsequent treatment, present state of health, time of death, etc.

Chapter II.

Embryology:

The anlage of the reproductive glands appear within the urogenital folds, whose development in the human is traced from the mesonephros. The mesonephros is formed along the posterior wall of

the body cavity. Only at the very beginning of its development does it find sufficient space in the retroperitoneum. As soon as it begins to expand, more space is required and this is found in the direction of the body cavity, invaginating the coelom wall as a fold into the cavity. This fold later contains also the Müllerian duct and the reproductive gland, in addition to the mesonephros and is therefore termed the urogenital fold. A small strip of the epithelium of the genital fold and this alone forms the parent tissue of the reproductive gland. The epithelium of the urogenital fold usually consists of two layers of cells and is spread out uniformly over the entire surface of the fold in embryo up to 4.7 mm. vertex-breech length. The epithelium over the median slope of the fold soon commences to become many layered and it is this area which represents the true reproductive gland area. As soon as the growth has reached about one-third of the dorso-ventral diameter of the urogenital fold, the formation of the true genital fold, mentioned above, begins. The whole genital fold is now filled with a homogenous mass, composed entirely of derivatives of the coelomic epithelium.

Since the in-growing epithelial mass displaces the mesonephric tubules, it is from the beginning in intimate relations with these, with the surfaces of Bowman's capsules and with the points where the collecting tubules bend into the secretory tubules. For these reasons, kidney and adrenal rests are often found at later stages in the region of the testes.

This period is followed by an indifferent stage of the reproductive gland which lasts only a short time and during which time the cranial portion of the urogenital fold gradually disappears.

During this time, the uniform epithelial mass of the genital fold separates into a superficial epithelium and an epithelial nucleus, a sharp boundary existing between the two. The surface epithelium retains its closed epithelial structure and may consist of from one to two layers. The nucleus becomes looser in texture, so that at the end of the indifferent stage its epithelial origin is no longer evident.

The differentiation of the reproductive gland into testis is actually to be observed. This differentiation consists in the characters of the male gland being developed in embryos of thirteen mm. greatest length. This process is first evidence by the occurrence of branched, anastomosing epithelial cords, the testis cords and second, by the occurrence of a broad tunica albuginea between the superficial epithelium and the testis cords. These structures are formed from the epithelial nucleus which is the active layer.

The superficial epithelium remains passive and grows only in proportion with the enlargement of the entire organ. The greater portion of its cells are indifferent epithelial cells, among which genitaloid cells are scattered here and there.

The epithelial nucleus rapidly forms the testis cords, loosely arranged cells concentrating at certain places and forming anastomosing cords. In all probability, the testis cords are all formed at once and the subsequent enlargement of the organ depends upon the elongation of the tubules and the increase in diameter. The cords are arranged transversely to the long axis of the testis, their inner ends being arranged around the point of insertion of the mesorchium - the future hilus - while the outer ones radiate to the surface of the testis. The outer end of each cord is thickened, the

inner one is pointed and all the inner ends unite to form a compact epithelial mass, which extends along the insertion of the mesorchium throughout the entire length of the embryonic testis; this epithelial mass contains the cells that will form the anlage of the rete testis and is called the rete blastema. This is not related to the parts of the mesonephros, except for its association with the epididymis tubules. The outer ends of the cords never reach the superficial epithelium, but a layer of at least two or three cells usually intervenes, from which the tunica albuginea develops. Since all the testis cords converge to the narrow line of insertion of the mesorchium, they cannot all reach the blastema and, therefore, they unite by twos or threes in order to attain this connection in common. In an embryo of about twenty-one mm. there are formed around the individual testis cords and their anastomoses, actual connective tissue sheaths. At the hilus all the sheaths unite to form a boundary around the rete blastema; this is the anlage of the mediastinum testis.

The testis cords consist at first of many indifferent epithelial cells with dark, homogenous nuclei. Between these lie scattered genitaloid cells which very soon develop into genital cells. The narrow inner ends of the cords contain only indifferent cells from which the tubuli recti are formed. The indifferent cells which are at first without any arrangement, gradually acquire one by their nuclei becoming oval and the cells placing themselves radially to a future lumen. In this manner there is formed a many layered epithelium, into which the genital cells enter as spermatogonia. All the testis cords are not transformed into tubules at birth. After birth, all the genital cells disappear and the tes-

tis tubules are lined only by indifferent cells. With the onset of puberty, a new generation of genital cells is formed which then enter upon the formation of spermatazoa. The intermediate cords at first are composed of indifferent and genitaloid cells, but later the indifferent cells practically all disappear. In embryos of forty-five mm. length the genitaloid cells are transformed into large, pale (interstitial) cells, with nuclei containing little or no chromatin. These cells gradually disappear after the fifth month. After birth, considerable connective tissue develops between the tubules and as a result, the number of interstitial cells diminishes still further.

The septula testis are formed by the thickening of the connective tissue sheaths of the testis cords. After the resorption of the intermediate cords, the sheaths of the adjacent testis cords come into opposition and then appear as a single structure, which radiates out from the hilus to the periphery.

Anatomy:

The term testicle, as often used, includes two essentially different parts, testis or true sexual gland and the epididymis - a convoluted beginning of the spermatic duct. The testicle proper is an elliptical shaped body suspended within the scrotum so that its long axis is not vertical, but directed somewhat forward and outward. It measures about four cm. in length and 2.5 cm. in breadth and two cm. in thickness. It is usually described as having a lateral and medial surface separated by an anterior and posterior border and an upper and lower pole. Both surfaces and the anterior border are covered completely by the visceral layer of the tunica vaginalis. The rounded anterior border is free while the

much less arched posterior border covered by the epididymis and attached to the spermatic cord, is devoid of serous membrane and corresponds to the hilus. The upper pole, capped by the head of the epididymis, lies farther outward and forward than the more pointed lower one, which is in relation to the tail of the epididymis and attached to the scrotal ligament. The cavity containing the testis and epididymis is lined by a smooth serous membrane - the tunica vaginalis - which resembles the peritoneum. The cavity is considerably larger than the contained structures and extends above and below the superior and inferior poles of the organ. The cavity tapers as it is traced upwards and above the level of the testis; the spermatic cord bulges forward into its posterior part. The cavity for the testis is lined by the tunica vaginalis and is reflected from the posterior wall of the scrotal chamber over the testis and epididymis, giving a covering to each. The part lining the cavity is called the parietal portion of the tunica vaginalis, while the part covering the testis and epididymis is termed the visceral portion. Between the body of the epididymis and the lateral surface of the testis, the visceral part of the tunica vaginalis dips in and lines a narrow interval called the sinus epididymis. The entrance to the sinus is limited above and below by crescentic folds of the tunica vaginalis, which passes from the testis to the head and tail of the epididymis. These folds are called the superior and inferior ligaments of the epididymis. In three positions the surface of the testis is not covered by the tunica vaginalis - superiorly where the globus major is attached, inferiorly where the cauda epididymis is in contact and posteriorly where the blood vessels and nerves enter the organ from the spermatic cord. The tes-

ticle is of a whitish color, rather soft but resilient to the touch. The framework of the testicle proper consists of a dense, white, fibrous capsule, the tunica albuginea, which is from four to six mm. in thickness and gives support and form to the subjacent parenchymal tissue. Behind, where the tunica albuginea covers the posterior border of the testicle, it becomes greatly thickened, forming a cone-shaped body, the corpus of Highmore, or Mediastinum testis, from which radiate a number of membranous septa which pass to the inner surface of the tunica albuginea. In this manner, the space within the capsule is subdivided into pyramidal compartments, the bases of which lie at the periphery and the apices at the mediastinum. These spaces contain from one hundred fifty to three hundred pyriform masses of glandular tissue which correspond to lobules (lobuli testis). Each of these is made up from one to three greatly convoluted seminiferous tubules, held together by delicate intertubular connective tissue.

The seminiferous tubules vary in diameter from .15 to .25 mm. and from 25 to 70 cm. in length. They begin near the bases of the lobules by blind extremities. In their course towards the mediastinum, they give off two or three diverticulae and exhibit frequent anastomoses, particularly near their origin, not only with the tubes of the lobule to which they belong, but also with those of adjoining lobules. Near the mediastinum the canals of each lobule unite to form a single straight excretory tube, one of the tubuli recti, which enter the mediastinum and unite into a close network, the rete testis. The latter extends almost the entire length of the mediastinum and consists of a system of irregular intercommunicating channels, the cuboid epithelial lining of which rests

directly upon the ensheathing fibrous tissue of the mediastinum. With these passages the canals of the testicle proper end, the immediate continuation of the spermatic tract being formed by from 15 to 20 tubules, the ductuli efferentes, which pierce the tunica albuginea along the posterior border and near the upper pole of the testis and forming the coni vasculosi, connect the sexual gland with the tube of the epididymis.

The interstitial tissue is a very delicate connective tissue, which supports the seminal tubules and the smaller ramifications of the blood vessels. It is derived from the trabeculae and is peculiar in that it contains, besides the ordinary cells of connective tissue, the so-called interstitial cells. These are large, rounded cells from .015 to .020 mm. in diameter, some of which exhibit branching processes. Their protoplasm is granular, often filled with fat, and may contain a yellowish or brown pigment. They occupy divers situations, surrounding the smaller vessels and lying between the tubules and are either a special variety of connective tissue cells, or are derived from cells of the germinal epithelium, which have not been used in forming tubes. In the space of this tissue the lymphatics of the testis take their origin.

The seminiferous tubules are formed of a connective tissue membrane which has a lamellar structure. The lamellae are covered by flattened cells. In the adult the tubules contain several layers of epithelial cells, but in the testicle of the child, there is no clear distinction into layers, the cells being all more or less similar except where they are in the process of division. Of these layers, the one next to the basement membrane is composed of clear cubical cells (spermatagonia), the nuclei of which exhibit

for the most part the irregular network which is characteristic of the resting condition, but in certain tubules show indications of division. At intervals between the spermatagonia, some of the lining epithelial cells are enlarged and project between the inner layers, being connected with groups of developing spermatazoa. These cells are called the cells of Sertoli.

Next to the lining epithelium is a layer of larger cells (spermatocytes), the nuclei of which are usually in some stage of mitotic division. These cells may be two or three deep. Internal to these cells are to be seen in some tubules a large number of small cells with simple spherical nuclei (spermatide). In some tubules the spermatids are elongated and the nucleus is at one end and in others, these elongated cells are changed into spermatazoa, which lie in groups. The heads of these spermatazoa project between the deeper cells and connect with one of the Sertoli cells of the lining epithelium and their tails merge into the lumen of the tubule. As they mature, they gradually shift towards the lumen where they eventually become free. During the time that this crop of spermatazoa has been forming, another set of spermatocytes has been produced by the division of the spermatagonia and on the discharge of the spermatazoa the process is again repeated. Each spermatazoa consists of three parts, a head, a middle part or body and a long, tapering tail.

The testis is supplied by the internal spermatic artery, a branch of the aorta. This tiny vessel after a long course, reaches the posterior border of the testis, where it breaks up into branches which enter the mediastinum testis and are distributed along the septa and on the deep surface of the tunica albuginea. The veins arising from the posterior border of the testis form a dense plexus.

called the pampiniform plexus, which eventually empties through the spermatic vein, on the right side, into the inferior vena cava; on the left side the spermatic vein joins the left renal vein. The nerves for the testis accompany the internal spermatic artery and are derived through the aortic and renal plexuses from the tenth thoracic segment of the spinal medulla. The arteries and nerves of the testis communicate with those on the lower part of the ductus deferens, i.e., with the artery of the ductus deferens and with twigs from the hypogastric plexus.

The Lymphatic System:

The collecting vessels, four to eight in number, pass out of the mediastinum testis and ascend with the veins in the cord and in the subperitoneal tissues over the psoas as far as the point where the spermatic veins cross the ureter. Here they part from the blood vessels and from each other and diverge into the lumbar glands. In the upper part of the abdomen, some of the vessels divide, sending their contents into more than one lumbar node.

The primary nodes (i.e., those receiving direct vessels from the testis) are those members of the lumbar group in front of and by the sides of the aorta and vena cava below the level of the renal veins, and one member of the external iliac group. Each testicle has its own set of nodes which communicate with each other and both sets receive lymph from other structures.

On the right side from one to three nodes lie in the groove between the aorta and vena cava as a general rule. In some cases, a unit is found on the lower part of the vena cava near the level of the bifurcation of the aorta. In still other cases, one or more nodes lie in front of the aorta between the left renal vein and the

origin of the inferior mesenteric artery. On the left side, the nodes usually lie in the tissue on the left side of the aorta, generally in a cluster behind the stem of the inferior mesenteric artery, but one may be placed as high as the left renal vein and one as low as the angle between the aorta and the left common iliac artery.

Secondary nodes (i.e., those receiving efferent vessels from the primary nodes) may be divided into three groups:

- (1) The primary nodes of the same and opposite sides;
- (2) The nodes behind and between the two great trunks below and about the level of the renal veins;
- (3) A chain along the outer side of each common iliac artery.

Specimens which have been injected for the purpose of marking out the lymphatic drainage, vary so much in number and arrangement that it is impossible to illustrate them by a drawing from any single specimen. For surgical purposes, it is advisable to regard the nodes as lying in the various parts of an area bounded above by the renal veins, at the sides by lines drawn vertically a finger's breadth outside the vena cava and aorta respectively and prolonged to cross the external iliac artery about the junction of the upper and middle thirds, below by lines drawn from the bifurcation of the aorta. The portion containing the right and left nodes overlap by the breadth of the aorta. As the left renal vein crosses the aorta just below the origin of the superior mesenteric artery, a considerable part of the area is covered by the head of the pancreas and the duodenum; the mesentery crosses the right portion of the area below the duodenum and the inferior mesenteric artery lies in the left part, hiding some of the left nodes.

The early lymph node metastases which occur in cases of tes-

ticular tumor are readily explained by the richness of the lymphatic plexus of the testicle. Owing to the division of vessels which so frequently occurs, infection may be conveyed from a small focus in the testis to several primary nodes. Involvement of the iliac nodes may be primary by means of the vessel above described running to the external iliac group or secondary, by the free back-wash from the lumbar to the iliac nodes which is so noticeable in injections. As the inguinal nodes never receive vessels from the testicle, those cases which show this type of involvement can only be explained by retrograde infection.

Chapter III.

History:

The first tumor of the testicle was described by Saint Donat in 1696. He recognized the bones of a skull and two pigmented depressions which were interpreted as the embryonic eyes of a rudimentary fetus. In 1803 Prochaska recognized portions of a fetus in two testicular tumors. Hair and teeth were found in the cystic portions and bones in the solid parts of similar tumors by Andre de Peronne in 1833. In 1841 Velpeau found skull, vertebrae, hair, eyes, joints, intestinal canal and fat and muscle tissue. Verneuil, in 1855, recognized brain tissue, nerve fibres, optic cups, intestinal or bladder structure, smooth muscle and cartilage. In the same year, Paget described a cystic tumor of the testicle chiefly cartilaginous, with numerous tiny chondromata along the vas, and many nodular chondromata in the lungs. In 1856, the first observation of the tri-dermal composition of these tumors was recorded by Johnson. He described the ectoderm as being represented by cysts lined by flattened epithelium, the entoderm by cysts lined by columnar and cil-

iated epithelium and the mesoderm by bone and connective tissue. In 1853, our knowledge of these tumors was greatly increased by Curling; he proposed the name "General Cystic Disease of the Testicle" and pointed out two most important features, namely, the frequent presence of hyaline cartilage in them and the fact that such tumors are situated between the epididymis and the testicle proper. He pointed out that as the tumor increases in size, it squeezes the secreting tissue of the gland and flattens it out till it forms a thin stratum over its upper pole. This left Curling to believe that such tumors arose in the rete; his work has led several investigators to take an interest in them. He divided these growths into cystic, relatively benign and solid malignant tumors and was among the first to make microscopic studies in this field. The gross anatomy of testicular tumors was described under the term "Hyatid Disease" and illustrated in 1845 by Astley Cooper. In 1858, Senftleben described striated muscle in these tumors. Wettergren, in 1872, found adenomatous, carcinomatous and sarcomatous areas in several tumors which were for the most part cystic, in one of which, metastases occurred in the heart, lungs and peritoneum. In 1876 Malassez described a tumor with special characteristics - the "Sarcoma Angeoplastique." It was formed by enormous cells containing several nuclei and approached the chorioepithelioma found in the female. In 1887, Kocher and Wilms found cranial and sympathetic ganglia in these tumors. In the same year, Langhans used the microtome in conjunction with his microscopic work. Together with Kocher, he attempted a classification of testicular tumors based on their microscopical structure. They recognized the carcinomatous nature of the alveolar sarcomata of former writers and began to suspect

that most of these tumors were teratomata. In 1896, Wilms published an extensive article in which he attempted to correlate the various classifications of these tumors as given in the current textbooks of that time. He showed that all the complex tumors of this group arise within the testicle and he divided them into two groups:

(1) Embryomata, cystic tumors in which the elements presented a somewhat orderly imitation of a fetus; and

(2) Embryoid tumors, or teratomata, more solid growths in which there was no orderly imitation of a fetus. He was familiar with the tendency of one element in a teratoma to predominate over the others, producing tumors which were chiefly cartilaginous, carcinomatous, etc., but he was disposed to separate the majority of pure simple tumors from the more complex growths. He decided that all pure forms of connective tissue tumors, as fibrome, sarcoma, lipoma, etc., arose in the testicle from the stroma cells or simply from misplaced groups of embryonal cells. In the same manner he concluded that "pure" adenoma carcinoma, etc., arose from the cells of the tubules. He grouped the teratomata into a separate class and decided that they were derived from the sexual cells.

In 1900 McCallum described a case which has since been shown to resemble a chorioma. He classified it as a Lymphendothelioma. In 1902, Schlagenhauer described a case of typical chorioepithelioma of the testicle. Metastatic nodules in the lung showed a structure similar to that in the testicle, namely, Langhans and syncytial cells and large zones of hemorrhage.

In 1904, Durr recognized an area resembling mammary fibro-adenoma, and Westerhofer reported a case with liver metastases having the structure of a lymphosarcoma. In 1906, Chevassu published a very extensive article in which he classified testicular tumors and made two essential classes (1) "Seminome," derived from tubule epithelium, and (2) Embryoma, or mixed tumors, made up of divers tissues. He collected a number of cases and gave us an idea of prognosis. In the same year, Frank published an extensive article on chorioneptithelioma

tous proliferation in the teratomata and collected from the literature 19 cases involving the testicle. All the patients which he was able to follow died shortly after operation. He added 3 cases of his own and described them in detail. The tumor elements were composed of closely resembling Langhans cells, syncytium, chorionic wandering cells, and transitional forms arranged for the most part in alveolar formation. There was a marked tendency to hemorrhage and necrosis. In 1908 Orton described in detail another case of chorioepithelioma of the testis. In 1911 and later in 1919 Ewing published extensive articles in which he concluded that testicular tumors were teratomatous in origin and that one type of tissue was prone to predominate. He classified them as follows:

1. Adult embryomata (including dermoids), usually benign.
2. Embryoid, teratoid or mixed tumors.
3. Embryonal, malignant tumors.

Chapter IV.

Classification:

Tumors of the testicle constitute one of the most confusing subjects in the field of pathology. Confusion has existed in the classification of these tumors since the earliest findings were recorded. These findings become incorporated into text books on surgery with the result that today a wide variety of terms is still in use.

In 1853 Curling proposed the name "general cystic disease of the testicle" for growths in that organ, but did not attempt a real classification. Kocher and Langhans in 1877 adopted a classic division of these tumors dividing them into (1) Epithelial and (2) Connective Tissue types. During the next twenty years, cases were reported in the literature under various titles such as sarcoma,

rhabdomyoma, cystic disease, angio-sarcoma, etc. In 1896 Wilms, in a very extensive article, classified them under the following headings in an attempt to correlate the various classifications used at that time:

1. Myosarcoma
2. Cystosarcoma
3. Carcinoma
4. Mixed Tumor
5. Sarcoma
6. Medullary Carcinoma
7. Cystoma
8. Cystoid Disease
9. Teratoma with Malignant Degeneration
10. Dermoids

This was a histological classification and led to an embryological classification later by the same author, which is as follows:

- (1) Embryomata, cystic tumors containing a somewhat orderly imitation of a fetus, and
- (2) Embryoid tumors, or teratomata, more solid growths in which there was no orderly imitation of a fetus.

In 1902 Schlagenhauer described a case of chorioepithelioma of the testicle and that classification was added to the others already in use and has remained as a separate entity up to the present time. In 1906 Chevassu adopted an extensive classification which follows:

1. Seminal Epithelioma or "Seminome."
2. Tumors of Interstitial Cells.
3. Adenoma.
4. Connective Tissue Tumors
 - (a) Fibroma
 - (b) Sarcoma
5. Mixed Tumors or Embryoma, comprised of divers tissues, epithelial, nervous, muscular, vascular, cartilaginous, osseous, fibrous, etc.

He did not believe that the chorioepitheliomata existed apart from the embryomata.

In 1911 and later in 1919, as noted in the previous chapter, Ewing proposed the following classification of testicular tumors:

1. Adult Embryomata (including dermoids) usually benign.
2. Embryoid (teratoid or mixed tumors)
3. Embryonal malignant tumors.

Recently Martland, Hertzler, Herman and others have concurred with Ewing in the belief that all these tumors are really teratomata and that the so-called pure tumors merely represent a one-sided development of a heterogeneous growth.

Of the 101 tumors studied in this series, 97 were malignant and 4 benign (dermoids). Of the 97 malignant tumors, 62 were soft, cellular and medullary in character. This is the most frequent form of testicular tumor, and is the type described by Langhans as a medullary carcinoma, by Chevassu as a pure "seminome," by Krompacher as a blood vessel endothelioma and by Ewing as an embryonal malignant tumor. This type of tumor develops in the interior of the testicle and probably invades the region of the corpus Highmore somewhat earlier than the anterior part of the testicle. The tunica albuginea is uniformly distended by a solid homogeneous tumor without cysts. The color is rose yellow and the consistency is somewhat more firm than that of normal testicular tissue. It is divided into lobules, some quadrilateral, others round. Often are seen degenerated zones, whitish in color; others whitish yellow in color, soft and with the appearance of tuberculosis. Areas of hemorrhage are frequent. On the other hand, before opening the tunica vaginalis this type of tumor looks singly like an enlarged testicle. The tunica vaginalis is normal, the globus major with its hyatid is usually intact, the veins of the cord are enlarged and the spermatic artery sometimes as large as the radial.

The microscopic picture of this type of tumor is quite characteristic. It is made up of round and polyhedral cells, possess-

ing voluminous nuclei and a much reduced protoplasm. The nuclei are oval and sometimes 12 u in diameter. At times they contain two or more brilliant nucleoli. The protoplasm about the nucleus is clear, with a faint acid or basic color, depending upon its reaction to these dyes. At the outer edge of the cell, the protoplasm is more condensed. The cells are very fragile, disintegrating with great rapidity and unless early and well prepared, the protoplasm is destroyed. Pressed together, they tend to take on a polyhedral shape; often 10, 20, 30 or 50 cells are grouped together suggesting a lobule. At times small nests of these cells infiltrate into the connective tissue and these tumors were often and still are at times, called large round cell sarcoma. The connective tissue is often infiltrated by lymphocytes sometimes arranged in rows between the stroma cells and oftentimes abundant about the blood vessels. Blood vessels are numerous and of the adult type. In most cases the neoplastic cells are extremely abundant and the stroma is much reduced; the stroma is thus almost uniformly composed of blood vessels which limit more or less the quadrilateral, lobulated areas. Cells often show karyokinesis. In other cases, the blood vessels show a large number of cells surrounding them and the cell infiltration into the stroma is very marked. Chevassu thinks this invasion is less abundant in cases where the proliferation is most rapid. Finally, a last type of this variety is that in which there is a fibrous reaction of defense. Broad bands of connective tissue run through the tumor.

In the examination of these cases, there were several tumors which at first were thought to belong to the above group. However, as more sections were cut, areas of different tissues such as cartilage and glands were found. Case #5 while coming under the classifi-

cation of the mixed tumor type, contained large areas of the carcinomatous tissue described above, which was evidently replacing the other tissues very rapidly. Probably this tumor would have been interpreted as belonging to the pure carcinomatous type had it been permitted to grow for a few more months. Cases #3 and #4 of this series, while being typical mixed tumors containing cartilage and cysts, contained areas of cells similar to those described above under the carcinomatous type. So marked was this resemblance that had it not been for the discovery of cartilage and cysts in other cut sections, these tumors would have been placed in carcinomatous class. For these reasons we cannot agree with Schultz and Eisendrath who believe that these tumors "are primary tumors of the testicle arising from the seminiferous tubules."

The origin of these tumors has been discussed by many men. Chevassu says he found cells in normal testicular tubules which resembled absolutely the cells of this tumor (seminome). He thinks this type of tumor is due to a proliferation of spermatagonia - the least differentiated cell of the seminal line. He contends that this is a pure tumor and is in no way related to a teratoma.

Ehrendorfer believes that they are really sarcomata and are derived from the corpus Highmore, while Hansemann thinks they have their origin in the interstitial cells. Debernardi thinks they arise from embryonal tubule cells. He describes in detail four large tumors of this type and discusses their origin. He does not believe they are mixed tumors. Ewing after an analysis of a series of tumors of this type concluded that they were not derived from the adult tubule cells, but were due to a one-sided development of a teratoma. While admitting that this was a tumor of characteristic structure, yet he found areas of exactly the same type of tumor in complex

teratomata in his series.

It seems logical to conclude after Ewing that these tumors are one-sided developments of a teratoma separating it into lobules. This type was described by Monod and Terillon as encephaloid carcinoma. Two microscopic characteristics are especially prominent in this variety of tumor - necrosis and hemorrhage.

Cases #3 and #4 of this series, while being typical mixed tumors containing cartilage and cysts, contained areas of cells similar to those described above under the carcinomatous type.

The next most common type of tumor is the so-called mixed or embryoid tumor. There were 35 such tumors in this series. These tumors contain divers tissues, - cartilage, muscle, epithelium with or without cyst formation, nerve tissue and sometimes bone. Case 13 shows cartilage, epithelium with cyst formation and nerve tissue. The epithelial tissue appears as either the epidermoid or glandular type. This epidermoid type lines the cavities. These cavities are filled by a fluid or semi-fluid mass which is secreted by the surrounding cells and constitutes the cysts, or they are filled by the products of desquamation. Case #3 shows a multilocular cyst formation. Morphologically the epithelium lining the cysts is pavement or cylindrical and it may be stratified or simple. The stratified layers sometimes resemble those of the oesophagus. Sometimes the characteristics are those of cutaneous epithelium. Epithelial pearl formation is common. This is beautifully shown in Case 12 (See microphotograph). The cysts with simple pavement epithelium are lined by a very low almost endothelial layer. Those lined by high columnar epithelium show some mucous cells at times resembling those of the intestinal tract, while other areas show several layers of cells. Gland-like structures resembling those of the intestine are seen in Case #13 (See micro-

photograph). Some of these cells have cilia similar to respiratory epithelium. Pick described a neuro-epithelial type of cell formation. The most typical form of neuro-epithelium is given by the rosette formation, - tiny cavities lined by a high epithelium, the cells of which radiate outward, resembling the primitive cells of the ependymal cavity.

Cartilaginous tissue is an element very common in this type of tumor. Out of 35 cases, cartilage was found 17 times in this series. It forms nodules of embryonal type or adult type. It is at its periphery limited by an envelope of condensed fibrous tissue which constitutes a real perichondrium. In the center of the cartilaginous lobe one frequently sees blood vessels. At times, there occurs a true ossification of cartilage with the usual transitions - calcification, etc. The cartilaginous lobes are encountered especially in the vicinity of the cystic cavities lined by an epithelium of the respiratory type suggesting bronchial cartilages about the respiratory tubes. Lobbe and Verneuil, in 1878, reported a case in which the cartilage presented the shape of two arytenoids. Most text books describe pure chondroma of the testis, but it is doubtful if such tumors exist apart from a teratomatous basis. Dauve, in 1863, reported twenty-eight cases of chondroma of the testis of which Kocher accepted only five as pure chondroma and added three of his own. In several of the cases cysts were described, thus lending support to the theory that they were mixed tumors with a preponderance of cartilaginous tissue.

Fibrous connective tissue is abundant in these tumors as supporting layers, capsule, and varying forms of interstitial substance. Pure fibromata have been reported in the older literature

and more recently, Chevassu has reported a large fibroma which completely replaced the entire testis. Although it contained several pseudocysts, he is not willing to admit that it is a one-sided development of a teratomatous tumor.

Such tumors may exist, but as Kocher says, they have not any clinical interest on account of their rarity. Lipomatous tissue has been described but none was found in any of the tumors in this series. Thyroid tissue was found in large quantity in case #80 and is beautifully shown in the microphotograph.

Myxomatous tissue is quite common and is usually bound with some other tissue such as cartilage or sarcomatous tissue.

Bone tissue is quite rare. There was none found in this group of tumors. It may occur as a long bone with a marrow cavity and its periosteum, but more frequently it occurs as plaques resembling the bone of the cranium. Teeth merit particular attention. Only three or four cases are on record. True testicular adenoma have been observed in only two cases and both these in undescended testicles, one of them being in a hermaphrodite. The tumors appeared as pin-head or bean sized yellowish nodules in the body of the atrophic testis. Some alveoli resemble sweat glands while others are lined by several layers of cells resembling those of the seminiferous tubules but much smaller. They are composed of regular tubules lined by high columnar cells with relatively small dense nuclei. These adenomatous processes in a gland partially atrophied may have the same significance as the adenomata of the liver or kidney in the course of cirrhosis of these organs. Case #48 contains areas resembling a papillary cystadenoma. Formerly sarcoma of the testis had the reputation of being very common - in fact, nearly every testicular tumor was called sarcoma by the surgeon. It is really a very rare tumor if it

really exists at all. Chevassu has seen but one case. It was operated by M. Raffin in 1903. Microscopically, it was uniformly constituted by an infiltration of irregular cells of varying shapes and sizes, some round and small in which the nucleus practically filled the cell; others were elongated and had various bizarre shapes. It was very malignant and the patient died six months after the operation. In my series, there were several tumors, some areas of which showed sarcomatous-like structure. Other areas, however, showed different structures so that none could be diagnosed as sarcoma.

The typical testicular dermoid is a definitely circumscribed tumor lying within the tunica, separated from the testicular tissue by a capsule and fused with the rete. The cyst contains hair and sebaceous material, often teeth and is lined by epidermis. Microscopically, it often shows a series of organ rudiments belonging chiefly to the cephalic region. Hair, sebaceous and sweat glands, brain tissue, smooth muscle, mammary gland tissue and other structures have been found in this type of tumor. So rare is this form of tumor that Bland Sutton states that specimens of the carcinomatous and mixed tumor types exist in all the pathological museums attached to the medical schools of London, but there are only three specimens of testicular dermoids containing hair.

The series reported in this paper contains four dermoids, Cases 74, 75, 76 and 77, three of which contained hair. In all these cases, the sac walls contained hyalinized and calcareous areas. Barrington reports a case of testicular dermoid with which was associated an "alveolar sarcoma."

A rare type of tumor reported by some authors is the interstitial cell tumor as described by Chevassu. Interstitial cells dim-

inish in number after reaching a certain stage in the embryo up to the adult age when they almost entirely disappear. In ectopic testes these cells are also abundant. Chevassu described a case of ectopic testis the size of a hen's egg, removed by Waldeyer in 1904. It was entirely surrounded by tunica albuginea. Microscopically could be seen lobules of varying sizes separated by very loose connective tissue. The lobules were made up of polygonal cells, all pressed against one another. Toward the periphery of each lobule, the cells were irregularly limited by the neighboring connective tissue. Under high magnification the cells showed a voluminous cytoplasm, were irregular and polygonal in shape, and were from 5 u to 7 u in diameter. The protoplasms contained granules in places and numerous vacuoles. The nuclei were small, spherical, very clear and as a rule pushed to one side of the cell; often mitotic figures are seen. The whole tumor was limited by a thin shell of fibrous tissue in which were found some atrophic seminiferous tubules. The patient was followed for twenty-two months after operation and was well at that time. Although this type of tumor undoubtedly exists, yet it is very rare.

There are undoubtedly a few authentic cases of benign tumors of the testicle such as Chevassu's fibroma and his interstitial cell tumor. However, these types are so rare that they may be practically disregarded from the clinical standpoint. In addition to these forms, there is the dermoid type, four of which were found in this series.

A further type of tumor which is still much debated, is that of the so-called chorio-epithelioma of the testis. In 1876, Malassez described a tumor with special characteristics - the sarcoma angio-plastique. It was formed by enormous cells containing several nucleo-

li and contained large masses of hemorrhage. In 1902 Schlagenhauser noted similarity between this type of tumor and the epithelium of trophoblastic origin and expressed the idea that they were identical. He reported a case with autopsy findings which was primary in the right testicle and had metastasized to the brain, liver, kidneys, stomach, peritoneum and thyroid gland. The patient's breasts were hypertrophied. Microscopically, a large part of all sections was occupied by areas of hemorrhage and fibrin, with here and there masses of indefinitely outlined acid staining cells. At the edges of the tumor mass were seen large polygonal cells of Langhans type massed about irregular blood sinuses. Lining the blood spaces and separating them from the Langhans cells were flattened multi-nucleated syncytial masses. These Langhans cells varied in size, were irregularly polyhedral-shaped and frequently, the cell borders were not clear. Three theories have been advanced to explain the origin of these peculiar tumors:

1. From the interstitial cells
2. From misplaced multipotential cells included in the organ during embryonic development.
3. From the spermatogenic cells themselves.

Most writers consider that the portions of these growths which resemble chorioepithelioma, are epithelial, although their views differ regarding the nature and origin of the tissue resembling the trophoblast. A majority of them agree that the tumors should be considered teratomata with actively proliferating malignant portions indistinguishable from true chorioepitheliomatous tumors. Schlagenhauser says they arise from fetal membranes formed during the development of the tumor, taking the view that teratomata originate from a fertilized polar body. This theory is not generally accepted. The fact that practically all these tumors occur after the age of puberty and

before old age suggests that the development is intimately associated with spermatogenesis. Ewing reports a case in which the small original tumor was largely destroyed by hemorrhage and presented the structure of embryonal adenocarcinoma with several areas of syncytium.

Lymphadenoma of lymphosarcoma is a rare questionable type of testicular tumor. Several cases were reported in the older literature but Chevassu has shown that they were tumors of the ordinary carcinomatous type (seminome). He reports one case of lymphadenoma. A man 54 years of age had many cutaneous tumors of unknown origin. A few days before death, both testicles became enlarged. Autopsy showed involvement of all the viscera and both testicles showed small tumorous nodules. Microscopically, these areas resembled the large celled carcinoma but the cells were only half as large, their protoplasm was much darker and the nucleoli were not so prominent. Ewing reports a case in which the tumor arose in the rete testis, which is the point of origin of teratomata, and from this fact, he suggests that the origin of lymphosarcoma is in some way connected with that of teratomata. However, this point is still unsettled. It is also unsettled whether this type of tumor is primary or secondary in the testis. If it is secondary, it is the only type we know of that is secondary.

Inasmuch as the testicle contains different kinds of meso-plastic tissues as well as the tissues which give rise to the common tumors, any classification of these tumors must include the various possibilities and hence, be complicated. Because of the fact that the same kinds of tissues were found in the two types of tumors, i.e., the carcinomatous and the mixed tumor types, it seems logical to conclude that they have the same origin. For this reason the term "teratoma" as suggested by Wilms, Ewing and others, undoubtedly simplifies the

classification of these tumors. The term "teratoma," however, as generally used, is applied to any tumor composed of tissues and organs of one, two or three germinal layers and is usually considered fairly benign. Since this type of tumor is the only one found in the testicle with the exception of a very few benign types as described above, it seems that the classification would be greatly simplified if a regional term, such as "orchitoma" were employed. While the regional classification of tumors is of great practical value, it often deals with the superficial characteristics of new growths and usually ends up by a grouping of distinct histological varieties occurring in different organs. But, as has already been seen, there is such a diversity of tissues in these peculiar tumors that a histological classification leads only to confusion. Orchitoma would at once designate a testicular tumor such as has been described in this paper.

In the following suggested classification, the two growths which are italicized are the only ones of clinical importance, while the others are included merely to give a place to those rare tumors which undoubtedly do occur.

A. Malignant

1. "Carcinomatous," large cell, large nucleus type undoubtedly closely related to
2. "Mixed Tumor Type"
 - a. Tumors containing cartilage, cysts, glands, etc.
 - b. Ordinary glandular structure tumors,
 - c. Chorio-epithelioma.
3. Sacroma (very rare).

B. Benign

1. Dermoid
2. Epithelial
 - a. Adenoma of the seminal tubules as described by Pick and Chevassu.

3. Mesoblastic

- a. Interstitial cell tumors (Chevassu)
- b. Fibroma (Lardennois and Lecene)
- c. Myxoma, Lipoma.

Chapter V.

Theories of Origin of Testicular Tumors.

I. Theory of Metaplasia: (Virchow)

It is assumed that one variety of tissue can change into another. Cysts were supposed to originate from the epithelium of the tubules in the testis or from solid processes of cells derived from the tubules, the central portion degenerating and thus forming a cyst. This activity on the part of the epithelium was supposed to exert a stimulus on the connective tissue which gave rise to the formation of cartilage and bone. In cases where cartilage was found to antedate the cysts, its development was supposed to stimulate the growth of the epithelium. Ciliated epithelium was traced back to the remains of the Wolffian body. This theory has not gained favor as an explanation of the complex tumors of tridermal type and is not generally accepted now.

II. Theory of Foetal Inclusion:

This theory was adopted by St. Hiliare, who called it the "inclusion abdominal" which later descended into the scrotum with the descent of the testicle. According to this theory, two ova are impregnated, both develop and finally, one overpowers and envelops the other - forming twinned monsters. The main objections to this theory are found in the rare observations on which it is based and in the wide distinctions which separate definite twinned monsters from the comparatively rudimentary structure of testicle tumors in general.

III. Theory of Fertilization of Polar Body: (Marchand and Bonnet).

Assumes that either a fertilized polar body or that after the impregnation of the ovum and during the early segmentation period, a cell or group of cells becomes separated and incorporated among the structures which later develops into the testis. Here the isolated cell group may give rise to a tumor of multiple tissues. However, the exact method by which such a cell could be included within the testis is uncertain. This theory also fails entirely to account for the frequency of this peculiar type of tumor in the sex organs.

IV. Theory of Partial Hermaphroditism:

Assumes the presence of an ovum in the testis which after fertilization develops into a fetus. This theory does not explain the tumors present at birth or developing shortly thereafter.

V. Theory of an Isolated Blastomere:

Wilms assumes that the varying structure of these testicular tumors depends upon the period of embryonic differentiation at which the originating cell complex is isolated. The less differentiated the cell, the more complex will be the resulting tumor. This theory which is quite analogous to that of Cohnheim paves the way for numerous hypotheses as to the origin of these tumors.

VI. Development from Cells Normally Present in the Testis:

Wilms has shown quite conclusively that these tumors arise in the rete testis and has endeavored to trace their origin back to the true cells of the organ. He believes that the tumor grows within the tubules and in proof of this, points out that in one of his

cases he found teratoid tissue in the adenomatous tissue of the tumor and has also found it is a normal tubule. Growth within the tubules explains as he believes, the corkscrew-like growth of the gland alveoli and cyst formation. Malassez, on the other hand, believes the growth begins in the interstitial tissue and cites instances where normal testicular tubules were found within the tumor. Wilms explains this fact by development within the tubules, the tumor by pressure shutting off some tubules and preventing growth into them. If the tumor develops within the tubules, we have only the spermatogenic cell as a point of origin, since the sustentacular cell is not a germinal element. If it arises in the interstitial tissue, Wilms suggests that it might originate in some way from the so-called interstitial cells of Leydig since Nussbaum believes these to be undeveloped germ cells. How either the spermatogenic or interstitial cells can develop into a tumor is not known and Wilms gives no explanation further than to say that the germ cell may have been pathological from the beginning or normal at first, later becoming pathological. That sexual cells may develop into tumors is a hypothesis which has two strong facts in its favor, - the predilection of these peculiar tumors for the sex organs and the development of abortive fetal membranes or their analogues in many of the tumors.

According to Adams Theory, these tumors are attributed to aberrant cell development of the spermatogonia (or possibly their precursors) but not to the spermatazoa. It is known that certain cells, the germinal blastomeres, recognizable at an early stage of segmentation, are set apart and eventually carried to the generative glands where they later form spermatazoa. All the intermediate stages of development between the primordial blastomeres and the spermatazoa retain the totipotential characteristics necessary for

the formation of the three germinal layers of an embryo or embryoma. Consequently a derivative from a germ blastomere, normally present in the testicle, may take on aberrant characteristics and form a teratomatous or terablastomatous tumor.

Chapter VI.

Etiology

1. Occurrence:

New growth of the testicle is a very rare disease. Approximately 600 cases have been reported. According to Bland Sutton, only 12 malignant tumors of the testicle were seen in the big hospitals of London during the year 1907. In the London Hospital records for a period of twenty years referred to 65 cases of this disease. During this twenty year period, 110,000 male patients had been admitted to the hospital. Out of approximately 300,000 admissions to the Mayo Clinic (including both males and females), about 50 cases of this disease were found. Bulkley looked over the records of 12,729 consecutive male admissions to the Presbyterian Hospital in New York and found 13 malignant testicular tumors. During the last eight years only 3 cases of this disease were treated at the Presbyterian Hospital in Chicago. The records of the Michael Reese Hospital show 15 admissions for this disease during the past ten years. Out of 20,000 admissions to the University of Minnesota Hospital (including both males and females) only 2 cases of testicular new growths are on record. Averaging up these figures, it is found that the disease occurs about once in 2,000 males.

2. Location:

New growths of the testicle are practically always unilateral. The bilateral malignant growths recorded in the literature are

extremely rare and always secondary. In 1876 Trelat and Melassez described a double "lymphadenoma" of the testicle. They thought it was primary in one testicle and later metastasized to the other. Later, Talavera reported two similar cases, one of which spread to the skin of the abdomen and scrotum and later invaded the other testicle. Chevassu says that the true neoplasm of the testicle never spreads to the other testicle. In a large series of cases of testicular tumors, he reported a case of a man, 34 years of age, with numerous cutaneous tumors, the point of origin being unknown. A few days before death, both testicles enlarged. Autopsy showed involvement of all the viscera and both testicles showed small tumor nodules. Microscopically, these areas resembled the carcinomatous type of tumor but the cells were much smaller, their protoplasm darker and their nucleoli not so prominent. He diagnosed the condition as lymphadenoma and concluded that it was entirely secondary in the testicles. Only recently has a case of simultaneous cancer of both testicles been described by Oraison. His case was that of a man 50 years of age, who early in 1918 suffered a testicular traumatism. Some months later when he had apparently recovered entirely, he made a journey of 15 kilometers on foot. Immediately afterward, his right testicle became swollen but not painful. This swelling increased and in a short time, similar changes took place in the left testicle. The patient was treated locally for two months, at the end of which time an operation was decided upon, but diagnosis was reserved. In the region of the left testicle, the vaginalis was filled with fluid and a neoplasm was found involving the testicle and cord. A similar condition was found on the right side. The tumor on the left side was removed, but the growth on the right was left intact owing to the patient's condition. Microscopic examination of the tumor removed showed it to

be an epithelial neoplasm having its origin in the seminal vesicles. The points of interest in the case are the bilateral position of the tumor and its relation to trauma. In 1915, Coley reported a case of bilateral abdominal malignant testes removed at operation by Dr. John Wyeth in 1905. In that same year Dr. O.C. Smith reported a case of bilateral malignancy in undescended testes.

3. Heredity:

Heredity seems to be of little if any, importance in this disease. Here and there throughout the literature are scattered cases giving a history of familial neoplasm, but in general, such a history is not found. In one case (Marchand) a brother is said to have died of the same disease. In my series, only one patient gave a family history of cancer. His brother, uncle and an aunt died of sarcoma.

4. Trauma:

Injury has often been named as an etiological factor. Miyata, in a series of 20 cases, concluded that fifty per cent were due to trauma. Chevassu, in a series of 128 cases, concluded that a large number were due to trauma but he did not attempt to give any percentage. Bulkley, in a series of 57 cases, encountered only one case which he thought was due to trauma. In this series, 22 patients out of 100 gave a definite history of injury to the testicle. Trauma from the contraction of the abdominal muscles may be a factor in those cases in which the testicle lies at or near the internal ring. The traumatic view of the etiology of these tumors has but small foundation.

5. Relation to Previous Inflammation or Other Antecedent Pathologic Conditions:

In only one case in this series was there a history of previous inflammation in the testicle. This patient had had an orchitis

accompanying mumps fifteen years previously. Venereal disease seems to have no relation to this disease.

6. Side Involved:

In this series, the right testicle was affected in 44 cases, the left in 56 cases. In 56 cases collected by Bulkley, there were 30 cases in which the right testicle was involved; 24 on the left side and 2 double. Chevassu collected 106 cases in which the right side was involved 56 times, the left 50 times.

7. Age:

In this series the ages were as follows:

Before five years	- - - - -	1
Between six and seventeen years	- - -	0
Between eighteen and twenty-nine	- - -	42
Between thirty and thirty-nine	- - -	32
Between forty and forty-nine	- - -	12
Between fifty and seventy-five	- - -	12

In 55 cases collected by Bulkley, the ages varied from 17 to 52 years, the average being about $34\frac{1}{2}$ years. Forty-two, or a little over seventy-five per cent, occurred between the ages of 25 and 45 years. These figures correspond closely with those of Kober, who found that seventy-one per cent, of 114 cases of scrotal malignant testes occurred between the ages of 20 and 50 years.

Kocher reported 37 cases with ages as follows:

Before twenty years	- - - - -	0
Between twenty and thirty years	- - -	11
Between thirty and forty years	- - -	18
Between forty and fifty years	- - -	2
Between fifty and sixty years	- - -	4
Between sixty and seventy years	- - -	2

Chevassu collected 128 cases with ages as follows:

Before five years - - - - -	5
Between six and seventeen years -	0
Between eighteen and twenty-nine-	37
Between thirty and thirty-nine --	46
Between forty and forty-nine - --	27
Between fifty and seventy-five---	9

These figures confirm the general opinion that practically all cases occur during the period of greatest sexual activity.

8. Relationship to Undescended Testicle:

In 1859 Johnson published the first case of malignancy associated with undescended testicle, although it was mentioned previously by such writers as Dupuytren and Lecompte. Since Johnson reported his cases, German and French writers have collected series of cases and placed them on record. Most prominent in this work were Farwick, Meiser, Kaepelin, Rademacher, Blank and Chevassu.

Various statistics are available showing the frequency of the condition relative to that of cryptorchidism, malignant testicular tumors in the inguinal canal and malignant scrotal testicles. Eccles found among 60,000 male admissions to a London Hospital, 38 cases of sarcoma of the testis. Of these only one was undescended and that was retained in the abdomen. Among the 65 cases of malignant testicular growth reported by Howard, 57 had complete histories and it was found that 9 cases were in ectopic testicles (15.7%), 8 in the inguinal canal one just below the external ring. This report is based on the 110,000 admissions mentioned above. Bulkley found 2 intra-abdominal malignant testicular tumors out of 13 (15.4%), the other 11 being situated in the scrotum. These cases were found among 12,729 male admissions. Thus in 182,729 admissions to general hospitals there were 3 cases of malignant growths of intra-abdominal testicles, or about one in each 60,000 cases and 12 cases of malignant growths in undescended testicles, or about one in each 15,000 cases. In these

series there were a total of 116 cases of malignant testicular tumors of all locations which would make the ratio of malignancy in undescended testicles to that in normally placed testicles about 1 to 9 or 10.3%. Shoedel encountered 5 cases of malignancy of the inguinal testicle as against 36 cases in the normally placed organ. In a series of 54 cases of malignant testicular disease reported by Odiorne and Simmons, it was found that 6 or 11% were in undescended testes. Four of these were in the abdominal cavity and two in the inguinal canal. Chevassu reported 10 malignant inguinal and 5 malignant abdominal testes out of a total of 128 cases. Thus his proportion of ectopic to normally placed malignancies is 1 to 9, and the ratio of the abdominal to the inguinal 1 to 2. Blank collected 19 cases of abdominal and 93 cases of malignant inguinal testes. Meiser collected 64 malignant inguinal testes, as against 4 abdominal testes.

In my series of 100 cases, there were 9 ectopic malignant testicles - 7 inguinal and 2 abdominal.

Summing up these records we find about 1 in 5 cases of malignant disease of the ectopic testicle in which the organ is situated within in the abdominal cavity; about one case of malignant abdominal testicle to 30 cases of normally placed malignant organs and about one case of malignant ectopic testicle to 9 cases of normally placed malignant organs.

According to Rennes the relation of the number of ectopic testicles to normal ones is 1 to 600, while Marshall gives it as 1 to 1000. Monod and Terillon found 6 ectopic testes among 3600 conscripts. Out of 48,000 males with herniae, Eccles reports that 854 had an undescended testicle either on one side or both and none showed malignancy. Coley reports 49,859 males with herniae, of which

number 400 had imperfect descent of one or both testes. No mention is made of malignancy in this series. Thus in 97,859 male patients with herniae, 1254 had one or more undescended testicles, a ratio of about 1 to 77.

While it is difficult to get the ratio of ectopic to normally placed testicles, yet there is no doubt that a much higher ratio exists between ectopic malignant testicles and normally placed malignant organs. Beers says that about 1 out of every 75 abdominally retained testicles will become malignant. If we accept the ratio of 1 case of malignant abdominal testicle to every 30 cases of normally placed malignant organs, it may be said that one case of malignant abdominal testicular disease will be found among 60,000 men. This statement is based on the fact that my series of tumors was found among approximately 200,000 male patients, giving an average of one tumor per 2000 men. There were but two retained abdominal tumors in this series, or about 1 per 100,000 men. Bulkley has computed statistics in which he found 1 cryptorchid in 900 men and only 1 malignant cryptorchid in 60,000 men.

Cunningham states that a perusal of the literature shows that new growths developing in undescended testicles is in reality of rare occurrence and usually occurs when the organ is retained within the inguinal canal or abdomen. He cites a case in which a tumor developed in an undescended testicle five years after it had been replaced in the scrotum by operation.

Kaepplin considers the abdominal retained organ relatively immune, arguing that if the malignant cases of abdominal, inguinal and scrotal testicles bore the same ratio to each other as the non-malignant cases, the malignant abdominal testis would be far more

common than it is. From these facts it seems logical to conclude that the abdominally situated testicle is relatively immune to malignant changes, whereas the testicle lying in the inguinal canal is more apt to become malignant than that in the scrotum.

Resumé

1. New growth of the testicle is a rare disease, occurring about once in 2,000 males.
2. The disease is practically always unilateral - involving both sides only as metastatic growths from the skin, seminal vesicles, etc. Only a few cases have been reported as bilateral.
3. Heredity seems to be of unsequential importance.
4. Trauma as an etiological factor in these tumors has but small foundation.
5. Previous inflammation or other antecedent pathologic condition in the testicle appear to have no significance.
6. Practically all cases occur between the ages of 18 and 50 years, the period of greatest sexual activity.
7. Both testicles are involved with about equal frequency.
8. Undescended testicles within the canal are more apt to become malignant than normally placed organs. Undescended testicles within the abdomen are relatively immune to malignant changes.

Chapter VII.

Changes in the Genital Tract:

Testicle:

Either type of tumor, benign or malignant, grows in such a manner as to force the testicular tissue towards the periphery and all appear encapsulated. It is exceptional that there should exist enough testicular tissue to make it practical to extirpate the tumor and leave the gland. It is easy to study the manner in which the testicle reacts to the neoplastic invasion. Its connective tissue is infiltrated with lymphocytes, the seminiferous tubules become thickened,

their inner lining lamellar and their lumina diminish. Those tubes in contact with the new growth become hyalinized. The interstitial cells atrophy and finally disappear. Infrequently the intratesticular tumor infiltrates into the midst of seminiferous tubules without pushing them before it.

Epididymis:

In all tumors of the testicle the epididymis is uninvolved for a long time. As the tumor enlarges, the epididymis spreads out over the tumor surface in much the same manner as the fibroid uterus elongates itself. The head, especially, remains intact for a long time. This point is very valuable from a diagnostic standpoint. The body and tail may be so flattened and spread out as to be imperceptible to the touch, but the head can practically always be distinguished. In two conditions the head of the epididymis is enlarged: (1) When secondarily invaded by the neoplasm; (2) When varicocele is present in the posterior veins of the cord.

Tunica Vaginalis:

The tunica reacts to changes in the epididymis. Often there is present a symptomatic hydrocele, which is rarely large enough to completely mask the diagnosis of the testicle. Following this exudative vaginalitis comes the plastic type with adhesions between the two leaves of the tunica vaginalis. Sometimes these adhesions begin at the edge of the cul-de-sac of the tunica vaginalis, and at the other times on the anterior surface of the testicle. This divides the cavity into two parts corresponding to the two poles of the testicle. The upper pole in the region of the globus major is the last to be invaded. These adhesions are found more frequently in the mixed type of tumor than in any other type. They occur in the

carcinomatous type but relatively late in the disease.

The Cord:

The arteries of the cord increase in volume according as the testicle enlarges. The spermatics may become as large as the radial. The deep and superficial veins are voluminous also. Not until late in the disease is the cord invaded by neoplasm and it keeps its suppleness until late. Finally, in the late period, the cord is infiltrated in such a manner that any separation of the divers elements becomes impossible. To the tumor of the testicle is then added a true tumor of the cord so that the whole tumor mass extends up into the inguinal canal. In more exceptional cases, the tumorous cord is surrounded by a fibrous tunic and grossly is separated from the tumor.

Chapter VIII.

Generalization:

The lung is the most frequent organ affected in a generalized metastatic condition of these tumors. If the neoplastic elements do not lodge in the lungs, they return to the left heart and from there are thrown into the general circulation. After this, they may be encountered in the brain, liver, spleen, kidneys or intestine. It is by this means that the opposite testicle may become involved, but this is rare. Even more rarely may an embolus reach a bone.

The carcinomatous type generalizes only slightly and it rarely passes the limits of the lymphatic circulation. On the contrary the malignant mixed type of tumor generalizes rapidly and extensively. But under what form microscopically does it generalize? The rapidly changing mixed type of tumor which already shows a preponderance of one type of tissue, such as papillary epithelium, generalizes as this type. But if such a tumor presenting rapidly growing epithelium has

clearly conserved its mixed structure, the generalization may equally be under the form of a mixed tumor, - cartilage, cysts, muscle, etc. A certain number of tumors generalize under the form of chorio-epithelioma without the tumor having clearly presented signs of that type of structure. It is possible in such a case that there was an intratesticular change into chorio-epithelioma, but it was small and unnoticed and did not grow much until generalized.

Chapter IX.

Diagnosis and Symptoms:

Usually the patient consults a doctor on account of a swelling in one side of the scrotum, which he has probably noticed for several months and which has undergone a gradual increase in size. These tumors are sometimes entirely without pain, sometimes sensitive, and occasionally very painful. In my series, there was a definite history of pain in the testicle during some period of the disease in 52 cases, or 52 per cent. The average time between the patient's discovery of disease and his presentation at a hospital was twenty-five months. The shortest time was three days and the longest twenty years. Careful examination of their surface oftentimes shows points where the sensibility of the testis still persists. This corresponds to the parenchymatous zones which are not yet invaded. The tumors are particularly heavy and usually of firm consistency. In most cases, the cord is much larger than that of the opposite side, due to the necessity of a greater blood supply to the part. But this is true also in syphilitic testicle and hematocele. The pulsations of the spermatic artery are usually noticeable, but this is often present in other conditions. In a certain number of cases, the cord, without being early invaded, is less supple than that of the other side. The

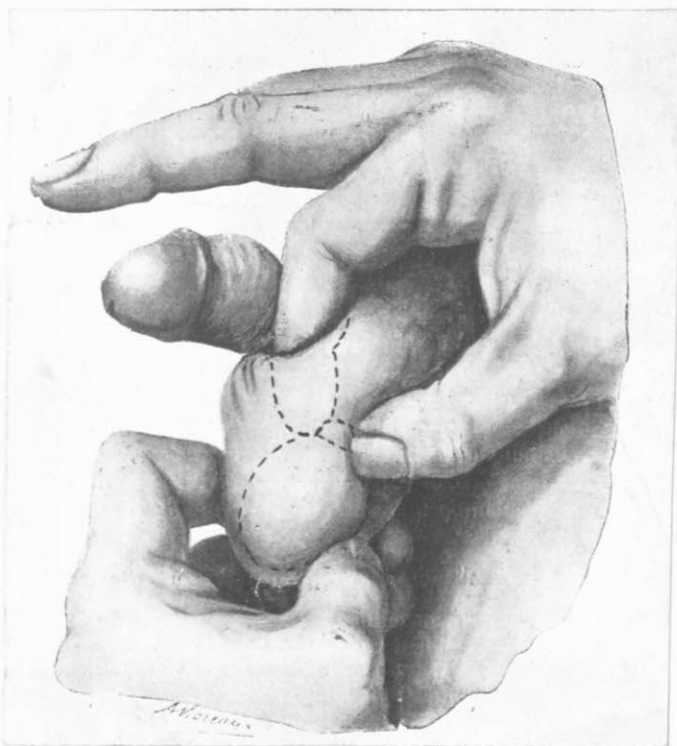
diseased testis cannot be pulled downward so easily as the healthy one, - probably due to lymphatic involvement of the cord. This sign is also seen in syphilis and hematocele.

There are two clinical types of tumor of the testicle. The first type is characterized by an increased consistency of the gland and a zone more or less limited, accompanied by a slight increase in its volume. These changes are due to the appearance of neoplastic tissue in the testicular parenchyma. This type corresponds to the first stage of the disease and is rarely seen. In the presence of such a case, only two diagnoses are possible - syphilis and the new growth. The syphilitic testicles are always more irregular in consistency and are rarely covered by a normal tunica vaginalis. These symptoms are not always absolute and in difficult cases, it is often necessary to resort to antisyphilitic treatment in order to make a diagnosis.

The second type is much more frequent. The scrotum contains an ovoid tumor, the size of a hen's egg, or larger, which is smooth or slightly furrowed and firm, elastic or fluctuating in consistency, and does not transmit light. Four diagnoses must be considered: neoplasm, syphilis, hematocele and tuberculosis. In tuberculosis, one is usually aided by the family or personal history. The growth usually increases in size quite rapidly, usually causes pain and sometimes fever. The growth first appears in the epididymis and extends along the vas as small nodules. Later on, the testicle is involved and often sinuses break through the skin surface. Tuberculosis of the testicle is usually only one manifestation of a generalized genital tuberculosis. The prostate and seminal vesicles may show signs of involvement and tubercle bacilli may be found in the urine.

Hematocele is relatively easy to distinguish. But it cannot be distinguished by its form, consistency, sensibility or the state of the cord. Two main signs are useful in differential diagnosis, - (1) The palpation of the tunica vaginalis, and (2) especially the palpation of the epididymis. If, on the surface of a scrotal tumor, one palpates the tunica vaginalis, it is certain that he is not dealing with a hematocele, for in such a condition the distended tunica vaginalis cannot be palpated. It is also impossible in hematocele to feel the epididymis between the fingers because one finds it hidden in the cavity of the hematocele. The palpation of the tunica vaginalis and that of the epididymis constitute two elements of prime importance in diagnosis. It permits us to affirm that the tumor in discussion is not a distended tunica vaginalis but surely an enlarged testicle. Exploratory puncture should not be done in such cases. Frequently a neoplasm is aspirated, blood is obtained and a diagnosis of hematocele made. In this way, harm is done in that proper treatment is delayed by the faulty diagnosis and the more early spreading of the neoplasm becomes possible. A biopsy is warranted in all cases of doubt. Syphilis of the testicle is usually more irregular in consistency than neoplasm. It is often accompanied by hydrocele formation. The history of syphilis and the Wassermann test are also valuable aids in diagnosis. In difficult cases, it is necessary to resort to antisyphilitic treatment to make the diagnosis. But this treatment should not extend over a long period of time. If at the end of eight days of intensive treatment, the lesion has not diminished to an appreciable degree, one should abandon the idea of syphilis and make a provisional diagnosis of neoplasm. In such condition a biopsy is also warranted.

According to Chevassu, the palpation of the epididymis is the most essential diagnostic point in differentiating neoplasm from the other possibilities. It is based on the fact that tumors of the testicle respect the integrity of the epididymis for a long time. In proportion as the neoplasm grows the epididymis is elongated, but its head conserves its aspect almost normally for a long time. It flattens out slowly and is drawn somewhat backwards but all in all, it retains about the same volume as formerly. The palpation of the superior pole of the epididymis is the key to the diagnosis.



The Palpation of the Epididymis (Chevassu).

By imaginary transparency can be seen the testicle fixed by the left hand and the epididymis palpated between the thumb and index finger of the right hand.

Chevassu first described the method of palpation of the epididymis. While the left hand immobilizes the tumor and draws it down as low as possible, the index finger of the right hand works its way down through the scrotal folds of the skin at a place just in front of its junction with the penis. The finger is then forced downwards towards the superior pole of the tumor while the thumb of the same hand accompanies it but on the scrotal surface. In this manner the cord is pinched between the extra-scrotal thumb and the index finger. They slide down along the cord vertically and reach the superior pole of the tumor. If one then attempts to reunite the digits, he finds them separated by a transverse cord, sometimes hard and sometimes quite supple. It is the epididymis. Sometimes the epididymis can be differentiated from the tumor, while at other times, it can simply be outlined in relief on the tumor surface.

The various symptoms of testicular neoplasm may be summarized as follows:

1. Cachexia; subumbilical glandular involvement; involvement of the cord. These are signs of terminal malignancy and are of no interest to the surgeon who wishes to save his patient.
2. The presence of an intrascrotal tumor, without abdominal adenopathy and without involvement of the cord, conditions which are frequently seen, must lead one to consider the following points:
 - (a) Size. This is of no importance. Neoplasm occurs in the testicle only slightly larger than normal as well as in the large tumor.
 - (b) Shape. It is usually ovoid, but may be slightly piriform. It has no constant characteristic shape.
 - (c) Surface. It is sometimes smooth and regular, at other times furrowed. The presence of furrows points to neoplasm; their absence signifies nothing.

- (d) Consistency. It is sometimes regular, sometimes irregular. It may be hard, firm, or soft; it is very often elastic and at the same time fluctuating. The great irregularities in consistency are more in favor of syphilis.

Thus it is seen how small is the value of the ordinary symptoms given in favor of neoplastic disease of the testicle. All are subject to caution, none gives absolute certainty, each may appear too late. In the meantime, the diagnosis is apt to fluctuate between syphilis, hematocele and neoplasm until valuable time has been wasted and the disease has progressed too far for helpful treatment. The question then filters down to a simple proposition. Any testicle which without manifest pain increases in size and consistency is neoplastic or syphilitic. If it is not syphilitic and the question may be decided after eight days of intensive antisyphilitic treatment, it should be treated as neoplastic.

Chapter X.

Prognosis:

Few neoplasms have a worse prognosis than those of the testicle. The following chart which summarizes approximately 600 cases of these tumors gives some idea of the prognosis. All these cases were operated upon.

(See Chart Attached)

Reported by	Where published.	No. of Cases.	No. not followed.	D i e d				L i v i n g				Date or un-known.		
				With- in 3 mos. after opr.	With- in 6 mos. after opr.	With- in 1 yr. after oper.	2 yr. after oper.	3 yrs. after oper.	4 yr. or more aft- er opr.	(1 yr. Date or un- less known. after oper.	2 yr.		3 yr.	4 yr.
Wettergren	Nordist Med. Archiv 1872, 4, 20.	1									1			
Malassez	Arch. de physiol. norm. path. 1875, 2, 122.	1								1				
Most	Arch. F. path Anat. 1898, 154.	6	1	1	1	1	1			1				
Kober	Am. Jr. Med. Sci. 1899, 117.	113	37		23	11	5		2		20	4	11	
Stwigis	Am. Med. Quar. 1899	40	22								16			
Carey	Johns Hopkins Bull. 1902 13, 268	26												
Roberts	Ann. Surg. 1902, 37	1		1										
Westenhafer	Verh. Dent. Path. Gesell. 1904, 7, 107.	1									1			
Chevassu	These Paris 1906	100			38	17	9		2		15		19	
Bland - Sutton	Practition- er London 1907, LXXIX	57	21								28	6	2	

	Med. Times 9/1913.																			
Glaser- field	Ztschn.f. Krebsforsch 1910, IX, 3.	1				1														
Sheen	Lond. Lancet Sept. 1910.	1			1															
Morris	Lond. Lancet 1912	2								1									1	
Bulkley	S.G.&O. 1913 XVII, 703.	57	18	7	3	8					12	5	2						1	
Hinman	J.A.M.A. 1914, IXIII	18								2	13	1							2	
Codman	Boston Med. & Med. S.J. 1914	80	(12 d'd of other causes) 16								39								13	
Coley	Ann. Surg. 1915 IXIV	64	14			32		2	2				5					3	2	4 have metastas- es & will die.
O'Crowley Martland	S.G.&O 1919 XXVIII #5	13	2			3		2	2				3						1	

Thus it is seen that out of 377 cases which could be followed to death or found to be living and well four years or more after operation 307, or 81 per cent, were dead, while only 25, or 5½ per cent, were definitely known to be alive four years after operation. Gregoire says 91.6 per cent of malignant testicular tumors cause death. My series of cases may be tabulated as follows:

Number not followed	- - - - -	15
Died within 3 months after operation	- - - - -	6
" " 6 " "	- - - - -	7
" " 1 year " "	- - - - -	12
" " 2 " "	- - - - -	7
" " 3 " "	- - - - -	7
" " 4 " or more "	- - - - -	3
Living 1 year or less after operation	- - - - -	6
" 1-2 years " "	- - - - -	5
" 2-3 " "	- - - - -	4
" 3-4 " "	- - - - -	3
" 4 " "	- - - - -	8
" 6 " "	- - - - -	2
" 7 " "	- - - - -	2
" 8 " "	- - - - -	1
" 9 " "	- - - - -	3
" 11 " "	- - - - -	1
" 14 " "	- - - - -	1
" 15 " "	- - - - -	1

Deducting four cases of dermoids from the 100 cases we find that 23 per cent (19 cases) of those followed are alive four years or more after operation, while only 3 cases (less than 4 per cent) are alive ten years after operation. Deducting the cases which are living less than four years since operation, we find that 70 per cent (42 cases)* are dead.

* This includes 2 patients who died from other causes, but will be compensated for by the two cases counted as living and well four years or more, with metastases and a hopeless prognosis.

In regard to prognosis, these tumors may be divided into three classes:

- (1) Very malignant (mixed tumor type)
- (2) Malignant to a lesser degree (carcinomatous type)
- (3) Truly benign or reserved prognosis (dermoids, etc.).

The mixed tumor types are generally very malignant and change rapidly in structure. The complex types change more rapidly than the more simple types. The prognosis of such a tumor should not be attempted until after a microscopic examination has been made. Tissues resembling the normal tissues of a fetus - epithelial cysts, regularly lined, connective tissue more or less rich in young cells, mucous tissue, islands of cartilage, etc., may convey the idea that one is not dealing with a malignant tumor. However, we have no right to assume that it is benign. Out of 55 cases of this type of tumor traced by Chevassu, only 10 were found to be alive and free from recurrence and 6 of these were less than three years post-operative. Of the 21 such cases reported in this paper, only 2 were alive three years or more after operation and 19 were dead (91 per cent). It is a rather curious fact that out of the 10 cases in this series containing cartilage, all died but one and all cases containing papillary and squamous epithelial nests died. One small area may be very malignant and be overlooked on section. In the midst of tissues appearing normal, the microscope may show some areas of epitheliomatous proliferation of cysts, islands of chorio-epitheliomatous tissue, etc. Such a tumor is clearly malignant. If the tumor is of the rapidly changing type, such as the chorio-epithelioma and the papillary epithelioma, the prognosis is very bad. Such types are rapidly fatal and generally die within a year after operation. Of the 18 cases mentioned above, 11 died within one year after operation.

The carcinomatous type of tumor is a malignant growth but of less degree than the mixed type. Its evolution is slow and it remains limited for a considerable length of time. It evolves in two to three years and even more. This is the type which may be eradicated if treated early. Out of 59 cases of this type reported by Chevassu, 22 patients were found to be free from recurrence and 13 of them were in their second year after operation. Out of 39 cases of this type in this series, which could be followed to death or shown to be alive four years or more after operation, 23 were dead and 16 living. This gives a mortality of 60 per cent. The prognosis is also better in the small tumors, in which the cord and epididymis are uninvolved and the tunica vaginalis completely free. The prognosis is always more grave as the tumor is voluminous, the epididymis invaded and the tunica vaginalis fused to the growth and especially, if the neoplasm has invaded the cord. All things being equal, the malignancy of a tumor varies in inverse ratio to the age of the patient. In old people, the duration may be four or five years, but in young people it is usually much less.

The prognosis in the abdominal type of tumor is especially bad, for the majority of the patients do not present themselves for treatment until fairly late in the disease, owing to the fact that no symptoms may be noticeable until complications from pressure arise. In Bulkley's series, 5 of these cases were discovered at autopsy. Ten cases when first seen were considered inoperable. Four of these cases were lost to observation, while the remaining 6 all died in less than a year. In 7 cases only an exploratory laparotomy was done, the tumor being so large or so adherent that removal was thought inadvisable. In 37 cases, the tumor was removed. Four of these cases

died from operative interference, an operative mortality of 10 per cent. Of the remaining 33 cases, 18 could not be followed. Of the 15 cases traced, 8 were reported dead within a year. All these patients died with recurrences. Of the 7 cases reported well, only 3 are alive over two years after operation. Thus out of 47 patients operated upon, only 3 are known to be alive and well after two years.

The dermoids are benign as a rule, but this benignity has two reservations, (1) all such tumors are subject to malignant change; and (2) it is impossible to draw a line between a relatively simple dermoid and a particularly complex mixed tumor.

Resumé of Prognosis

1. The average mortality of these tumors taken from the literature is about 80 per cent, based on a four year post-operative period.
2. In this series the mortality was found to be about 70 per cent.
3. The so-called mixed type of tumor gives a much higher mortality than the carcinomatous type. In this series it was 90 per cent for the former and 60 per cent for the latter type.
4. Tumors containing cartilage, squamous epithelium or papillary epithelial structures, seem to have a decidedly unfavorable prognosis. In this series there was a 90 per cent mortality in all cases containing cartilage, while all those containing squamous epithelium or papillary epithelial structures, that could be traced, were fatal.
5. The prognosis in the abdominal tumors is also very bad, only 6 per cent of a large series being alive and well two years after operation.

Chapter XI.

Treatment:

The treatment for this condition resolves itself into two types, - operative and non-operative:

I. Operative:

1. Simple castration.
2. Simple castration, combined with Coley's serum.
3. Simple castration, combined with Radium or X-Ray.
4. Simple castration, combined with Coley's serum and Radium.
5. Radical operation, combined with X-Ray or Radium or no. (This operation consists in the removal of the tumor, together with the lymphatics and lymph nodes, which are related to the testicle).

II. Non-Operative:

1. Coley's Serum.
2. Radium.
3. X-Ray.
4. Combinations of 1, 2, and 3.

Simple castration has been the method of treating such cases for many years, but it has been disappointing from the curative standpoint. This, of course, does not apply to the benign types, some of which may be treated by simple removal of the growth and the preservation of the testicular tissue and the others by simple castration. Arrou says that castration has never cured an individual suffering from cancer of the testicle. Monod and Terillon say that castration does not give any general hope of life to patients operated upon. Paget, Curling, LeDentu, Most and others confirm the same opinion. Kocher did not believe there was a single case cured by this method. Gross in his statistics of 26 malignant testicular tumors cites 3 cases of "cures," - two for two years and one for fourteen years. In a series of 76 cases collected by Kober, he found 16 who remained cured more than one year. Chevassu collected 59 cases of the carcin-

omatous type (seminome) and found 22 patients to be free from recurrences, 13 of whom were in their second year after operation.

One to two years	6
Two to three years	4
Four to five years	2
Five to six years	1

Out of 55 cases of the mixed tumor type collected by the same author, 10 cases were found to be free from recurrence as follows:

Six months post-operative	4
Two to three years "	1
Three to four years "	1
Four to five years "	3
Five to six years "	1

Of the 30 patients who died the following table shows the time after castration:

Fifteen days to two months	13
Two months to six months	6
Six months to one year	5
One year to two years	4
Two years to three years	1
Three years to four years	1

Out of the 101 cases reported in this paper, 34 were of the so-called mixed type. Out of 25 of these cases which could be traced, only 6 were found to be living and well as follows:

Six months	3
Eight months	1
Seven & 1/2 years	1
Nine years	1

Only 2 cases are known to be alive four years after operation and only one of these has lived nine years. None has reached the ten year limit.

Of the 19 patients who died, the following table shows the time after castration:

Seven days to two months	2
Two months to six months	2
Six months to one year	6
One year to two years	3

Two years to three years	3
Three years to four years	1
Four years or over	2

There were 62 cases of the carcinomatous type of tumor. 54 of these cases were traced and 23 were found to be dead following castration. The following table shows the time after castration:

Seven days to two months	1
Two months to six months	6
Six months to one year	6
One year to two years	4
Two to three years	3
Three to four years	3
Four years or over	2

The 31 living patients were as follows:

Six months to one year post-operative	3	
One to two years	" "	4
Two to three years	" "	4
Three to four years	" "	5
Four	" "	6
Six	" "	2
Seven	" "	1
Eight	" "	1
Nine	" "	2
Eleven	" "	1
Fourteen	" "	1
Fifteen	" "	1

Hence, it is seen that 15 patients are alive four years or more after operation and 3 are alive ten years after operation.

Since the advent of Coley's Serum, it has been used following castration in a considerable number of cases. In 1915, Coley reported a series of 52 cases treated in this manner and contends that a better prognosis is offered by such treatment than by the radical operation. Of these 52 cases, only two showed involvement of the lumbar lymphnodes clinically at the time of castration. Of the remaining 50, 18 are dead, 14 have been lost from observation and 18 are living. Of these 18 who are still living, 9 have well marked metastases and will, in all probability, die. Of the other 9 who show no clinical metastases, 3 are alive over four years since castration, 3

are alive over three years, 1 over two years and 2 over one year. Excluding the two inoperable cases and the 14 which were not followed, the remaining 36 show a certain mortality of over eighty per cent, while none of the remaining twenty per cent have lived long enough to be pronounced cured. In my series, only 6 patients were treated by this method. Of these 4 ($66\frac{2}{3}$ per cent) are dead and 2 ($33\frac{1}{3}$ per cent) are still living, seven and nine years after operation. However, these 2 were both the so-called carcinomatous type of tumor and about thirty-three and a third per cent of them are cured by simple castration alone.

In this series, 11 patients received X-Ray or radium treatments following castration. X-Rays alone were used in 7 cases, X-Ray and radium in 3 cases and radium alone in 1 case. The results in the 7 cases treated by X-Rays are given in the following table:

1	living and well	four years	after operation		
1	"	"	"	three	"
1	"	"	"	two & $\frac{1}{2}$	"
1	"	"	"	fifteen months	"
1	died	three months	"	"	"
1	died	seven months	"	"	"
1	died	seven months	"	"	"

Cases treated by X-Rays and Radium:

1 living and well 1 year after operation
1 died three months after operation
1 died six months after operation.

Cases treated by Radium:

1 living and well six months after operation

From these statistics it is seen that 5 out of 11 cases are dead and out of the 6 which are still alive, only 1 case is living over four years.

Theoretically the ideal treatment of malignant testicular tumors should consist in the ablation of the neoplastic testicle, the

lymphatics and all the nodes into which these lymphatics drain. Any given malignant tumor should be investigated as to its extensions upwards and in particular the state of the lumbo-aortic lymph nodes. This is very difficult to determine. If a mass can be palpated deep in the abdomen below the umbilicus, the diagnosis is easy. But very frequently, cases which are seen apparently early and which show practically no involvement of the cord except a slight thickening, are operated by castration and in a few months, marked metastases in the lumbo-aortic nodes are seen. It is, therefore, fair to conclude that in every case of cancer of the testicle, one should regard the lumbo-aortic nodes with extreme suspicion. Complete castration for malignancy of the testicle should be followed by a systematic removal of the nodes draining this region.

The first operation of such a character was performed by Roberts of Philadelphia in 1902. He operated upon a patient with recurrent malignancy of the testicle by a median abdominal incision and removed the lumbar nodes. The patient, two months later, died of peritonitis. The first successful operation of this kind was performed by Cuneo in 1906. He removed four enlarged lymph nodes, one of which showed malignant invasion and the patient remained well and free from metastases for three years, when he disappeared from observation. Since that time, numerous surgeons, especially in France, have adopted this operation. It is strongly recommended by Chevassu, who has operated upon several cases and by Gosset, Fredet, Michon, Gregoire, Delbet and Panchet.

Bland Sutton says, "Tradition plays an unconscious part in the acts of the most unconventional surgeon. This is the only explanation I can offer concerning the universal practice among sur-

geons when performing the ancient operation of castration for malignancy of the testicle of allowing their efforts to be limited by the internal abdominal ring. The immediate risks of orchidectomy for malignant disease under modern conditions are trifling. The remote results are most discouraging, for within a few months, in the majority of instances, the disease returns in the stump of the spermatic cord, or the lumbar lymph glands become infected with cancer and form huge masses in the abdomen, or secondary nodules appear in various parts of the body. It is undeniable that the modern method of extirpating the primary growth, the associated lymphatics and the lymph glands in dealing with cancerous organs has greatly improved the remote results of operation designed for the relief of cancer. This is manifest in the case of the breasts, the lips and the labia.

He reports a case of a man thirty-one years of age whom he operated upon for malignant testicular growth by the radical method in 1909. The exploratory incision confirmed the diagnosis. The incision was carried up to the costal arch in the semilunar line. The spermatic veins were tied off just before their entrance into the vena cava, the vas and arteries were ligated at the pelvic brim. Exposure was such that he found one large gland at the level of the third lumbar vertebra lying on the anterior face of the vena cava. No other lymph nodes were found. This gland was shelled out and microscopic examination showed it to be as malignant as the primary tumor. By personal communication, I find that this patient was living and well with no signs of recurrence in 1916, seven years after operation, at which time he was lost from observation. Here then is evidently a cure which is due to the radical operation, for if the ordinary castration operation had been performed, the malignant

lymph nodes would have been left behind to grow and eventually cause death.

Hinman has collected a total of 46 cases which were treated by the radical method. There was a combined surgical mortality in all cases of eleven per cent (3 deaths from pneumonia and 2 from peritonitis). Commenting on this mortality, Beer says, "Even though at present the mortality of this operation is much higher than that of simple castration, experience has shown that such is the case with all new operations. The writer feels confident that during the next decade, the mortality of this extensive operation will be markedly reduced." Although sufficient time has not yet elapsed to enable us to estimate the ultimate results in all the cases treated by this method, Hinman found that forty-six per cent were alive, - 1 for five years; 1 for four years; 5 for almost three years; 2 for over two years, and 11 for one year or less. There is a probable cure in at least 4 cases which had lumbar nodes invaded with cancer at the time of the operation. Simple castration would not have cured any of these cases and their cure is directly attributable to the early and clean removal of the affected lymph node area. Within the last three years, Hinman has personally operated upon 5 cases of testicular tumors by the radical method without a single operative mortality. In 4 of these cases retroperitoneal lymph nodes containing metastatic tumor masses were removed. All 5 cases enjoy good health now nine months, seven and a half months, four months, three months, two months and three and a half years respectively following operation. Naturally the ultimate results in these cases cannot be known for years. However, the findings in 4 cases of metastatic tumor tissue in the lymph nodes shows the futility of simple castration.

A cure by the radical operation in any one of these four cases will have been due to the early and clean removal of the lymph draining area.

Technique of the Operation:

A simple castration is first performed through a high inguinal incision. The cord is dissected out as high up as possible and divided upon a clamp, preferably with a cautery. The clamp is left in place for traction on the spermatic vessels in the second part of the operation. At this stage the tumor is examined and if found to be malignant on gross or microscopic examination, the second **step** of the operation is carried out. The incision is prolonged from the high inguinal incision made over the external ring to a point half an inch above the anterior superior spine; the incision then curves upward until it reaches the costal margin at the level of the tenth rib. The incision is carried through the muscle of the abdominal wall until the peritoneum is reached. The cord is traced until it passes through the internal abdominal ring and then with the sides of the incision strongly retracted, tension is applied to the cord as to keep it recognizable. The peritoneum can then be stripped back by gauze dissection without carrying the cord with it. The cord is then traced well down into the true pelvis where it is divided between two ligatures. The next procedure consists in the dissection of the fascia over a portion of the iliacus and psoas muscles, together with the spermatic vessels and lymphatics which it contains and the removal of the nodes from off the inferior vena cava and aorta. Due to the fact that the spermatic vessels spread out above the point where the vas was ligated, it is necessary to make a wide dissection of the

fascia on the outer side and this should extend to the lateral border of the psoas muscle. On the inner side, the line of division of the fascia should pass medially, crossing the common iliac at its bifurcation; here the ureter will be found and should be well exposed. The dissection is then carried upwards along the inner side of the common iliac vessels to the aortic bifurcation. When the right testicle is the one involved, the inner border is continued over the middle of the aorta. When the left testicle is the seat of the tumor, the inner border is carried up along the right border of the aorta, where the inferior mesenteric artery must be carefully guarded. In either case, the upper limit is the upper border of the renal veins. Everything between these boundaries must be removed. The spermatic artery can be clamped as it emerges from the aorta and the vein as it enters the renal vein or inferior vena cava. After securing all bleeding points, the peritoneum is allowed to fall back into place and the wound closed with drainage. This is best accomplished by a rubber tube put down to the aortic bifurcation and brought out as in kidney drainage. Hinman advises in those cases with apparent metastases the placing of a small rubber tube or catheter in the end of which is fastened a fifty milligram tube of radium alongside of the rubber drainage tube. In this way, the metastatic area could be radiated from above downward by removing the catheter certain distances at intervals of one or two hours.

The radical operation should never be undertaken when abdominal metastases are recognizable clinically and should be used only in those cases in which the disease is apparently limited. Owing to the deep position of the nodes, these cases cannot always be differentiated before operation, so that every case in which there is clinically no invasion is suitable for this operation. Before pro-

ceeding with the operation, the diagnosis should be confirmed by examination of the tumor following the first stage of the operation, -castration. This would prevent further operation in cases of syphilitic testicles in which an incorrect diagnosis had been made. The non-operative treatment consisting of Coley's Serum, Radium or X-Ray treatments, should be used in all cases which show abdominal metastases clinically.

Resumé of Treatment

1. The radical operation should be used in all cases in which the disease is apparently limited, i.e., in cases showing no abdominal metastases clinically.
2. The ordinary castration operation even when supplemented by Coley's Serum, X-Rays or Radium, does not yield satisfactory results.
3. Cases which show abdominal metastases clinically should not be operated upon, but should receive such treatments as Coley's Serum, X-Rays and Radium.

Chapter XII.

Report of Original Cases:

Case 1, (A46905 Mayo Clinic), T.M., age 27. 12-12-1910. Five months ago was struck in left testicle by a baseball. Two months later, testicle began to enlarge and has increased steadily since. For the last two weeks pain has been very severe.

Physical Examination: Left testicle enlarged to three or four times its normal size, hard. No lymph nodes palpated.

Gross Examination: Solid, oval, encapsulated tumor, 7 x 5 x 5 cm. in size. Cut section presents a brownish colored surface, one portion of which is made up of a coarsely fibrous area containing numerous tiny cysts. This area is well walled off by a wide dense septum outside of which is a wide zone of normal testicular tissue comprising about one-third of the entire mass.

Microscopic Examination: Tumor is composed of a very loose connective tissue stroma containing small ducts lined by columnar epithelium, large cystic spaces lined by several layers of stratified epithelium, areas of gland-like tissue resembling that of the intestinal tract and round nests of squamous epithelium containing pearls. Still other areas show ovoid areas of very young cartilage and strands of striated muscle.

Diagnosis: Teratoma Testis (mixed tumor type).

Subsequent History: Took Coley's Serum treatment for two years. Died of abdominal metastases, 11/20/1918.

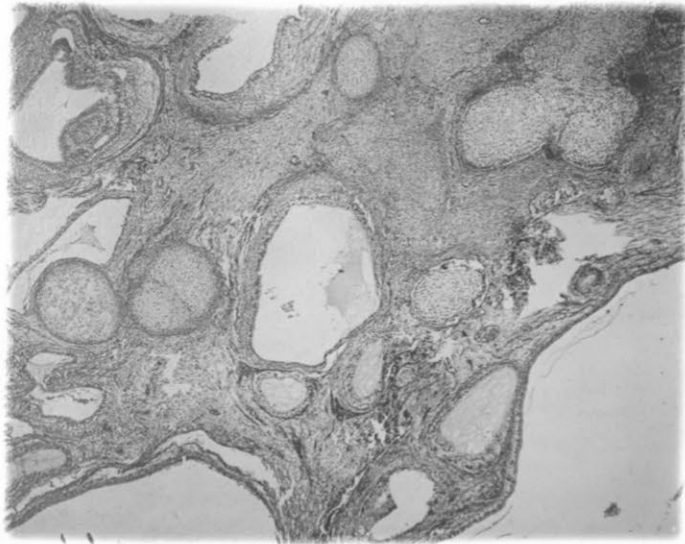


Figure I, Case I. Low power photomicrograph showing cysts and areas of cartilage.

Case 2 (A127522 Mayo Clinic), D.H., age 27, 3/27/1915.

As long as patient can remember, left testicle has been larger than right. Six months ago, he suddenly noticed marked enlargement, but had no pain.

Physical Examination: Left testicle hard, regular, pear-shaped mass 10 x 7 x 7 cm. Does not transmit light. Wassermann negative.

Operation: April 2, 1915, Orchidectomy and herniotomy.

Gross Examination: An oval-shaped, well encapsulated, very firm mass which does not involve the epididymis. Cut section presents a greyish colored surface made up for the most part of cysts varying in size from that of a pin-head to a centimeter. At the lower pole between the cyst-like area and the outer capsular covering can be seen a narrow zone of testicular tissue.

Microscopic Examination: Sections show several large cystic cavities lined by rows of flattened epithelium and an inner cornified layer. Other areas show a diffuse mass of large epithelial cells with large nuclei and a pale cytoplasm. Still other areas show gland-like structures. A few small nests of young cartilage are seen. Numerous nests of small granular cells resembling lymphocytes are present, as well as nests of squamous epithelium with pearls.

Diagnosis: Teratoma Testis (mixed tumor type).

Subsequent History: Died Feb. 15, 1920 of metastases.



Figure II, Case 2. Showing typical
cystic type of tumor on cross section. Cysts
are of varying size.

Case 3 (A76986 Mayo Clinic), W.H., age 23 years. 12/5/1912.

About a year ago patient noticed vague pains and cramps in the abdomen most marked in the right and left lower quadrants. Four months later his left testicle was noticeably enlarged. In three months his abdominal pain became much worse and his home doctor diagnosed the condition as appendicitis and performed an appendectomy. Symptoms rapidly became worse, testicle gradually enlarged until he came to the Clinic.

Physical Examination: Enlarged, hard left testicle; enlarged lymph node in left inguinal region; firm tumor, size of an orange, in left hypochondrium with masses extending down towards groin. Weight 130 pounds; normal weight 146. Wasserman negative.

Operation: December 9, 1912, Orchidectomy.

Gross Examination: Tumor consists of a hard, smoothly encapsulated mass 5 x 3 x 3 cm. in size. Epididymis is not involved. Cut section shows a surface which for the most part is made up of apparently normal testicular tissue. Other areas show a finely granular brown surface and one other large area 2 cm. in diameter presents a multilocular cyst formation containing thin, clear fluid.

Microscopic Examination: Sections show areas of young cartilage and large cysts lined by high columnar mucinous epithelium. Other areas show large rounded epithelial cells with relatively large nuclei, prominent nucleoli and a scanty pale cytoplasm. (These areas are identical with those found in the carcinomatous type of tumor). Large areas of necrosis are present.

Diagnosis: Teratoma Testis (mixed tumor type, with probable change into more malignant growth, - epithelial in character).

Subsequent History: Died July 1913 with abdominal metastases



Figure III, Case 3. Shows a multilocular
cyst formation.

Case 4 (All0051 Mayo Clinic), A.B., age 26 years. 7/8/1914.

Thirteen years ago patient was kicked in the left testicle by a horse. Testicle swelled up at that time and was very painful for a few days, after which it cleared up but there was left a "constriction in the center". Had no more trouble until last winter, when after carrying a heavy stove his left testicle again became swollen and very painful. For the past few weeks has had pain radiating up along the cord into the lumbar region.

Physical Examination: Large, hard left testicle freely movable within the scrotum. Enlarged inguinal nodes on both sides, more marked on the left side.

Operation: July 13th, 1914, Orchidectomy.

Gross Examination: Tumor is a rounded encapsulated mass, 6 x 6 x 5 cm. in size. On cut surface one sees a hydrocele of considerable size surrounding the solid tumor. Cut section through solid portion presents a rough granular surface composed in places of brown colored friable tissue surrounded by a definite capsule. In other places are greyish colored cystic areas which cut with increased resistance. The epididymis is not involved.

Microscopic Examination: Sections show large masses of young cartilage, nests of epithelial cells and numerous cysts, some of which are lined by a double layer of cuboidal cells while others have a flattened single lining. Still other areas show large rounded epithelial cells such as are found in the so-called carcinomatous type of tumor.

Diagnosis: Teratoma Testis (mixed tumor type), probably degenerating into an epithelial proliferation.

Subsequent History: Patient returned December 14, 1914, with

(case 4 continued)

constant pain in right side of abdomen, loss of weight and anorexia. Physical examination showed a palpable mass deep in the abdomen to the right of the umbilicus. A letter from his wife written January 15th, 1915, says, "Husband was operated upon by a local doctor for abdominal tumor. When abdomen was opened, they found a mass of matter which was scooped out with the hands."

Patient died January 11th, 1915.



Figure IV, Case 4. Showing cut surface of tumor. Note hydrocele sac at one edge.

Case 5, (A216123 Mayo Clinic) J.R., age 29 years. 12/7/1917.

Three months ago patient first noticed pain and swelling in right testicle. Swelling has been increasing gradually since. Inguinal glands, both sides enlarged.

Operation: December 24, 1917, Orchidectomy. January 14, 1918, X-Ray treatment.

Gross Examination: Tumor is 8 x 7 x 7 cm. in size, weighing 425 grams. It is hard, well encapsulated and does not involve the epididymis. Cut surface shows a large number of black hemorrhagic areas and a greyish white soft tissue containing numerous tiny cysts.

Microscopic Examination: Sections show cystic areas lined by flattened epithelium, round glandular areas lined by high columnar cells and other extensive areas of large rounded and poly hedral epithelial cells such as are found in the so-called pure carcinoma of the testis. Large areas of necrosis are seen.

Note: This tumor might easily be interpreted as a pure carcinoma later on if it had not been operated. The areas of large epithelial cells appear to be growing very rapidly.

Diagnosis: Teratoma Testis (mixed tumor type with predominance of epithelial proliferation).

Subsequent History: May 27, 1918, complains of pain about the navel; constant pain for last two weeks and marked loss of weight.

Physical Examination: Large mass in abdomen. Patient died August 31, 1918 of abdominal metastases.



Figure V, Case 5. Note black hemorrhagic areas
on cut surface.

Case 6, (A41438 Mayo Clinic), J.N., age 36. 8/8/1910. For past two years the left testicle has been gradually but painlessly enlarging. A few days before admission to the Clinic a local doctor tapped the scrotum and aspirated a small amount of fluid.

Physical Examination: Left testicle is enlarged to the size of a small orange. It is hard and painless; no light transmitted.

Operation: August 10, 1910, Orchidectomy. Tumor was confined entirely to the testicle and had not infiltrated the surrounding tissues.

Gross Examination: Specimen is an oval, well encapsulated mass 9 x 7 x 7 cm. in size, not involving the epididymis. Cut section presents a pink colored surface containing areas of dark colored, soft, granular, almost necrotic material. In the region of the lower pole and between the tumor tissue and the outer capsule can be seen a narrow zone of testicular tissue.

Microscopic Examination: Sections show a diffuse growth of large polyhedral cells with large nuclei, prominent nucleoli, colorless, clear cytoplasm and for the most part, definite cell boundaries. Scattered throughout is a diffuse infiltration of lymphocytes.

Diagnosis: Teratoma Testis, (carcinomatous type).

Subsequent History: August 1912, well, no signs of recurrence.

April, 1915, " " " " "

Sept., 1919, " " " " "

Case 7, (A56144, Mayo Clinic); W. O'B., age 27 years; 7/8/11.

Two months ago the left testicle suddenly began to swell and became very hard. Six weeks later, the skin of the scrotum broke down in one place and discharged pus.

Physical Examination: Large, hard, left testicle draining thick pus and necrotic tissue.

Operation: 7/27/1911. Castration with removal of portion of scrotum.

Gross Examination: Specimen is an oval tumor mass, 7 x 5 x 5 cm. in size with attached piece of scrotum on one side. Cuts easily and presents a soft, cheesy, necrotic surface in the central portion surrounded by firm tumor tissue.

Microscopic Examination: Sections show large areas of necrosis and masses of polyhedral cells of varying size, separated by dense bands of connective tissue giving the appearance of an alveolar structure. Some areas resemble adrenal tissue. The cytoplasm is slightly granular and takes a basic stain. The nuclei are large and granular. Strands of smooth muscle are scattered throughout.

Diagnosis: Teratoma Testis (mixed tumor type).

Subsequent History: Used Coley's Serum for 1 year.

1912, well; no signs of recurrence

1919, well; no signs of recurrence.

Apparently cured.

Case 8, (A245306 Mayo Clinic); S.W., age 25 years. 9/12/1918

In November 1917 patient was struck across the right flank while loading lumber. Soon began to have stiffness in the back and says he was feverish. The following July (this year) he was operated upon and the doctor told him he drained a perirenal abscess on the right side. There were no urinary symptoms at any time. After this operation patient noticed for the first time that his right testicle was swollen and was becoming sensitive and painful. Has been enlarging gradually since. He also complains of a sense of fulness in the abdomen.

Physical Examination: Enlarged nodes in both axillae; large mass in mid-epigastrium, size of a grapefruit. Right testicle enlarged and hard; left testicle retained in canal. No palpable nodes in either groin.

Operation: 9/17/18. Orchidectomy. X-Ray treatment to metastases.

Gross Examination: Specimen is an oval-shaped, definitely encapsulated mass, 5 x 4x3 cm. in size. Epididymis is not involved. Cut section presents a central greyish, finely granular tumor area extending out from the rete towards the periphery. Between this area and the capsule is a zone of testicular tissue one cm. in width.

Microscopic Examination: Sections show a diffuse growth of rounded epithelial cells with large nuclei and a pale basic staining cytoplasm. Numerous mitoses are seen. Connective tissue proliferation is so marked in places that it gives the impression of scirrhus carcinoma.

Diagnosis: Teratoma Testis (carcinomatous type).

Subsequent History: Patient died in December, 1918, of generalized metastases.



Figure VI. Case 8. Showing growth of tumor tissue from region of rete out towards periphery. Zone of normal testicular tissue can be seen between tumor area and outer capsule.

Case 9, (Mayo Clinic, A183491); H.B., age 46 years.

1/18/1917. Six years ago the patient first noticed an enlargement of the right testicle which has gradually increased in size since. There was no history of injury and no pain at any time.

Physical Examination: Large mass in right scrotum; no light transmitted.

Operation: January 22, 1917. Orchidectomy.

Gross Examination: Specimen is a large oval tumor, 8 x 15 x 6 cm. in size, breaking through the capsule at one point. It cuts with leathery consistency and presents a deep brown colored surface resembling fibrous or muscle tissue. Some areas are necrotic.

Microscopic Examination: Sections show rounded and polyhedral and cells, of varying sizes with relatively large nuclei and a pale staining slightly granular cytoplasm. In places definite cell membranes can be made out. Numerous mitoses are seen. Connective tissue stroma is present as thin, dense bands.

Diagnosis: Teratoma Testis (carcinomatous type).

Subsequent History: Patient returned with a recurrent nodule (May 1917), which was removed; was treated by X-Ray and discharged. October 1917, returned for X-Ray treatment; no signs of recurrence. September 1919, well. October 1920, well.

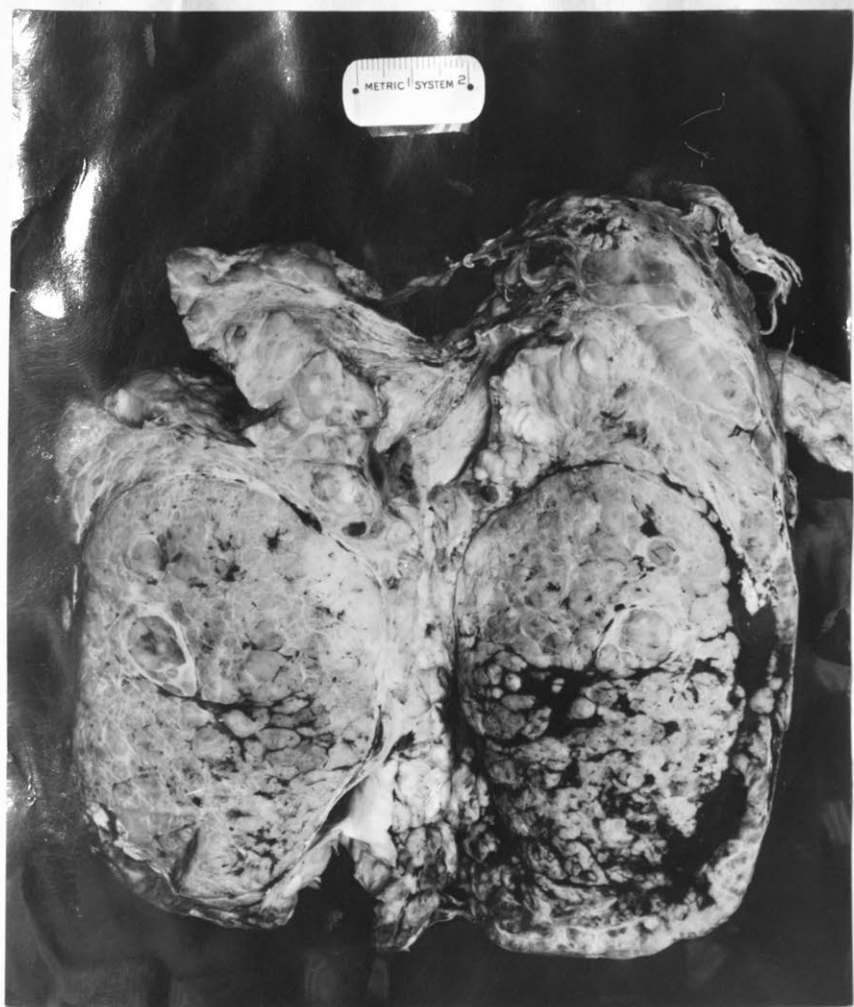


Figure VII, Case 9. Note large size of tumor with hemorrhagic and necrotic areas.

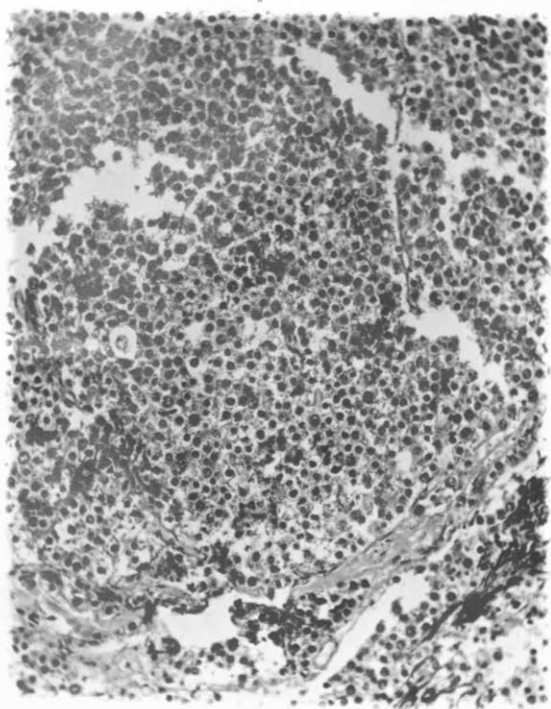


Figure VIII, Case 9, (to the left). High power view showing the large polyhedral cells with deeply staining nuclei and pale cytoplasm, which is characteristic of this type of tumor.

Case 10, (Mayo Clinic, A68197); E.S., age 35 years. May 24, 1912. In November, 1911, patient accidentally discovered that his left testicle was larger and more firm than the right one. There is no history of injury and only slight pain at times. During the past few weeks, testicle has increased in size very rapidly.

Physical Examination: Left testicle size of a goose egg; firm and tender. No glands palpated. Wassermann negative.

Operation: May 29, 1912. Orchidectomy.

Gross Examination: Specimen is an oval, smoothly encapsulated tumor mass 6 x 5 x 4 cm. in size. Cut section shows a yellow, finely granular surface.

Microscopic Examination: Sections show large oval and rounded cells with large nuclei and prominent nucleoli. Numerous mitoses are seen. The cytoplasm is pale and scanty. Connective tissue is present as thin, dense bands.

Diagnosis: Teratoma Testis (carcinomatous type).

Subsequent History: Patient was well for nearly four years following operation. Returned to Clinic in April 1916, complaining of pain, tumor and sense of fulness in upper abdomen. Examination showed a large, scarcely movable mass lying deep in the left hypochondrium. Died December 1916, with abdominal metastases.

Case 11, (Mayo Clinic, A141146); R.J., age 1½ years. September 14, 1915. Nine months ago, the parents noticed swelling of the right testicle which gradually increased in size until three months ago. At that time, a right orchidectomy was performed by Dr. H.A. Johnson of Minneapolis and a diagnosis of malignant tumor was made. There was local recurrence inside of a month and the mass has been growing very rapidly since.

Physical Examination: Large, nodular, movable tumor in right scrotum, size of an orange.

Operation: September 30, 1915. Excision of mass.

Gross Examination: Specimen consists of a rounded mass 4 x 4 x 3 cm. in size covered by skin on one side. Cut section shows a brownish colored surface made up of several large lobules separated by dense, fibrous septa.

Microscopic Examination: Tumor is composed of cells irregularly arranged and having for the most part a fusiform and polyhedral shape. Some cells are very large and have enormously large nuclei. The inter-cellular substance is scanty in amount. Large amount of mitotic figures are seen. Taken as a whole it resembles a sarcoma.

Diagnosis: Teratoma Testis (Carcinomatous? type).

Subsequent History: Died February 24, 1916, with generalized metastases.

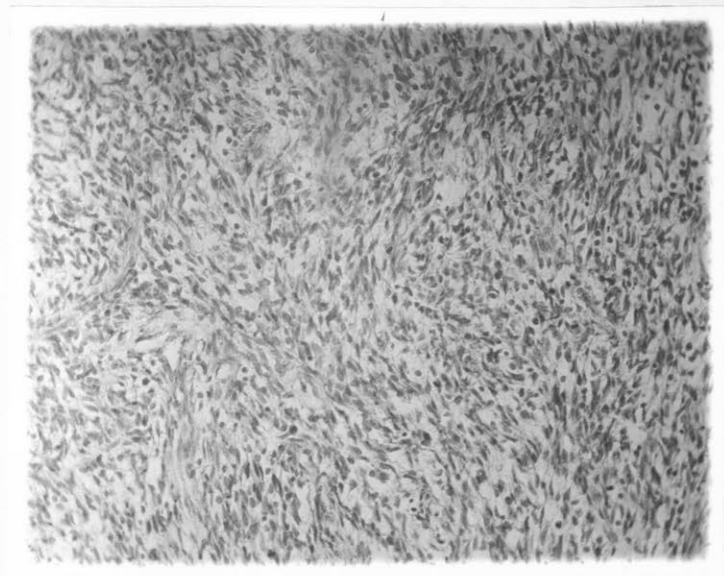


Figure IX, Case 11. High power view showing an arrangement which resembles sarcoma. All sections showed the same structure. The fact that this tumor occurred in a baby one and a half years old and was of very rapid growth undoubtedly has something to do with the shape of the cells, which are evidently flattened due to pressure.

Case 12, (A45137, Mayo Clinic); O.H., age 31. 10/25/1910.

One year ago patient suffered an injury to left groin; no trouble at that time. Seven months ago left testicle began to swell and continued to enlarge up until one month ago. Since that time, there has been no change. Has ~~no~~ pain in left groin, radiating around to small of back. For past three weeks has had hoarseness.

Physical Examination: Left testicle enlarged to size of a small orange. Nose and Throat Department diagnosed vocal cord condition luetic and patient was sent home on KI treatment. Two months later, he returned improved so far as hoarseness was concerned, but there was no change in testicle.

Operation: December 10, 1910. Orchidectomy.

Gross. Examination: Specimen is a rounded, smoothly encapsulated tumor mass 7 x 6 x 5 cm. in size. Epididymis is not involved. Tumor cuts easily and presents a coarsely granular, brownish colored surface mottled with tiny, softened, yellowish colored areas.

Microscopic Examination: Sections show nests of squamous epithelium, the cells of which have a clear colorless cytoplasm and granular nuclei. Epithelial pearls are present. Other areas show cystic spaces, gland-like structures made up of high columnar mucinous cells. A few striated muscle fibres are seen. Large necrotic areas are present.

Diagnosis: Teratoma Testis (mixed tumor type).

Subsequent History: January 27, 1911, patient returned with trouble in breathing, stomach distress, constipation, loss of weight and appetite. Nodes in left side of neck enlarged. Examination showed small tumor in right side of neck, just above clavicle. Large mass in abdomen above and to the left of the umbilicus. Died 3/16/11 with metastases.



Figure X, Case 12. Note the coarse, granular surface of tumor. .

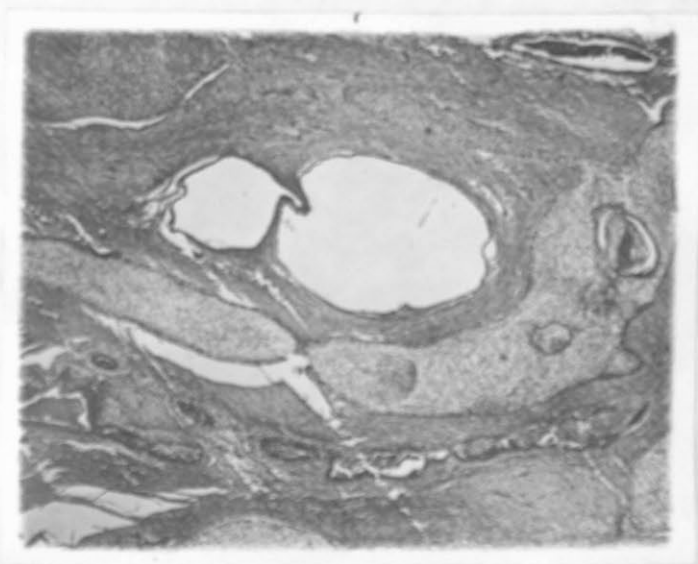


Figure XI, Case 12. Low Power photomicrograph showing cystic spaces and nests of squamous epithelium containing pearl formations.

Case 13, (A229088) Mayo Clinic); J.E.B., age 33 years.

April 22, 1918. Seven months ago, patient noticed that his left testicle was somewhat swollen. He paid no attention to it and had no trouble until seven weeks ago, when he began to have marked soreness in the left lumbar region. This soreness extended around to the groin with occasional shooting pains into the left testicle, which was gradually increasing in size. Recently, the pain has been severe enough to keep him awake nights. Two weeks ago, he passed bloody urine for a week. Has lost 28 pounds in weight during the past seven weeks.

Physical Examination: Large mass palpated deep in left hypochondrium. Left testicle enlarged to three times its normal size; hard; not translucent but feels like an acute hydrocele. Wassermann negative. Cystoscopic examination negative.

Operation: May 2, 1918. Castration.

Gross Examination: Specimen is rounded, encapsulated, 5 x 5 x 4 cm. in size. It cuts easily and presents a large central zone made up of finely granular tissue containing numerous cysts and surrounded by a narrow zone of testicular tissue.

Microscopic Examination: Sections show masses of cartilage, large round cysts lined by a double layer of cuboidal epithelium and areas of tortuous gland-like structures resembling those of the intestinal tract. Nerve trunks are also seen.

Diagnosis: Teratoma Testis (mixed tumor type).

Subsequent History: Died June 24, 1918, with metastases.

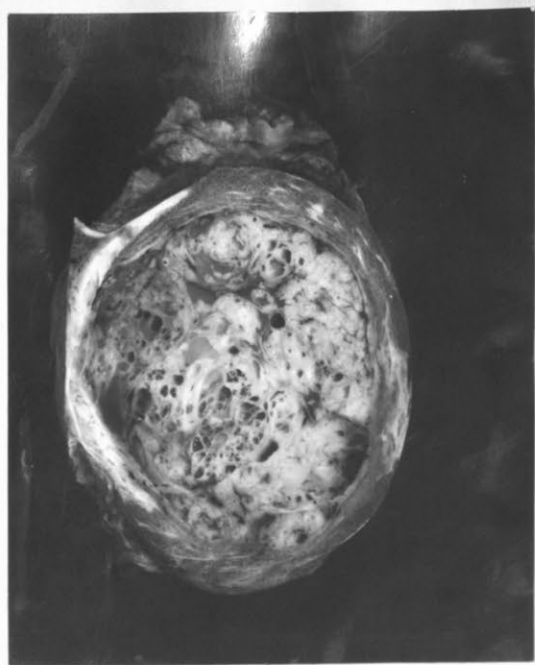


Figure XII, Case 13. Showing a rounded tumor mass made up of finely granular tissue containing many cysts and surrounded by a narrow zone of testicular tissue.

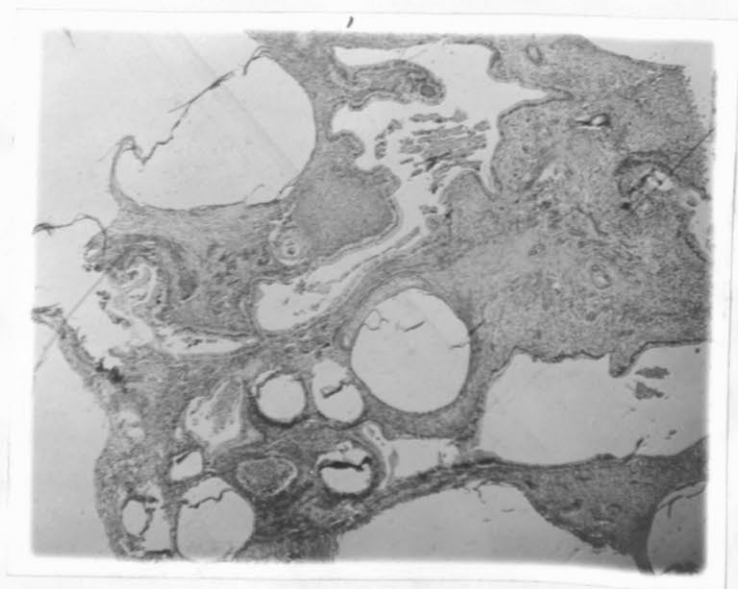


Figure XIII, Case 13. Low power photomicrograph showing large cystic spaces and gland-like structures resembling those of intestine.

Case 14, (A13365G Mayo Clinic), S.F.S., age 75 years. August 11, 1908. Two years ago, was kicked in the left testicle by a horse. Soon after, a swelling developed which was diagnosed by the local doctor as a hydrocele.

Physical Examination: Large left hydrocele and double bubonoc-
cele.

Operation: August 12, 1908. Castration.

Gross Examination: Specimen is that of a firm tumor, 5 x 5 x 4 cm., surrounded by a hydrocele. Epididymis is not involved.

Microscopic Examination: Sections show large fusiform and rounded cells with numerous mitoses. No definite cell membranes can be made out.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Two months after operation, there was a local recurrence, the size of a grape-fruit. He became "paralyzed on the left side," and was operated upon for "tumor" at Yankton, South Dakota. Died September 9, 1909.

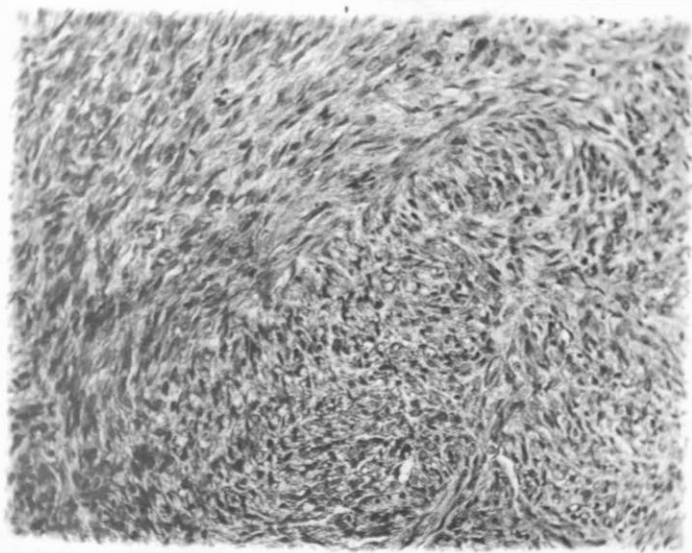


Figure XIV, Case 14.
High power magnification
showing fusiform and poly-
hedral shaped cells. This
was a very rapidly growing
tumor.

Case 15, (A59659 Mayo Clinic); G.B.G., age 50 years. 10/5/11/

When fifteen years of age patient straddled a fence and injured his left testicle. It swelled up badly and remained so for five or six years, after which time it decreased somewhat. Several times since then, he has injured the same testicle and each time it has swollen up. Two weeks ago he "caught cold" and the left testicle suddenly swelled up and caused considerable pain.

Physical Examination: Left scrotum the size of a croquet ball, tense, dull on percussion; slight fluctuation.

Operation: October 7, 1911. Castration (left).

Gross Examination: Specimen is a rounded mass, 6 x 5 x 5 cm. in size, definitely encapsulated and not involving the epididymis. Knob-like growths can be seen beneath the capsule. Cut section shows a pink colored surface which in places is finely granular and is marked off by septa into lobules about 2 cm. in diameter. Other areas are made up of dense pink strands of tissue containing small rounded areas of cartilage.

Microscopic Examination: Sections show numerous duct and gland-like structures of varying sizes lined by one or two rows of low epithelium and cystic spaces lined by several layers of stratified epithelium. Several areas of young cartilage are seen. Other areas are made up of rapidly growing epithelium resembling that found in the carcinomatous type of tumor.

Diagnosis: Teratoma Testis (mixed tumor type).

Subsequent History: August 6, 1912, patient returned complaining of pain in the left inguinal region, "bloating of abdomen" and inability to sleep. Physical Exam. Enlargement of inguinal nodes, abdominal tenderness in left lower quadrant. Died April, 1913, of metastases.

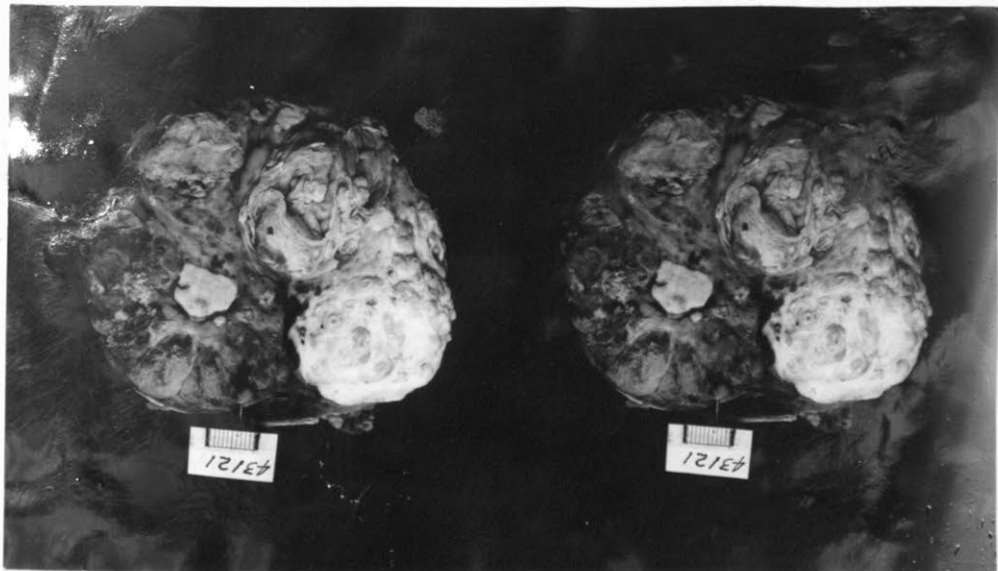


Figure XV, Case 15. Showing cut surface with various formations.

Case 16. (A63785 Mayo Clinic); W.L.T., Age 46. 2/5/1912.

Right testicle has been slightly enlarged and hard since childhood. For the last 3 or 4 months it has been enlarging rapidly in size.

Physical Examination: Right testicle size of a goose egg; hard.

Operation: Feb. 6, 1912. Castration.

Gross Examination: Specimen is a well encapsulated, rounded mass 5 x 4 x 4 cm. in size. Epididymis is not involved. Cut section shows a brownish colored granular surface uniform throughout, except at the periphery, where a zone of normal testicular tissue about 1 cm. in width is seen beneath the outer capsule and sharply demarcated from the tumor tissue.

Microscopic Examination: Sections show large polyhedral cells of varying sizes having for the most part definite cell boundaries. The nuclei are large and contain one or more prominent nucleoli. The cytoplasm is pale and almost clear.

Diagnosis: Teratoma Testis (carcinomatous type).

Subsequent History: Was treated with Coley's Serum several months after operation. September 1919 - perfectly well.



Figure XVI, Case 16. Showing peculiar granular type of tumor tissue sharply differentiated from the normal testicular tissue.

Case 17, (A148827 Mayo Clinic), G.B., Age 34, 1/3/16.

Patient says he has had a hernia on right side ever since he can remember. Two years ago, he noticed his right testicle was enlarged. Recently, he has had a dragging pain in right testicle and cord and has lost 13 pounds in weight.

Physical Examination: Right testicle size of a fist, irregular and firm. Has a right sided hernia and hydrocele. Nodes in both inguinal regions enlarged - most marked on the right side.

Operation: January 3, 1916. Right orchidectomy and herniotomy.

Gross Examination: Rounded, smoothly encapsulated mass 7 x 5 x 5 cm. in circumference, not involving the epididymis. The cut surface is mottled throughout by black and yellow areas of varying sizes. A narrow zone of testicular tissue is seen beneath the capsule and surrounding the tumor zone.

Microscopic Examination: Shows large, polyhedral cells having definite cell membranes, clear cytoplasm and numerous mitotic figures. The connective tissue stroma contains rows of small round cells closely packed between the fibres. Small nests of these cells are seen throughout the section. Large areas of necrosis are seen.

Diagnosis: Teratoma Testis. (Carcinomatous type with Lymphoid Stroma).

Subsequent History: Sept. 1919. Perfectly well with no signs of recurrence. Jan. 1920. Perfectly well with no signs of recurrence.



Figure XVII, Case 17. Showing tumor area sharply differentiated from testicular tissue at periphery.

Case 18. (A64398, Mayo Clinic); C.R., age 38; 2/21/12.

Four years ago, patient noticed a small, nodular swelling at lower pole of right testicle. It has been gradually and painlessly enlarging up until the present time. A few weeks ago, his local doctor tapped it, but obtained no fluid.

Physical Examination: Large tumor on right scrotum, firm; not attached to scrotal skin; does not transmit light.

Operation: 2/27/12 - Castration.

Gross Examination: Specimen consists of a large, oval-shaped, smooth, well encapsulated tumor mass 10 x 9 x 6 cm. in size. Epididymis is not involved. Cut section shows a uniform brownish colored granular surface. No areas of testicular tissue are seen.

Microscopic Examination: Sections are made up of large polyhedral cells with large nuclei and prominent nucleoli. Blood vessels within the stroma are large and numerous. Small round cells are scattered diffusely throughout the tumor area.

Diagnosis: Teratoma Testis. (Carcinomatous type with lymphoid stroma).

Subsequent History: March 29, 1915 - patient perfectly well with no signs of recurrence. March, 1916 - no signs of recurrence.



Figure XVIII, Case 18. Cut surface showing large tumor surface.

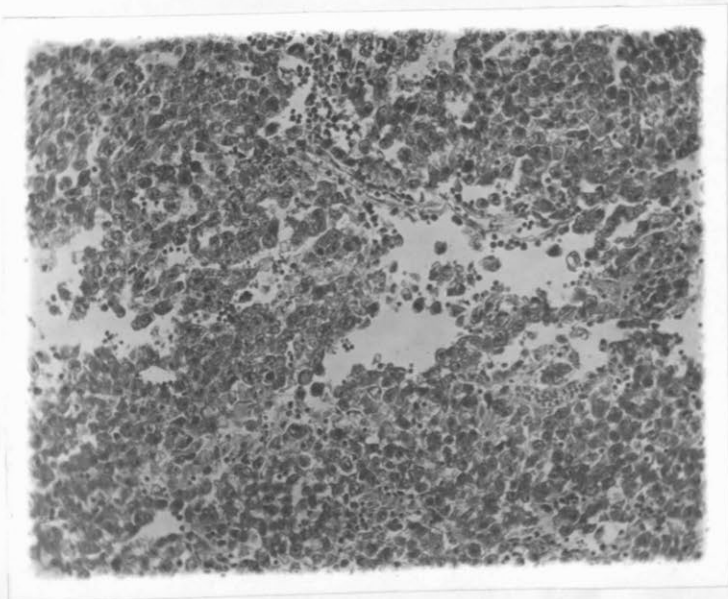


Figure XXIX, Case 18. High power magnification showing the typical large polyhedral cells with dense, large nuclei. Infiltrations of small round cells can be seen throughout the section.

Case 19. (A178809, Mayo Clinic), Age 22, 11/25/16.

Right testicle never descended down into scrotum, but stopped at external ring. When six years of age, patient injured right groin by running into sharp edge of a trunk. Following this accident, a swelling developed in right groin and he was told he had a hernia. Condition never caused much trouble until last October (1915) when he experienced considerable pain in this region. A doctor told him he had a strangulated hernia and operated upon him. Following the operation, there was marked swelling of the wound, which drained "serum and matter." Wound area rapidly increased in size and 3 months ago, was incised and drained. Has lost 8 pounds in weight during past few months.

Physical Examination: Large mass in right groin extending over the pelvis brim and very adherent. Testis can be outlined as a rounded mass size of a coconut. Mass is of a reddish color and is discharging a bloody fluid. Inguinal glands on both sides enlarged.

Operation: 11/29/16. Small piece of tissue excised for diagnosis. Was given one treatment with radium and later, had two X-Ray treatments.

Microscopic Examination: Sections show compact masses of rounded and fusiform shaped cells with large nuclei and an almost clear cytoplasm. Numerous mitotic figures are seen.

Diagnosis: Teratoma Testis. (Carcinomatous type).

Subsequent History: Died three months after operation.

Case 20, (A95165 Mayo Clinic), L.B., age 34 years. 11/8/13. In 1911, patient noticed a little swelling and soreness in left testicle. In 1912 he went to a local doctor who diagnosed the condition as tuberculous testicle and removed it. Three months ago (17 months after operation) he noticed a recurrent swelling in left scrotum and had pain in left groin and back. Has lost 15 pounds in weight recently.

Physical Examination: Large hard swelling in left scrotum size of a goose egg; some enlargement of inguinal glands. Wassermann negative.

Operation: 11/13/13. Left sided scrotal tumor adherent to skin of scrotum - removed.

Gross Examination: Specimen consists of a mass 7 x 5 x 5 cm. in size adherent to the scrotum in places. Cut section presents a fibrous granular surface, brownish in color and mottled with tiny whitish yellow areas.

Microscopic Examination: Tumor is made up of large polyhedral cells with relatively large nuclei, prominent nucleoli and a pale staining cytoplasm. Cell boundaries are fairly distinct and mitotic figures are numerous. Dense wide connective tissue septa ramify the tumor.

Diagnosis: Teratoma Testis. (Carcinomatous type).

Subsequent History: Developed an abdominal recurrence and was operated upon for this by local doctor. Died January 20th, 1914, following this operation.

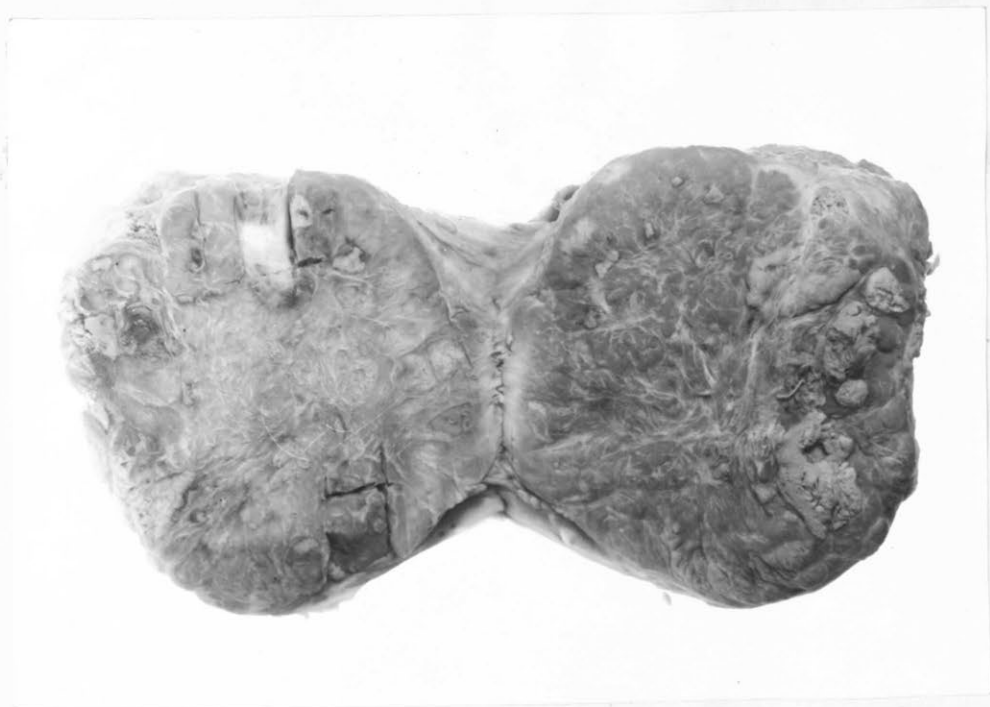


Figure XX, Case20. Showing dense fibrous structure of tumor on cut section.

Case 21, (A186566, Mayo Clinic), W.L. Age 43; 2/24/17.

Last summer while doing some heavy lifting, patient thinks he "ruptured himself" because shortly afterwards, he noticed a swelling in right side of scrotum. Has lost 24 pounds during past 3 months.

Physical Examination: Large, elongated, hard mass in right scrotum; does not transmit light.

Operation: 3/9/17 - Orchidectomy and herniotomy.

Gross Examination: Specimen consists of an oval-shaped, well encapsulated mass 8 x 7 x 6 cm. in size, not involving the epididymis. Cut section shows a surface made up of grayish white softened areas and numerous areas of hemorrhage, with wide dense connective tissue bands.

Microscopic Examination: Sections show large polyhedral cells with large nuclei and a small amount of almost clear cytoplasm surrounded by cell membranes and separated by scanty amounts of connective tissue stroma. Numerous mitotic figures are seen. Small round cells are scattered throughout.

Diagnosis: Teratoma Testis. (Carcinomatous type with lymphoid stroma).

Subsequent History: October 1917, Patient returned with severe pains in back and groin relieved only by opiates. Examination showed a large mass size of a cocoanut in upper right abdomen and several small recurrent nodules in right scrotal sac. Died March 1918.



Figure XXI, Case 21. Cut surface showing dense, wide connective tissue septa and yellowish soft tumor areas.

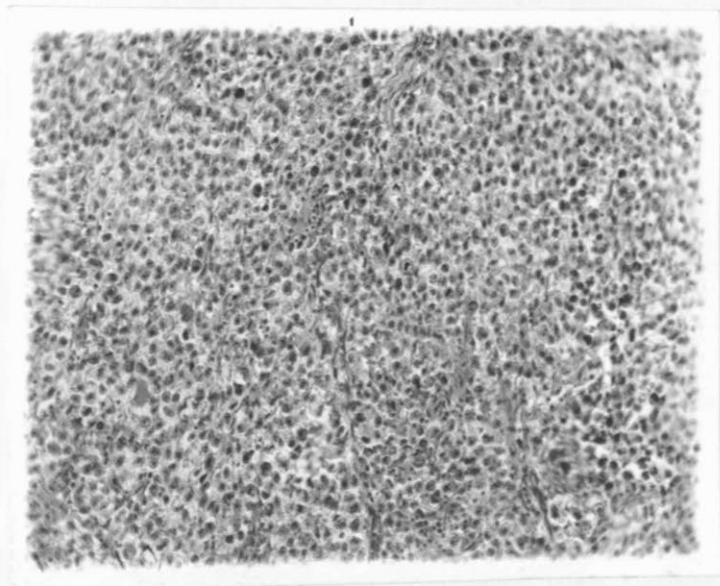


Figure XXII, Case 21. High power photomicrograph, showing the typical large polyhedral cells with large dense nuclei, containing numerous mitoses and a clear, almost colorless cytoplasm.

Case 22. (A148640 Mayo Clinic); W.H., age 36 years; 12/28/15.

Was perfectly well up until 4 months ago. At that time, while at work, patient received a severe blow on left testicle. Pain was very severe for several hours and next day, testicle began to swell. It has been gradually enlarging since.

Operation: 12/29/15. Orchidectomy.

Gross Examination: Specimen consists of an oval-shaped, encapsulated mass 5 x 4 x 4 cm. in size. Epididymis is not involved. Cut section presents a finely granular grayish surface containing large circumscribed areas of a brownish color and softer consistency. At the lower pole, outside the tumor area, but within the capsule is a narrow zone of normal testicular tissue.

Microscopic Examination: Sections show large polyhedral and rounded cells with large nuclei, prominent nucleoli, pale staining cytoplasm and numerous mitoses.

Diagnosis: Teratoma Testis. (Carcinomatous type).

Subsequent History: November, 1917, returned complaining of dull pain in back, suprapubic tenderness, loss of weight and strength. Examination showed suprapubic tenderness and a large metastatic mass in left upper abdomen. June 6, 1918 - died.



Figure XXIII, Case 22. Cut section of tumor showing different colored areas of tissue and separated from a small zone of normal testicular tissue at the lower pole.

Case 23, (A164308) Mayo Clinic); C.N., age 28 years; 6/29/16. Had mumps at 15 years of age followed by atrophy of right testicle. One year ago, patient first noticed some enlargement of right testicle. For the past six months, he has had considerable pain of a dragging character.

Physical Examination: Large tumor mass in right scrotum; does not transmit light.

Operation: July 7th, 1916. Orchidectomy.

Gross Examination: Specimen consists of a rounded, well encapsulated mass 6 x 5 x 5 cm. in size.

Microscopic Examination: Sections show large polyhedral and rounded cells with relatively large nuclei separated by dense bands of connective tissue stroma. Numerous nests of small round cells are present both in the stroma and amongst the tumor cells.

Diagnosis: Teratoma Testis. (Carcinomatous type with lymphoid stroma)

Subsequent History: 11/16/16 - patient returned with pain in back, in left testicle and along left spermatic cord. Also complained of abdominal cramps and vomiting. Examination showed a large deep tumor mass in left upper abdomen. Pressure on this mass caused referred pain in left testicle. There was also a movable mass high up in the epigastrium, probably a nodule in the liver. Died - 12/25/16.

Case 24, (A21104 Mayo Clinic); C.M., age 27 years; 10/17/17.
First noticed swelling of left testicle 3 months ago. At first, it was soft but gradually became more firm. Recently, patient has had pain in testicle and groin and had noticed a swelling extending from testicle up into groin.

Physical Examination: Firm tumor left testicle size of an orange with induration and swelling extending up into inguinal region. Cord is swollen, hot and tender. Wassermann negative.

Operation: Orchidectomy with removal of greater portion of left inguinal glands. Radium and X-Ray treatment following operation.

Gross Exam: Specimen consists of a rounded, smoothly encapsulated tumor mass 8 x 6 x 6 cm. in size involving tail of epididymis and spermatic cord. Cut section shows for the most part a brownish yellow colored surface. Several black hemorrhagic areas are seen. One multilocular cyst containing a clear thin fluid and measuring 2 cm. in diameter is seen.

Micro. Exam: Sections show large polyhedral cells with large nuclei, numerous mitoses and a pale staining cytoplasm. Large areas of hemorrhage and necrosis are seen.

Diag: Teratoma Testis (Carcinomatous type)

Subsequent History:

12/11/17. Returned for X-ray treatment. Condition poor.

April 1918. Died with metastases.



Figure XXIV, Case 24. Large areas of hemorrhage and necrosis.

Case 25, (A131607 Mayo Clinic); A.C., age 29; 8/13/15.

About one year ago, left testicle commenced to swell and gradually increased in size. Last May it became suddenly larger. Patient went to local doctor who diagnosed condition as strangulated hernia and operated upon him. He says a hydrocele was also found. Since operation, he has had pain in the back, left groin and left testicle. Has lost 12 pounds in weight recently.

Physical Examination: Left testicle enlarged to about 4 times its normal size, hard and fairly regular and fixed in scrotum. Small irregular tumor mass palpated deep in left hypochondrium.

Operation: August 19, 1915 - Orchidectomy.

Gross Examination: Specimen is that of an oval-shaped, encapsulated mass 6 x 11 x 7 cm. in size. Epididymis is not involved. Cut section shows for the most part a brownish coarsely granular surface divided into lobules by dense fibrous septa.

Microscopic Examination: Sections show large rounded and polyhedral cells with relatively large nuclei, numerous mitoses, prominent nucleoli and a pale staining, almost clear cytoplasm.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Died September 1916 from abdominal metastases.

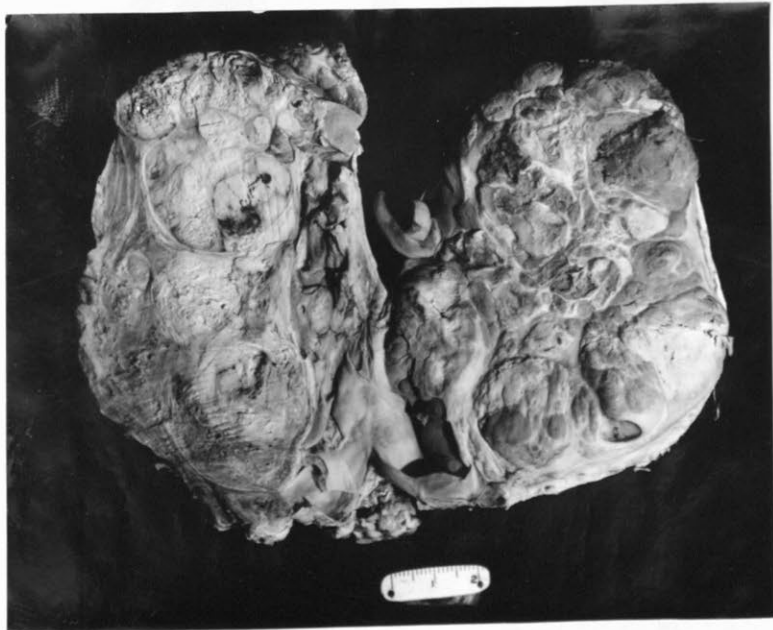


Figure XXV, Case 25. Coarsely granular tumor surface divided by dense connective tissue bands.

Case 26. (A39407 Mayo Clinic); A.S., age 28 years, 6/25/10. Seven months ago patient noticed swelling of his right testicle. Several times since then he has injured the part and each time the testicle has swollen up and been painful. Recently, swelling has extended up into groin.

Physical Examination: Right testicle enlarged and hard; right epididymis very large and hard, vas palpably enlarged; small hydrocele; both breasts secreting.

Operation: July 2, 1910 - Orchidectomy.

Gross Examination: Specimen is a rounded mass 5 x 5 x 4 in size invading lower portion of epididymis and the vas. Cut section shows a uniform brown colored finely granular surface divided up by dense fibrous septa.

Microscopic Examination: Sections show large polyhedral cells with large nuclei and pale cytoplasm grouped into lobules and separated by dense bands of connective tissue.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: September 1911 - letter from home physician says, "Patient has large abdominal tumor near spine." He was operated upon for this condition shortly. Died December 17, 1911.



Figure XXVI, Case 26.

Case 27, (A203055 Mayo Clinic); J.C., age 52 years; 7/31/17. Twelve years ago scrotum was pinched on the edge of a barrel. It was sore for some time and then a small lump formed on the lower pole of the right testicle. This was injured again six years ago. Following this the right side of the scrotum swelled up and has remained swollen since gradually increasing in size.

Physical Examination: Right testicle size of a grape-fruit. Enlarged inguinal nodes (right side).

Operation: 8/3/17. Specimen is a rounded, encapsulated tumor mass 10 x 8 x 7 cm. in size. Cut section shows several large lobules separated by dense white septa. These lobules are composed of a brownish colored granular substance - very soft and friable.

Microscopic Examination: Sections show the typical carcinomatous type of tumor composed of large clear cells with relatively large nuclei.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: September 21, 1919 - perfectly well.



Figure XXVII, Case 27. Dense, wide, septa
separate the different tumor areas.

Case 28, (P2289 Mayo Clinic); J.T., age 50, 2/20/1905.

Five years ago patient suffered a blow to right testicle. There has been a gradual enlargement since.

Physical Examination: Large hard, irregular tumor of right testicle size of a grape-fruit.

Operation: February 22, 1905 - Orchidectomy.

Gross Examination: Large, rounded tumor 12 x 10 x 10 cm. in size.

Microscopic Examination: Tumor is composed of large polyhedral cells with nuclei of ordinary size and only a very few mitotic figures. The cytoplasm takes a pale eosinophilic stain.

Daignosis: Teratoma Testis (Carcinomatous type).

Subsequent History: October 11, 1919 - perfectly well.

Case 29, (A54423, Mayo Clinic); J.H., age 39, 6/13/11.

About eight months ago, patient first noticed swelling and tenderness in left testicle with dragging pain in the cord. For several months there seemed to be no change in the condition. About two weeks ago, it commenced to ache and increased rapidly in size. Local doctor tapped it and only a small amount of fluid was withdrawn.

Physical Examination: Large, firm symmetrical tumor of left testicle; does not transmit light.

Operation: 6/26/1911 - Orchidectomy.

Gross Examination: Specimen is an oval, encapsulated tumor mass 10 x 7 x 7 cm. in size. The peripheral portion is firm and cuts with normal resistance but the central portion is soft and necrotic. At certain points along the periphery can be seen areas of normal testicular tissue.

Microscopic Examination: Tumor is the typical carcinomatous type with large, polyhedral cells, pale clear cytoplasm and numerous mitotic figures.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: February 18, 1913 - patient returned with pain and "tumor under left ribs," and loss of weight. Examination showed a large tumor mass in left upper abdomen. Was put on Coley's Serum. April 1913 returned, tumor reduced one-half in size. Patient has lost 50 pounds in weight.

June 1913 - Died with metastases.

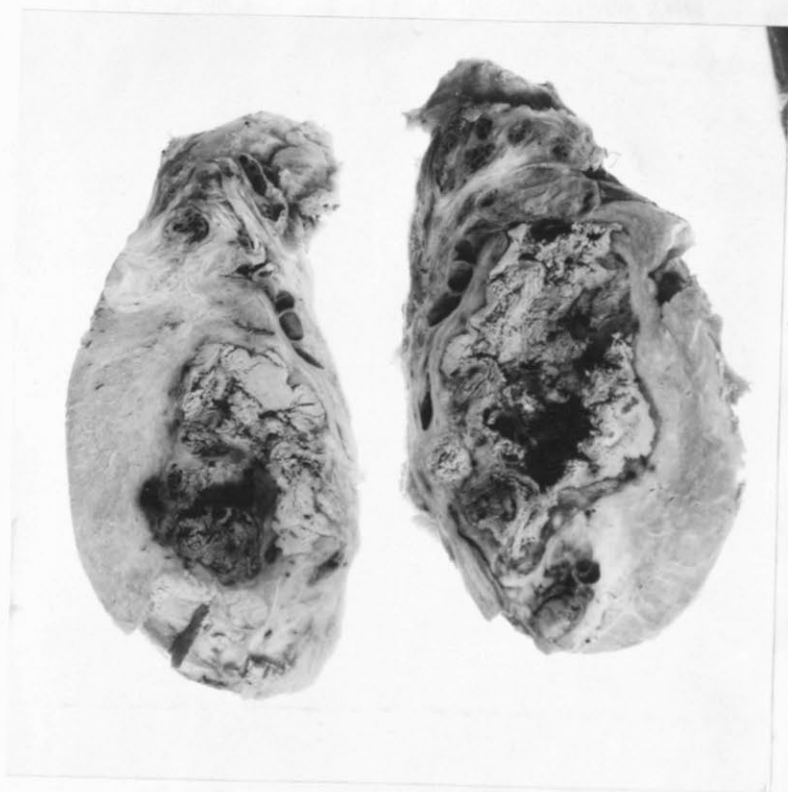


Figure XXVII, Case 29.

Case 30. (A77343, Mayo Clinic); F.J., age 38 years; 12/13/12. Three and one-half years ago, after an attack of typhoid fever, patient noticed that his left testicle was slowly and painlessly enlarging. About 6 months ago the enlargement became very rapid and pain was so severe that he had to go to bed. Pain extended from left groin up towards kidney and down along the thigh.

Physical Examination: Left testicle enlarged to four times its normal size, very hard. Epididymis is hard and nodular.

Operation: 12/17/12. Orchidectomy.

Gross Examination: Specimen is an oval-shaped mass 6 x 4 x 4 cm. in size involving the lower portion of the epididymis. It acts easily and presents a brownish colored finely granular surface divided up by thin septa.

Microscopic Examination: Tumor sections show typical carcinoma, like areas composed of large polyhedral cells with relatively large nuclei and pale, clear cytoplasm.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Not available in this case.



Figure XXIX,
Case 30.

Case 31, (A8656 Mayo Clinic); W.R., age 37 yrs. 4/8/08.

In October 1907, patient injured his right testicle. Since that time it has gradually, but painlessly increased in size.

Physical Examination: Right testicle enlarged to five times its normal size; hard; not tender.

Operation: April 11, 1908 - Orchidectomy.

Gross Specimen not available.

Microscopic Examination: Slides show large polyhedral cells with large nuclei and pale staining almost clear cytoplasm.

Diagnosis: Teratoma Testis. (Carcinomatous type).

Subsequent History: - Aug. 1912 - perfectly well.

Case 32, (A48755 Mayo Clinic); A.H., age 30 yrs; 3/24/05.

Last September patient noticed for the first time that his left testicle was enlarged. Has been increasing steadily in size since. For the last ten days has been painful.

Physical Examination: Left testicle enlarged to size of a grape-fruit; hard; does not transmit light.

Operation: 3/30/05 - Orchidectomy.

Gross Examination: Specimen is a rounded, encapsulated tumor mass 6 x 6 x 4 cm. in size, not involving the epididymis. The cord is somewhat thickened. On cut section one sees many tiny cysts and hemorrhagic areas. At one edge of the tumor is a zone of normal testicular tissue separated from the tumor tissue by a dense band of connective tissue.

Microscopic Examination: Section shows carcinomatous type of tumor arranged in lobules and separated by dense wide connective tissue septa. Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: September 1919 - perfectly well.

Case 32 (A48755 Mayo Clinic) A.H. Age 30 years. 3/24/05.

Last September patient noticed for the first time that his left testicle was enlarged. Has been increasing steadily in size since. For the last ten days has been painful.

Physical Examination: Left testicle enlarged to size of a grape fruit; hard, does not transmit light.

Operation: 3/30/05. Orchidectomy.

Gross Examination: Specimen is a rounded, encapsulated tumor mass 6 x 6 x 4 cm. in size, not involving the epididymis. The cord is somewhat thickened. On cut section one sees many tiny cysts and hemorrhagic areas. At one edge of the tumor is a zone of normal testicular tissue separated from the tumor tissue by a dense band of connective tissue.

Microscopic Examination: Sections show the carcinomatous type of tumor arranged in lobules and separated by dense wide connective tissue septa.

Diagnosis: Teratoma Testis (Carcinomatous type)

Subsequent History: Sept. 1919. Perfectly well.

Case 33, (A18968 Mayo Clinic); J.G., age 25 yrs. 1/12/09. Two years ago patient first noticed enlargement of left testicle. Three months later it was as large as his fist. In March 1907, he was operated upon by local doctor and the testicle was removed. He was told it was a tumor. Four months after this operation, there was a local recurrence and tumor was very painful. This mass was immediately removed. Eight months later there was another recurrence which was removed. Since that time, the wound has been open and has been discharging a bloody fluid. Another mass has made its appearance recently.

Physical Examination: Discharging wound in left scrotum; walnut size mass palpated within scrotal sac.

Operation: January 13, 1909. Tumorous nodule removed and area curetted.

Gross Examination: Specimen not available.

Microscopic Examination: Slides show large polyhedral cells with relatively large nuclei and a clear, pale staining cytoplasm grouped in lobules separated by wide dense bands of connective tissue.

Diagnosis: Teratoma Testis (Carcinomatous type)

Subsequent History: June 1920 - perfectly well. Has had no treatment since last operation.

Case 34, (A302606 Mayo Clinic); R.M., age 36, 1/13/20. About 18 months ago first noticed an uncomfortable feeling about scrotum while riding in an automobile. There was no pain or enlargement at this time. About June 1919 left testicle began to enlarge and at times was very painful with pain shooting up into groin. The enlargement has been gradual up until the present time.

Physical Examination: Left testicle size of a lemon; somewhat nodular and tender.

Operation: 1/21/20. Left castration followed by X-Ray treatment.

Gross Examination: Specimen is oval in shape, encapsulated, 8 cm. x 5 cm. x 4 cm. in size and does not involve the epididymis. Cut surface is finely granular.

Mircoscopic Examination: Sections show a diffuse growth of large rounded and polyhedral cells with large granular nuclei and a clear, almost colorless cytoplasm. Cell membranes are distinct for the most part. Foci of small round cells are present throughout - most marked around the blood vessels. Large areas of necrosis are seen.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: November 1920 - has had five courses of X-Ray treatment since operation; has gained 15 pounds in weight and shows no signs of recurrence.



Figure XXX, Case 34.

Case 35, (A233915 Mayo Clinic); F.S., Age 44, 6/17/18.

Right testicle never descended through external ring. About one year ago, patient noticed a swelling in right inguinal region. It rapidly and gradually increased in size and caused pain, pressure sensations and constipation.

Physical Examination: Large palpable tumor in right inguinal region extending over pelvic brim into abdominal cavity.

Operation: 6/20/18. Right inguinal incision. Large tumor 125 gms., developing on an undescended testicle was removed, together with a large area of Poupart's ligament. Tumor was adherent to pubic bone and had a subperitoneal projection.

Gross Examination: Specimen consists of a large rounded mass, weighing 1250 gms. and 15 x 10 x 9 cm. in size. Cut surface is soft and finely granular with necrotic areas.

Microscopic Examination: Microscopic sections show areas of the carcinomatous type of tumor together with numerous large areas of necrosis.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: May 1920 - feeling well.



Figure XXXI, Case 35.

Case 36, (A254118 Mayo Clinic); R.F., age 30 yrs. 12/20/18. Was operated upon 8 years ago for hernia and undescended testicle on right side. Surgeon was unsuccessful in bringing testicle down into scrotum. Condition never caused any apparent trouble until one year ago at which time it became painful at times and began to enlarge. Has gradually increased in size up until the present time.

Physical Examination: Right testicle in inguinal canal and twice its normal size.

Operation: 12/24/18 - Castration.

Gross Examination: Specimen is oval-shaped, encapsulated, 11 x 7 x 6 cm. in size. Cut section shows large areas of soft necrotic tissue. Beneath the capsule and outside of the tumor tissue is a narrow zone of normal testicular tissue.

Microscopic Examination: Sections show the typical large round and polyhedral cells of a carcinomatous tumor.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: September 1919 - feeling well; has had frequent X-Ray treatments since operation. November 1920 - living and well.



Figure XXXII, Case 36.

Case 37, (A231217 Mayo Clinic); E.H., age 25, 5/15/18.

Ten months ago, patient noticed hardening of left testicle and slow enlargement to the size of a hen's egg. Six months ago, testicle was removed by local doctor who made the diagnosis of "sarcoma." One month after this operation, a recurrence was found in the scrotum. This mass has been growing steadily since. Had one massive X-Ray treatment two weeks ago.

Physical Examination: Tumor of left scrotum extending up into left inguinal ring, involvement of inguinal glands. X-Ray of lungs negative, no retroperitoneal glands palpated.

Operation: May 28, 1918. Removal of tumor with portion of attached scrotum and vas up to internal ring. Removal of left inguinal glands.

Gross Examination: Specimen is rounded, encapsulated mass, 4 cm. x 4 cm. by 5 cm. in size not involving the epididymis. Cut surface is mottled with black hemorrhagic areas.

Microscopic Examination: Tumor is composed of large rounded cells with relatively large nuclei, prominent nucleoli and a slightly granular basophilic cytoplasm. In places gland-like structures are seen. This tumor then shows two kinds of epithelium which helps to disprove the theory that the carcinomatous type is a pure tumor as advocated by Chevassu and others.

Diagnosis: Teratoma Testis. (Mixed tumor with predominance of carcinomatous structure).

Subsequent History: Dec. 1918 - feeling well. Has taken X-Ray treatments at frequent intervals since operation. Sept. 1919 - feeling well. Has taken X-Ray treatments every two months during past year. Nov. 1920 - perfectly well.



Figure XXXIII, Case 37.



Figure XXXIV, Case 38. Showing peculiar homogeneous soft structure on cross section.

Case 38, (A289557, Mayo Clinic); R.D., age 38, 9/16/19.

Two months ago, patient injured his left testicle. Shortly afterwards he noticed gradual enlargement which condition has progressed up until present time.

Physical Examination: Large, smooth tumor left testicle. Does not transmit light. Wassermann negative.

Operation: 9/24/19. Left castration.

Gross Examination: Specimen is that of a very firm, rounded, encapsulated mass 8 cm. in diameter. Cut section shows a soft central portion, mostly necrotic. Around the periphery of a tumor beneath the capsule is a zone of normal testicular tissue.

Microscopic Examination: Sections show solid masses of polyhedral and rounded cells of varying sizes containing relatively large nuclei and one or more prominent nucleoli. The cytoplasm is pale and scanty in amount. Numerous mitoses are present. There is a diffuse infiltration of lymphocyte cells.

Diagnosis: Teratoma Testis. (Carcinomatous type).

Subsequent History: October 8, 1913 and November 8, 1919, X-Ray treatments. November 10, 1920, radium treatment; general condition good. December 1920 - no signs of recurrence.

Case 39, (214993 Mayo Clinic); H.M., age 37, 11/26/17.

Patient says he has been "ruptured" on the left side for six or seven years and recently it has become considerably larger in size. Has had only slight pain at times.

Physical Examination: Left testicle enlarged to three times its normal size; irregular, firm; some suggestion of fluid. No light transmitted. Chest negative. Wassermann negative. No glandular involvement found.

Operation: 12/13/17 - Castration (left).

Gross Examination: Specimen consists of an enlarged testicular mass and an epididymis apparently not involved. Testicle is practically entirely replaced by a brownish colored tumor mass mottled by tiny yellowish areas.

Microscopic Examination: Sections show large amounts of necrosis with only a few islands of large rounded and polyhedral cells with large nuclei and many mitotic figures.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: December 1920 - living and well.

Case 40, (A27390 Mayo Clinic); C.P., age 26 yrs. 6/10/19. One and one-half years ago, patient noticed that his right testicle was slowly becoming larger than normal. At times he had pain which extended up along the right ureter. During the past six months the growth has been more rapid.

Physical Examination: Right testicle size of a small orange; hard. Inguinal glands enlarged; Wassermann negative.

Operation: 6/19/19. Right castration, spermatic cord removed at internal ring.

Gross Examination: Specimen is a rounded mass 6 cm. in diameter, not involving the epididymis. Cut section shows a mottled grayish colored surface containing only a few connective tissue septa.

Microscopic Examination: Sections show large rounded and fusiform cells with heavily stained nuclei, numerous mitoses, a pale eosin staining granular cytoplasm and only a few definite cell membranes. In places are seen structures resembling glands and containing a pink staining homogenous substance.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Took X-Ray treatments at regular intervals for six months. September 1920 - in good health; no signs of recurrence.

Case 41, (A80461 Mayo Clinic); A.W., age 30 years, 2/24/13. Four months ago, patient noticed pain and tenderness in left inguinal region associated with gradual enlargement of left testicle. At first, the pain was referred up towards the left kidney and he had frequent urinations. During the last few weeks, the enlargement has been more rapid and testicle has become very tender and painful.

Physical Examination: Large scrotal tumor of left side, size of a grape-fruit - very tender and painful.

Operation: 3/7/13. Left castration.

Gross Examination: Specimen is a firm, rounded, encapsulated mass 5 x 5 x 4 cm. in size. Epididymis is not involved. Cut sections show brownish colored surfaces made up of coarse granular tissue studded with numerous tiny cysts. At the lower pole of the tumor is a narrow zone of normal testicular tissue.

Microscopic Examination: Sections show numerous large islands of cartilage, cystic spaces lined by a double layer of cuboidal cells and gland-like areas lined by high columnar cells. Areas of large rounded epithelial cells are present. Still other areas show strands of smooth muscle.

Diagnosis: Teratoma Testis (Mixed tumor type). (It is possible that this tumor would very soon resemble the so-called pure carcinoma (seminome) because the epithelial tissue appears to be growing more rapidly than any other area).

Subsequent History: April 29, 1915 (2 years after operation) patient answered questionnaire as follows:

Health fair; no enlarged glands or signs of recurrence; no subsequent treatment.

October 1920 - living and well.



Figure XXXV, Case 41. Shows cystic areas
and dense connective tissue bundles.

Case 42, (A45342 Mayo Clinic); J.L., age 24 yrs. 11/1/10. Ten weeks ago, patient bruised left testicle while riding a plow seat. Was able to work for a month following this injury but at the end of that time, pain was so severe he was unable to work. For the past month, he has been confined to bed with a tender, painful testicle which has been increasing rapidly in size during the last month.

Physical Examination: Large hard left testicle about 14 x 10 cm; small glands left groin.

Operation: 11/4/10. - Orchidectomy.

Gross Examination: Specimen is an oval-shaped, encapsulated mass 7 x 6 x 5 cm. in size. The epididymis is not involved.

Microscopic Examination: At one edge of the sections is a wide zone of edematous fibrous connective tissue containing numerous widely distended blood vessels. Other areas are composed of large polyhedral cells with heavily staining relatively large nuclei.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: August 1912 - had had 26 injections of Coley's Serum since operation; no X-Ray treatments; in fairly good health. May 1915 - in good health. September 1919 - in good health; no signs of recurrence.

Case 43, (A123104 Mayo Clinic); J.F., age 55; 1/21/15.

Three months ago, patient first noticed tenderness in feet and stiffness in back when walking. Shortly afterwards, he discovered that his right testicle was slightly enlarged. For the past two months, has noted a gradual enlargement of testicle which has been very tender. Has lost 15 pounds in weight recently. Has had pain in the epigastrium after eating lately. Recently has had pain in chest - most marked in the left axillary line.

Physical Examination: (1) Large mass in right abdomen size of a pineapple - immovable and probably retroperitoneal; (2) Large hard right testicle.

Operation: February 2, 1915 - castration.

Was given Coley's Serum and X-Ray treatment.

Gross Examination: Specimen is a smoothly encapsulated mass with a definite line of demarcation on the outer surface separating tumor from normal testicular tissue. It is 5 x 4 x 4 cm. in size. The cord is thickened but the epididymis can be made out.

Microscopic Examination: Sections show large rounded cells with heavily staining large nuclei and clear cytoplasm. Numerous mitoses are seen.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: August 1915 - had used Coley's Serum since operation and had had several X-Ray treatments. September 1915 died of generalized metastases.



Figure XXXVI, Case 43. Shows definite line of demarcation between tumor tissue and testicular tissue.

Case 44. (A156760 Mayo Clinic); W.N., age 25 yrs, 4/6/16. Nine months ago, patient injured his right testicle and three weeks later, noticed that it was somewhat enlarged. Had some pain at first. For the past five months it has been increasing gradually in size.

Physical Examination: Mass in right scrotum; direct hernia.

Operation: 4/13/16 - castration; herniotomy.

Given X-Ray treatment following operation.

Gross Examination: Specimen is a rounded, smoothly encapsulated mass 6 x 4 x 4 cm. in size. Cut section shows a grayish colored coarsely granular surface mottled with extensive black colored areas probably due to hemorrhage. Throughout are seen areas of glairy opaque material - probably cartilage.

Microscopic Examination: Sections show gland-like structures, solid epithelium, nests of cartilage, and large areas of hemorrhage.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: 12/5/16. Returned to Clinic complaining of weakness and pain in back. Examination showed a huge mass in the epigastrium and a large gland in left side of neck. January 7, 1917 - died of generalized metastases.

Case 45. (A213172 Mayo Clinic) W.O.F. age 29 years. 11/7/17. Patient has had attacks of slight pain, soreness and tenderness and a feeling of fullness low down in right abdomen since he was 16 years old. He had no nausea or vomiting. Seven years ago, his appendix was removed for same trouble. During past six months, he has been having same trouble, with increased severity.

Physical Examination: Patient right inguinal canal; testicle undescended on this side and can be pushed back into abdomen.

Operation: 11/22/17. Right herniotomy and castration.

Gross Examination: Specimen is that of a rounded, almost normal sized testicle and epididymis. It is rather soft, well encapsulated and contains no nodules on palpation. Cut surface has the appearance of a normal testis except for a small whitish area in the region of the rete. This is evidently a very early case of malignancy.

Microscopic Examination: Sections through region of rete show areas of large rounded cells with clear cytoplasm and large, granular nuclei. Numerous mitoses are seen in these areas. Normal testicular tissue is seen surrounding these areas of new growth.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: January 1920 - perfect health; no signs of recurrence.



Figure XXXVII, Case 45. Approximately a normal sized testicle which appears normal, except for whitish areas in the region of the sections through these areas showed tumor. This is evidently a very early case of malignancy.

Case 46, (A67556, Mayo Clinic); F.W., age 21, 8/21/14.

In March 1914, patient first noticed small hard swelling of left testicle which seemed to increase quite rapidly in size. Cord became enlarged and painful. For past month he has had a dragging sensation and pain in small of back.

Physical Examination: Left testicle enlarged uniformly to size of a large orange; cord enlarged to size of thumb.

Operation: 9/13/14 - castration (left)

Gross Examination: Specimen is a large rounded encapsulated mass 8 x 8 x 7 cm. in size. The epididymis can be made out with difficulty. Cord is thickened and nodular. Cut sections show a shiny, slightly pink colored surface, well divided by bluish gelatinous looking septa. At one edge of the tumor near the epididymis is a narrow zone of normal testicular tissue.

Microscopic Examination: Sections show areas of gland-like structures, tiny cysts lined by flattened epithelium and numerous large areas of young cartilage.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: February 1915. Returned to Clinic complaining of pain across the back and in left lumbar region. About three months ago, he noticed a lump in the abdomen below the ribs. Examination shows a large abdominal mass diagnosed as retroperitoneal metastases. . Died April 19, 1915.



Figure XXXVIII, Case 46. Shows several small rounded areas of bluish substance which proved to be cartilage.

Case 47, (A126176 Mayo Clinic); A.L.E., age 29 yrs. 3/10/13.
About one year ago, left testicle began to swell and has increased gradually in size up until present time. At no time has there been any pain.

Physical Examination: Left testicle enlarged to size of a hen's egg, hard and regular. Wassermann negative.

Gross Examination: Specimen is an oval-shaped, well encapsulated mass 6 x 4 x 3 cm. in size. The epididymis is not involved. Cut sections show a smooth, finely granular surface.

Microscopic Examination: Sections are made up of large, rounded and polyhedral shaped cells with large, granular nuclei, prominent nucleoli and a pale almost clear cytoplasm. Numerous mitoses are seen.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Patient was followed for two years at the end of which time he was in good health.

Case 48. (A-19-254 U. of Minn.); W.C., 52 yrs. 11/27/19. Sixteen months ago, patient injured left testicle while riding horse-back. It began to swell slowly and has gradually increased in size since. Was tapped several times and bloody fluid in small amounts was withdrawn. Was admitted to hospital with marked dyspnea saying his abdomen began to swell two weeks previously and caused him considerable pain. 1600 C.C. cloudy fluid was removed from peritoneal cavity on admission to hospital. Patient died soon after admission.

Autopsy Findings: There was found an enormous enlargement of the lymph nodes along the aorta from the diaphragm to the bifurcation. Generalized metastatic nodules were found in the mesentery, mediastinum, lungs and cervical region. Left testicle was 12 x 6 x 6 cm. in size and largely covered by tunica vaginalis. On section, the greater part of the mass was found to be composed of tumor tissue with a rather large central cystic portion. The testicular tissue was compressed to about one-third its normal size and is in intimate relation with the tumor tissue. The globus minor of the epididymis showed very little involvement, the globus major could not be definitely made out. The spermatic cord was greatly-increased in size due to infiltration with tumor tissue.

Microscopic Examination: Sections show diffuse papillary structures and cystic spaces for the most part filled up by these ingrowths of epithelium. It resembles a papillary cyst adenoma. For the most part, the cells are cuboidal in type and have a heavily staining cytoplasm.

Diagnosis: Teratoma Testis. (Mixed tumor type).

Case 49, (Autopsy 543 - U. of Minn.); Ed. VanB; 12/15/05. Nine months ago, patient received a blow on right testicle. Some swelling ensued and he had considerable pain. Went to a doctor four months later and was told he had a cancer of the testicle. At that time, his abdomen was enlarged and tense and no treatment was attempted. Died 12/14/05.

Autopsy Findings: Right testicle is markedly enlarged (6 x 5 x 4 cm.). The tunica vaginalis is adherent, obliterating the normal cavity. The tumor occupies the entire testicle and cord and merges into the subperitoneal tissue of the abdomen. Epididymis cannot be made out. The abdomen is almost completely filled up by tumor masses which have invaded nearly all the organs.

Microscopic Examination: Sections show large rounded cells with relatively large nuclei surrounded by a clear pale staining cytoplasm. Nuclei show brilliant nucleoli and numerous mitoses.

Diagnosis: Teratoma Testis. (Carcinomatous type).

Case 50. (O-1209 - 1899 U. of Minn.) M.S., age 50. Sept. 1899. For about one year patient has noticed a gradual enlargement of left testicle. Has noticed slight pain at intervals.

Physical Examination: Enlarged, firm, regular left testicle.

Operation: "Cord dissected out and ligated at internal ring. Castration."

Gross Examination: Large testicle, size of a small orange, encapsulated and not involving the epididymis.

Microscopic Examination: Sections show areas of glandular tissue which resembles that of intestine. Cystic spaces lined by a single layer of cuboidal epithelial cells are seen. Numerous areas of very young cartilage are present. A large portion of the tumor is necrotic.

Diagnosis: Teratoma Testis. (Mixed tumor type).

Subsequent History: 1902 - died with recurrence in glands of neck.

Case 51. (O-17-148 U. of Minn.); C.W.H., age 33 yrs.

4/17/17. Right testicle was undescended at birth but remained at the external ring. Seventeen years ago, patient was operated upon for rupture of right groin but the surgeon was not able to replace the testicle into the scrotal sac. The testicle became encroached upon by the scar and was under more or less constant pressure. About two years ago, it began to increase in size and has grown gradually since. Pain and tenderness have been present at times.

Operation: 4/19/17. - Castration (right).

Gross Examination: Specimen is a well encapsulated tumor mass 6 x 4 x 4 cm. in size; cord is thickened; epididymis apparently is not involved. Cut surface is smooth, finely granular and of a yellowish color. Micro sections show lobulated areas of large rounded cells separated by thin dense bands of connective tissue stroma which is everywhere diffusely infiltrated with lymphocytes. The large rounded cells have relatively large nuclei surrounded by a pale eosin staining cytoplasm and in places a definite cell membrane. Numerous mitotic figures are seen.

Diagnosis: Teratoma Testis (Carcinomatous type with lymphoid stroma).

Subsequent History: January 1920 - patient died following attack of influenza. He had lived three years since operation and apparently had no signs of recurrent growth.

Case 52. (O-16-385 - U. of Minn.); Wm. C., age 33 yrs. 10/13/16. Ten years ago, patient was severely kicked in the right testicle. It swelled up occasionally and was tender. One year ago, he noticed some enlargement. Three months ago, it was the size of two fists and has grown rapidly since. Came to doctor because he thought he had a rupture.

Physical Examination: Right testicle 17 cm. in diameter, hard; does not transmit light. Right leg is twice the normal size due to edema.

Operation: 10/15/16.

Excision of dependent portion of growth and as far as possible into the abdomen through the right ring. The skin over the growth was red and tense and the superficial blood vessels dilated but not attached to the growth.

Gross Examination: Specimen is a very large tumor mass 20 x 12 x 10 cm. in size involving the epididymis. Cut surface shows large necrotic areas some of which are hemorrhagic. Other areas show smooth yellowish colored tumor tissue.

Microscopic Examination: Sections show numerous tiny cysts lined by a single layer of flattened epithelium, numerous large nerve trunks, multinucleated cells, and a diffuse growth of large epithelial cells which show no regular arrangement and no tendency to differentiation. Scattered throughout the entire section is a diffuse infiltration of lymphocytes.

Diagnosis: Teratoma Testis (Mixed Tumor type).

Subsequent History: Patient died ten months after operation with generalized metastases.

Case 53. (O-16-120 - U. of Minn.) C.E., age 42 years.
4/14/16. Reported by permission of Dr. H.P. Ritchie. Two years ago, patient first noticed swelling of right testicle. A year ago it was diagnosed by local doctor as hydrocele. During the past year, the swelling has gradually increased and patient presented himself for treatment for supposed hydrocele.

Physical Examination: Large right testis; hard; regular in shape; does not transmit light.

Operation: 4/14/16. - Castration.

Gross Examination: Specimen is a well encapsulated tumor mass 6 x 6 x 4 cm. in size. The epididymis is not involved.

Microscopic Examination: Sections show lobulated areas of large polygonal cells with relatively large nuclei and an almost clear cytoplasm surrounded for the most part by a definite cell membrane. These areas are separated by dense connective tissue septa. Few mitoses are seen.

Diagnosis: Teratoma Testis. (Carcinomatous type).

Subsequent History: June 1920 (over 4 yrs. post-operative) patient is in good health with no signs of recurrence.

Case 54. (Museum 543); age 26 years.

Right testicle was undescended at birth and remained just under external ring. Two years ago, patient noticed a slight enlargement which has gradually increased up until the present time.

Physical Examination: Right testicle enlarged to twice its normal size.

Operation: Castration.

Gross Examination: Specimen is a round tumor mass, well encapsulated and not involving the epididymis. Cross sections show smooth surfaces with numerous tiny cysts.

Microscopic Examination:- Sections show numerous islands of cartilage, many small cysts lined by flattened epithelium, proliferating areas of mytomatous tissue.

Diagnosis: Teratoma Testis (Mixed tumor type)

Subsequent History: Died within two years with metastases.

Case 55. (Op. 1106); age 22 yrs; 2/6/1902. Two years ago, patient noticed gradual slow enlargement of left testicle. Enlargement continued up until present time. No pain at any time.

Physical Examination: Left testicle hard, regular and about twice its normal size.

Operation: February 6, 1902 - castration.

Gross Examination: Specimen is a well encapsulated tumor mass 5 x 5 x 4 cm. in size. Epididymis is apparently not involved.

Micro. Exam: Sections show large rounded and polyhedral cells with relatively large nuclei and a pale eosin staining cytoplasm. Few mitoses. Diagnosis: Teratoma Testis. (Carcinomatous type).

Subsequent History: February 1908 - (6 years after operation) patient was in good health with no signs of recurrence.

Case 56. (Op. 1288); age 24 yrs; 5/23/03. About a year ago, patient noticed that his right testicle was slightly enlarged and painful at times. During the past year, it has gradually increased in size and has been quite painful.

Physical Examination: Right testicle about twice as large as the left; hard; regular; does not transmit light.

Operation: 5/23/03 - castration.

Gross Examination: Specimen is 5 x 5 x 4 cm. in size; firm; does not involve the epididymis.

Microscopic Examination: Sections show large polyhedral cells with large nuclei, bright nucleoli, few mitoses and pale cytoplasm.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Patient was followed for 4 years, at the end of which time he was in excellent health and had no signs of recurrence.

Case 57. (21-H) Age 30 years.

Eighteen months ago, patient noticed swelling in left testicle accompanied by pain and tenderness. Swelling increased slowly and gradually up until present time.

Operation: Castration.

Gross Examination: Specimen is an oval tumor 15x10x10 cm. in size definitely encapsulated, very firm and heavy. The epididymis is flattened out but the head can be distinguished. Cut surface shows areas which appear to be mucoid tissue. A narrow zone of normal testicular tissue can be seen at the lower pole.

Microscopic Examination: Sections show cystic spaces many of which are surrounded by masses of large rounded epithelial cells. Large areas of myxomatous tissue and numerous smaller areas of striated muscle fibres are seen.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Not available.

Case 58. (O-16-411 - U. of Minn.); G.L.S., Age 39 yrs.
10/30/1916. Reported by permission of Dr. John Rogers. In the early
spring of 1916, patient noticed discomfort in left testicle. Four
months ago, swelling appeared and has gradually increased since. One
brother, an uncle and an aunt died of sarcoma.

Physical Examination : Enlarged, firm, left testicle.

Operation: 10/31/16. Left testicle removed.

Gross Examination: Specimen is a rounded tumor mass 6 x 6 x
4 cm. in size, definitely encapsulated in the tunica. The epididymis
is not involved. Cut surface shows a finely granular area partially
necrotic and surrounded by a narrow zone of testicular tissue about
1 cm., in width. Several bluish colored areas suggestive of cartil-
age are seen.

Microscopic Examination: Sections show many gland-like struc-
tures and cysts lying in a connective tissue stroma. Most of the
gland structures are made up of high columnar cells with large nuclei
and a clear cytoplasm. The cyst spaces are for the most part, lined
by a single layer of flattened epithelium - others by several layers.
Several areas of very young cartilage are seen.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Died from metastases three years af-
ter operation.

Case 59. (O-15-115 - U. of Minn.); age 20 years. 6/2/15.

Reported by permission of Dr. H.D. Newkirk. Four years ago was kicked on the left testicle by a horse. There has been a gradual enlargement since that time and some pain. One year ago, a doctor aspirated some bloody fluid thinking the condition was that of hydrocele.

Physical Examination: Enlarged left testicle; does not transmit light.

Operation: 6/3/15 - castration.

Gross Examination: Specimen is a tumor mass 9 x 6 x 4 cm. in size - firm and encapsulated. The epididymis cannot be made out. Cut section presents a finely granular, yellow colored surface.

Microscopic Examination: Tumor is composed of large rounded cells having relatively large nuclei with numerous mitoses and a small amount of almost clear cytoplasm. Cell membranes are distinct in places but for the most part cannot be made out. Wide dense bands of connective tissue separate the tumor cells at regular intervals giving the impression of a lobulated surface. Small round cells are diffusely scattered throughout the section.

Diagnosis: Teratoma Testis (Carcinomatous type with lymphoid stroma).

Subsequent History: Patient died within a year from "internal tumors."

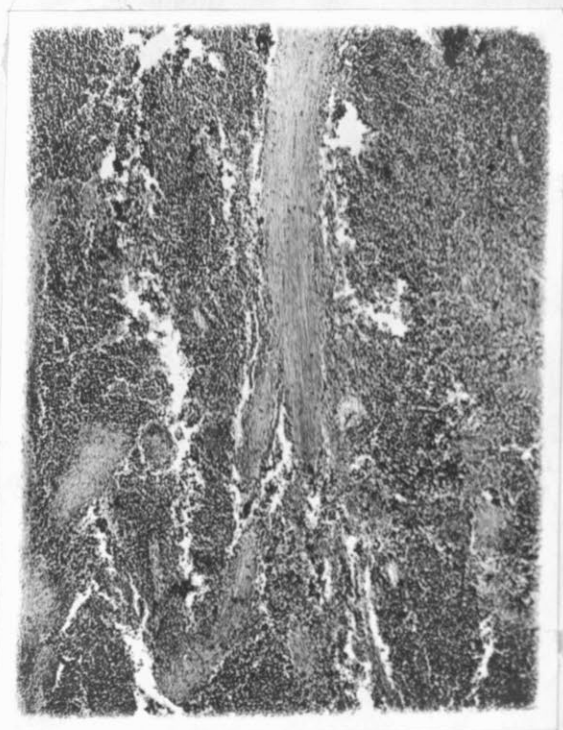


Figure XXXIX, Case 59. Low power photomicrograph showing wide connective septa ramifying a dense mass of the typical carcinomatous type of cells.

Case 60. (Op. 2403 - U. of Minn.!) Wm. S., Age 32 yrs.

1/13/1909 - two years ago, patient noticed a slight swelling of left testicle. Since that time it has grown slowly but gradually. There has been no pain at any time.

Physical Examination: Left testicle enlarged to twice its normal size, hard; does not transmit light.

Operation: 1/13/1909 - Castration.

Gross Examination: Specimen is an oval-shaped tumor mass 6 x 6 x 4 cm. in size. Epididymis is not involved. Cut sections show numerous tiny cysts and necrotic areas.

Microscopic Examination: Sections show areas of gland-like structures, cysts lined by flattened epithelium and other areas of squamous cell epithelium.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Not available.

Case 61. (O-19-350 - U. of Minn.); Age 25 yrs. Sept. 23, 1919

Patient returned from overseas military service and was invalided from army with tuberculosis. One month ago, while at sanitarium he noticed swelling and pain in left testicle. The local doctor told him it was a tuberculous testicle. Since that time, it has increased rapidly in size and is very painful.

Physical Examination: Left testicle enlarged, hard; no sinuses or softened areas made out. Pulmonary tuberculosis.

Operation: 9/22/19. Testicle and cord removed.

Gross Examination: Specimen is a round, encapsulated tumor 6 x 6 x 5 cm. in size. Epididymis is not involved. Cut sections show smooth yellowish colored surfaces with numerous areas of necrosis containing hemorrhage.

Microscopic Examination: Sections show large areas of gland-like tissue, nests of solid epithelium, a few cysts lined by a single layer of flattened epithelium and large areas of necrosis with hemorrhage.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Patient died two months after operation. No post mortem was held and it is not known whether he died of pulmonary tuberculosis or malignant growth.

Case 62. (O-20-37 - U. of Minn.);, age 30 yrs. 1/15/20.

History of pain and swelling in left testicle for over a year.

Operation: Tumor mass removed together with cord and epididymis.

Gross Examination: Specimen is an oval definitely encapsulated mass 8 x 6 x 6 cm., attached to the cord and epididymis and what appears to be tunica vaginalis in hydrocele formation. On section throughout the surface are seen numerous spaces with definite walls and of diameters varying from one to ten mm.

Microscopic Examination: At one edge section shows an area of hyalinized testicular tissue, the glands of which have partially disintegrated. Closely adherent to this area, is a zone of very cellular tissue, showing many mitoses and a relatively small amount of intercellular fibrils. A few large giant cells are present in this area. Also there is seen a large mass of red blood cells and disintegrating leucocytes surrounding which mass is a slight infiltration of eosinophiles. In the remaining portions of the tumor are several large and small epithelial gland-like spaces scattered throughout the tumor area. There are also scattered areas of mucoid tissue with large rounded nuclei and spider processes running out from them. Several rounded formations of embryonic cartilaginous tissue are seen. The peripheral layers of some of these areas of cartilage merge into the surrounding tissue so that a definite line of demarcation between the cartilage cells and the connective tissue is impossible. A few large cystic spaces lined by several layers of cells are seen.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Living and well 6 months after operation.

Case 63. (O-20-115 U. of Minn.) S.O. age 29, 1/28/20. Married six years, two children living and well; venereal history negative. Since Sept. 1919, has noticed a gradual painless enlargement of the left testicle. During the past month, it has not increased much in size, but has been painful when patient became over-tired or overworked. No loss of weight.

Operation: 1/28/20. Testicle and cord removed.

Gross Examination: Specimen is a mass 8x6x6 cm. in size, attached to the cord and epididymis. Beneath the capsule, which is smooth and glistening and of a bluish color, can be seen many tortuous, distended blood vessels. The mass feels rather firm. On section, there is seen a shiny, roughened surface, some areas of which are yellowish white and are surrounded by dense bands of connective tissue.

Microscopic Examination: There is a connective tissue background, containing epithelial cell structures of varying formations. The epithelium is arranged in places as low cuboidal cells lining large, clear cystic spaces. In other places, it is arranged as glands with high columnar mucinous cells and in still other places, as low columnar cells, forming tortuous gland-like structures. Other areas show solid nests of epithelial cells without differentiation and containing large numbers of mitotic figures. Some of these areas show hyalinized centers. The connective tissue stroma is present in a multiplicity of forms from young spider cells to dense bands of fibres. In some places, it is necrotic.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Living and well six months after operation.



Figure XL, Case 63. Low power photomicrograph showing peculiar gland-like formation.

Case 64. (O-20-171 - U.of Minn.) Wm. L. age 37 yrs. 2/17/20. Reported by permission of Dr. Ikeda. About eight months ago patient noticed that his right testicle was slightly larger than the left. There was no pain, neither were there any inflammatory signs at that time. A month later, he began wearing suspensory upon the advice of his doctor. There was no more enlargement until five weeks ago when the testicle suddenly began to swell and a "sore spot" appeared on the lower external surface. This spot enlarged and finally, on January 25, 1920 broke open and a large amount of "pus" was discharged. Patient denies lues. Jan. 25, 1920, Wassermann negative. Jan. 27, Feb. 5, and Feb. 10, neodiarsenal was given. Feb. 2, Wassermann negative.

Operation: Feb. 16, 1920. Tumor mass and cord removed as high as external ring.

Gross Examination: Specimen is a large rounded mass 12x12x15 cm. in size, enclosed in a capsule which has evidently recently ruptured. Nearly the entire mass is composed of soft granular necrotic material. No area of normal testicular tissue can be seen.

Microscopic Examination: Sections through firmest portions of tumor show masses of large rounded cells separated by thin but dense bands of connective tissue stroma. These cells have large heavily staining nuclei and a pale cytoplasm. Numerous mitoses are seen. In places are seen definite gland-like structures. The connective tissue stroma is infiltrated by eosinophiles and lymphocytes. Large areas of necrosis are present. (This tumor is probably undergoing rapid change caused by the marked proliferation of the large, round epithelial cells at the expense of other types of tissue which have probably been replaced. Only a few gland-like structures remain).

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Six months after operation, living and well.

- - - - -

Case 65. (O-17-121 - U. of Minn.) Wm. E., age 25 yrs.

3/21/17. Fifteen months ago, patient was kicked in right testicle while playing basket ball. Was sore for two months following this. Then the soreness disappeared but some thickening remained. Three months ago, it began to increase in size and was quite painful. Since that time it has grown rapidly.

Operation: 3/ 21/17. Testicle and cord removed up to internal ring.

Gross Examination: Specimen consists of a tumor replacing the entire testis, the greater part of the tumor being necrotic. A small area of normal testicular tissue is seen at the upper pole just beneath the capsule.

Microscopic Examination: Sections show areas of gland-like tissue, other areas of epithelial cells closely packed together and still other large areas of necrosis. The cells of the gland-like spaces show an unusually large number of mitoses.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Not available.

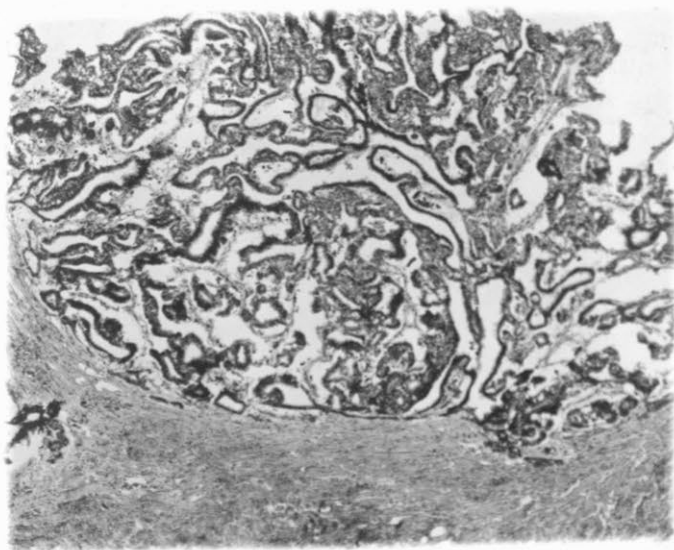


Figure XLI, Case 65. Low power photomicrograph showing peculiar gland-like formations.

Case 66. (2493 - U. of Minn.); J.B., age 50 yrs. Aug.22/09.

Eleven months, ago while working and carrying heavy objects, patient noticed a sharp catchy pain in right inguinal region. Tho't he had ruptured himself. Inside of a week, his right testicle began to swell. It gradually increased in size without pain until January 1909, when he noticed sharp, shooting pains up into right lumbar region. For the last ten days the pain has been so severe that he could scarcely walk without doubling up.

Physical Examination: Right testicle enlarged to size of a pear; is tense; not translucent.

Gross Examination: Specimen is a large, rounded tumor mass, well encapsulated and 7 x 7 x 5 cm. in size. On cut section, large masses of cheesy, bloody material are seen.

Microscopic Examination: Sections show a considerable increase in amount of fibrous tissue along one side. The greater part of the section consists of masses of large rounded and polyhedral shaped cells with relatively large nuclei and pale cytoplasm, separated by a fine net-work. Large areas of necrosis are seen.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Patient died in about eighteen months with generalized metastases.

Case 67. (O-15-125. U. of Minn.) age 24. 4/29/15. Several months ago, patient noticed a dragging pain in left testicle and a slight enlargement. Since that time there has been a gradual increase in size and pain at intervals.

Operation: 4/29/15. Castration.

Gross Examination: Testicle enlarged and hard; does not transmit light. Size 5 x 5 x 4 cm. Cut sections show surfaces made up of tiny cystic spaces and other areas of smooth, mucoid looking substance.

Microscopic Examination: Sections show gland-like structures, cysts lined by a single layer of cuboidal cells and large areas of myxomatous tissue. Foci of small round cells are scattered throughout.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Not available.

Case 68. (O-15-54. U. of Minn.) Mr. C. age 40 years.

2/23/15. About three months ago, patient noticed a small tumor mass in right testicle. It did not seem to be growing until three weeks ago when it suddenly lighted up and rapidly grew to the size of a small apple. During the past three weeks it has been very tender.

Physical Examination: Testicle enlarged, firm, tender.

Wassermann negative.

Operation: 2/23/15. Castration.

Gross Examination: Specimen is a rounded tumor mass 8x6x7 cm. in size. Epididymis is not involved. Cut sections show a smooth, finely granular, yellowish colored surface.

Microscopic Examination: Sections are made up of large polyhedral cells with large granular nuclei containing prominent nucleoli. The cytoplasm is pale - almost clear. Numerous mitoses are seen. A tendency to alveolar grouping is noticeable. The connective tissue stroma is loose and contains numerous blood vessels and an infiltration of small round cells.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: May 1920. Signs of recurrence in lungs proved by operation. Died October 19, 1920.

Case 69. (O-13-130. U. of Minn.) O.H., age 47 years.

10/1911. In October, 1911, patient was admitted to University Hospital with a broken leg and a mass in left scrotum. Scrotal mass had not been noticed until a few months previously and was thought to be a rupture.

Operation: October 1911. Right orchidectomy with ligation of cord.

Gross Examination: Specimen consists of a large rounded tumor mass 14 x 10 x 10 cm. in size. Epididymis could not be made out. The central portion of the tumor was soft and contained broken down debris.

Microscopic Examination: Sections show lobulated areas of gland-like structures separated by dense bands of connective tissue stroma. The gland-like structures resemble thyroid tissue in places, but no eosin staining secretion is seen. The cells are relatively small and contain a pale colorless cytoplasm. Other areas are made up of large cystic spaces lined by a single layer of flattened epithelium lying in a loose connective tissue stroma which is infiltrated with small round cells.

Diagnosis: Teratoma Testis (Mixed tumor type)

Subsequent History: One year after operation, patient returned to hospital with a large recurrent tumor mass in scrotum. This was removed but patient died of generalized metastases in March, 1913.

Case 70. (O-15-233. U. of Minn.) F.S. age 56. 7/30/15.

Four years ago, while riding horseback, patient injured left testicle on pommel of saddle. It began to enlarge and was quite painful. He went to a doctor who treated it as a hydrocele. During the past year, it has increased rapidly in size.

Operation: August 5, 1915. Castration.

Gross Examination: Specimen is an oval-shaped tumor 6 x 4 x 4 cm. in size. The epididymis is not involved. Mass is very soft and friable - cuts easily and presents a dark brown colored finely granular surface.

Microscopic Examination: Sections are composed of large rounded and polyhedral shaped cells with large deeply staining nuclei and a pale cytoplasm. Numerous mitoses are seen.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Patient died of pneumonia, December 30, 1916. (Sixteen months after operation). There were no signs of recurrent growth.

Case 71. (Op. 1523. U. of Minn.) Mr. C., age 35. 6/8/04.
Two months ago, patient noticed a swelling in left testicle and in left inguinal region. Has had some tenderness in inguinal region for over a year.

Physical Examination: Swelling in left scrotum size of a hen's egg; hard and firm; inguinal glands enlarged and soft.

Operation: 6/8/04. Left testicle removed together with whole area above oblique fascia which was dissected away.

Gross Examination: Sections show large polyhedral cells with relatively large nuclei, numerous mitotic figures and bright nucleoli.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: 12/24/04. Recurrence in site of old operation removed. Jan. 1906 - recurrence in inguinal glands. Nov. 1906 - died of generalized metastases.

Case 72. (Op. 1502 - U. of Minn.) W.O., age 22 yrs., 10/22/04.
About two years ago, patient noticed that his left testicle was slightly enlarged. It gradually became larger until at the end of a year when it was tapped by his local doctor. A thick bloody fluid was obtained at this time. Since that time it has grown rapidly in size.

Operation: 10/22/04 - castration.

Gross Examination: Specimen is a large rounded tumor 13 cm. in diameter. The head of the epididymis can be made out. Cut sections show numerous, caseating, yellowish colored areas and numerous cystic spaces containing a greenish yellow fluid.

Micro. Exam.: Sections show large rounded and polyhedral cells with deeply staining granular nuclei, bright nucleoli and

pale cytoplasm. Numerous mitoses are seen. Large areas of necrosis are seen.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Not available.

- - - - -

Case 73. (O-20-328. U. of Minn.), Mr. L, age 29 yrs.

4/15/20. Reported by permission of Dr. Witham. Three months ago, patient noticed swelling of left testicle. It remained swollen for two months and then went down somewhat. During the past few weeks, it has gained rapidly in size. Has had pain running up the cord into groin region. A tentative diagnosis of tuberculous testicle was made.

Operation: 4/15/20 - castration.

Gross Examination: Specimen is an approximately normal shaped testicle 6 x 4 x 4 cm. in size. The epididymis is not involved but the cord is markedly thickened. Cut sections show a yellowish colored surface, knob-like in character and made up of a finely granular tissue.

Microscopic Examination: Sections show large rounded cells of varying sizes with relatively large deeply staining nuclei, bright nucleoli and a pale eosin staining cytoplasm surrounded in places by a definite cell membrane. Numerous mitoses are seen.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Living and well eight months after operation.

Case 74. (A-59295 Mayo Clinic). H.N., age 62. 9/25/11.

For a number of years, patient has noticed that his left testicle was considerably enlarged.

Physical Examination: Left testicle enlarged and hard.

Operation: 9/28/11. Left castration.

Gross. Examination: Specimen is a rounded mass seven cm. in diameter, attached to what is an apparently normal testicle. On opening the mass, one sees a large central cavity enclosed by walls five mm. in thickness and definitely separated from the testicle proper. The walls are studded with cartilaginous areas.

Microscopic Examination: Walls of sac show hyalinized connective tissue and calcareous deposits.

Diagnosis: Dermoid.

Subsequent History: Died 1917 - apparently from "old age."



Figure XLII, Case 74. Shows dermoid sac with rough-
ened walls, sharply separated from normal testicular
tissue.

Case 75. (108873 - Mayo Clinic) T.L., age 70; 6/23/14.

Nineteen years ago, patient says he fell and ruptured himself in the left groin. Has never worn truss. Mass in scrotum causes considerable dragging pain. For the past few years, has had considerable bladder trouble - dribbling, frequency and retention.

Physical Examination: (1) Large scrotal mass on left side - probably a hydrocele but does not transmit light; (2) Prostate enlarged, hard and irregular.

Operation: 7/7/14. Left castration and herniotomy.

Gross Examination: Specimen is a large, rounded soft tumor, well encapsulated and having hard calcareous walls. It is eight cm. in diameter. On opening the mass, one sees a large central cavity containing hair and enclosed by walls five mm. in thickness and studded with yellow plaques. The testicle which is apparently normal, is separated from the cyst by a definite capsule.

Microscopic Examination: Sections through wall of cyst are made up of hyalinized connective tissue and calcified areas.

Diagnosis: Dermoid.

Subsequent History: Patient died from carcinoma of prostate in 1915.



Figure XLII, Case 75. Shows large dermoid sac
which was approximately eight cm. in diameter.

Case 76. (138356 - Mayo Clinic), I.P.J., age 49; 8/11/15.
Patient complains of "hydrocele" which has been present for several years.

Physical Examination: Large mass in left scrotum; appears to be soft and to contain fluid.

Operation: 8/17/15 - left orchidectomy.

Gross Examination: Specimen is well encapsulated, round tumor mass nine cm. in diameter, lying within the tunica and separated from the testicular tissue by a capsule. On opening the mass, a large central cystic cavity containing hair is seen. The walls of the cyst are four mm. in thickness and filled with calcareous deposits.

Microscopic Examination: Sections through wall of sac show hyalinized connective tissue and calcareous deposits.

Subsequent History: Three years after operation was in good health.

Case 77. (A186247 - Mayo Clinic); J.R. McG, age 23,2/19/17.

When twelve years of age, patient injured left testicle and again when sixteen years of age. He thinks it enlarged some after each injury. Has always had a rupture on the right side. Comes to hospital primarily for the rupture.

Physical Examination: (1) Small right indirect inguinal hernia; (2) left testicle enlarged - lower pole hard and nodular.

Operation: 3/3/17. Right herniotomy and left orchidectomy.

Gross Examination: Specimen is a sharply circumscribed tumor lying within the tunica, separated from the testicular tissue by a capsule and fused with the rete. On section, the growth presents a large cyst containing hair and cartilage and lined by epithelium.

Microscopic Examination: Sections through cyst wall show calcareous deposits and hyalinized connective tissue.

Diagnosis: Dermoid.

Subsequent History: October 1920. In good health; no signs of new growth.

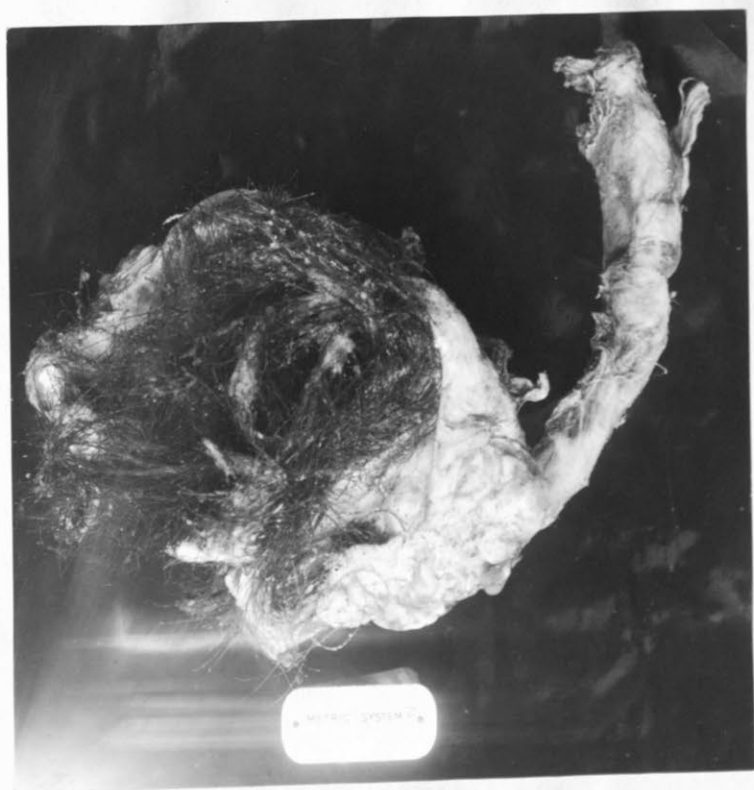


Figure XLIV, Case 77. Shows dermoid cyst containing hair.

Case 78. (O-18-178 - U. of Minn.) O.O., age 25 yrs. 5/9/18. Two years ago, first noticed slight enlargement of right testicle. Recently, the growth has been more rapid and pain has been present at times.

Operation: 5/9/18. Testicle and cord as far as external ring removed.

Gross Examination: Specimen is an oval-shaped mass 8 x 4 x r cm. in size. Cord and epididymis apparently are not involved. Cut surface is yellowish in color with numerous soft grayish colored patches.

Microscopic Examination:- Sections show a lobulated surface made up of large polyhedral cells with a relatively large nuclei diffusely invaded by small round cells and separated by wide dense bands of connective tissue septa.

Diagnosis: Teratoma Testis (Carcinomatous type).

Follow-up Notes: May 1920 - in good health; no signs of recurrence. December 1920 - same.

Case 79. (O-20-229 - U. of Minn.) W.R., age 26 years, 3/8/20. In Jan. 1918, patient says he injured his right testicle and noticed that it began to swell shortly afterwards. Since then, there has been a gradual increase in size and pain has always been present on the slightest pressure.

Physical Examination: Right testicle hard and size of a walnut. Dumb-bell shaped growth palpable at lower pole. This is about the size of an olive and seems to be attached to testicle and vas.

Operation: Right testicle and tumor together with cord removed.

Gross Examination: Tumor mass is about 7 x 4 x 3 cm. in size. It is enclosed in a smooth, white capsule which forms a constricting band at the junction of the upper two-thirds with the lower third. Section through upper portion shows a whitish gray, opaque surface with mottling of whitish areas. The lower third presents a surface, part of which resembles testicular tissue. Embedded in this brownish testicular tissue are definitely circumscribed white areas, some of which appear caseous, while others look like new growth.

Microscopic Examination: Sections through upper third of tumor show large areas of necrosis and other areas of tumor tissue. This latter is composed of large rounded pale staining cells with definite cell membranes. The nuclei are relatively large and are rich in chromatin. Numerous mitotic figures are seen. There is no tendency to differentiation on the part of the cells. Scattered among these cells and evidently a part of the tumor tissue, are nests of closely packed lymphocytes. The tumor cells are separated by thin but dense bands of connective tissue stroma, which for the most part, is infiltrated with lymphocytes and eosinophiles and presents

varying degrees of hyalinization. No cartilage is seen. Section through the lower pole of the tumor presents areas of the above described tissues together with areas of testicular tissue which shows different stages of atrophy and hyalinization.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Living and well nine months after operation.

Case 80. (O-20-365 - U. of Minn.) G.H., age 25 years.

4/27/20. Reported by permission of Dr. Soderlind. Two years ago, patient fell astride a fence, striking his right testicle. It swelled up and was very painful. After a short time, the swelling subsided but soon began to grow very rapidly. During the past year, the growth has been steady and rapid.

Operation: 4/24/20. Right testicle and cord removed at external ring. Radium treatment given following operation.

Gross Examination: Specimen is a large tumor mass 15 x 9 x 7 cm. enclosed in a tense capsule. The epididymis cannot be differentiated. Cut section presents a yellowish surface which cuts easily and comprises about 2/3 of the tumor, this is separated by a capsule from a grayish colored surface 4 x 3 cm. in size. The yellow area is soft and granular while the grayish colored area cuts with difficulty and appears to be very fibrous. It looks like thyroid tissue. No normal testicular tissue is seen.

Microscopic Examination: Sections from soft yellow colored tumor area show areas of glandular structures separated by dense connective tissue bands which in places are partially necrotic. Some epithelial formations are arranged as papillary projections with a central stalk of connective tissue as support. Large areas of necrosis are present. Still other areas show large polyhedral cells with relatively large nuclei and a colorless cytoplasm. Sections through the fibrous tumor tissue show long follicles resembling thyroid tissue. These follicular spaces are lined in places by one row of low cuboidal epithelium. In other places, they are lined by a double layer and are separated by thin bands of connective tissue stroma. The spaces are filled by a pink staining colloid substance.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Living and well eight months after operation.

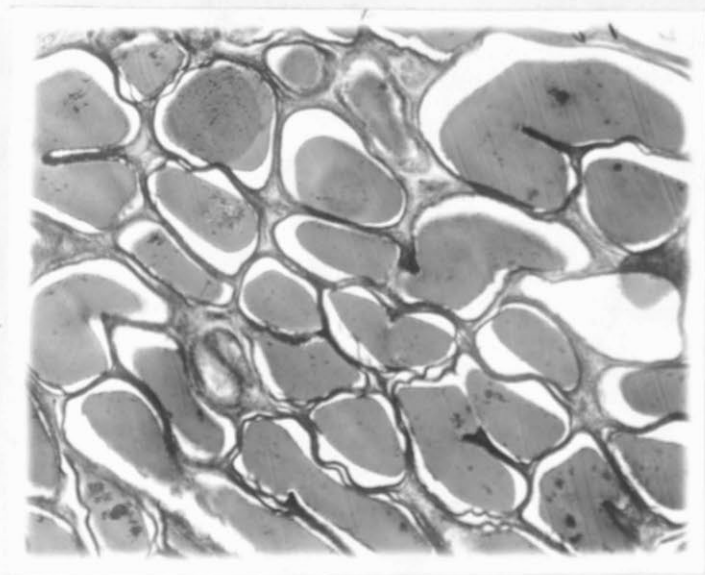


Figure XLV, Case 80. Low power photomicrograph showing thyroid tissue. Other areas in the same tumor showed large polyhedral carcinomatous-like cells and still other areas showed gland-like tissue.

Case 81. (O-19-526) U. of Minn.) Mr. B., age 30 years. 12/11/19. Four and one-half years ago, patient first noticed a lump in right groin and noticed that when he lifted anything heavy, he had pain. He knew he had an undescended testicle, but it never bothered him. Soon after he noticed the lump and the pain, he realized that it was swelling and growing quite rapidly. He went to a doctor who advised removal. At the end of two years, it seemed to stop growing but the pain became worse. Last summer, the pain was so bad at times that he would vomit and faint. During the last few months, the pain has been continuous and has been present on the left side as well as the right.

Operation: 12/4/19. Large mass in right groin removed.

Gross Examination: Specimen is an oval mass 9 x 6 x 5 cm. studded with large nodules and enclosed in a smooth capsule. Sections show very thin area of testicular tissue adjacent to the capsule. The greater part is grayish white, opaque and smooth with two yellowish colored areas of softer consistence.

Microscopic Examination: Sections of smooth opaque portion show large masses of large rounded cells separated by thin but dense bands of connective tissue stroma. These rounded cells have relatively large nuclei surrounded by a pale eosin staining cytoplasm and in places a definite cell membrane. Numerous mitotic figures are seen.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Followed three months and then disappeared from observation.

Dr. Abbott.

Case 82. (509 - U. of Minn.), age 27 yrs. 1905. History of pain and swelling in right testicle over a period of two years with gradual enlargement.

Operation: Testicle and cord removed at external ring.

Gross Examination: Specimen is an ovoid tumor 6 x 5 x 5 cm. in size. The epididymis is not involved. Cut section shows a smooth shiny yellowish gray colored surface mottled with bluish smooth shiny areas.

Microscopic Examination: Sections show myxomatous tissue, islands of young cartilage and cystic cavities lined by a low cuboidal epithelium.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Died within three years of metastases.

Case 83. (A-74695 - Mayo Clinic); J.B., age 28, 3/12/13.

In August 1911, patient notices two or three small tumors over right thigh and later, one in right inguinal region. In October 1912, these tumors which were then about the size of walnuts, were removed and diagnosed as oval and round cell sarcoma. About one week ago, patient noticed a small lump in right testicle and immediately came to the Clinic.

Operation: 3/12/13. Orchidectomy (right side).

Gross Examination: Specimen is soft, rounded, well encapsulated mass 5 x 5 x 4 cm. in size. It cuts easily and presents a brownish colored surface the central portion of which is coarsely granular.

Microscopic Examination: Sections show polyhedral cells with relatively small dense nuclei, a rather dense protoplasm and definite cell boundaries. The cells are smaller than those found in the ordinary carcinomatous type of tumor.

Note: - This is the only tumor in this series which is secondary in the testicle. Chevassu reported a case in which the patient had many cutaneous tumors of unknown origin. A few days before death both testicles became enlarged. Autopsy showed involvement of viscera and both testicles showed little tumorous nodules. Microscopic sections were similar to those described in this case.

Subsequent History: After leaving the Clinic patient was treated with X-Rays and Coley's Serum. In a few months small tumors had developed over his entire body and he died August 8, 1913.

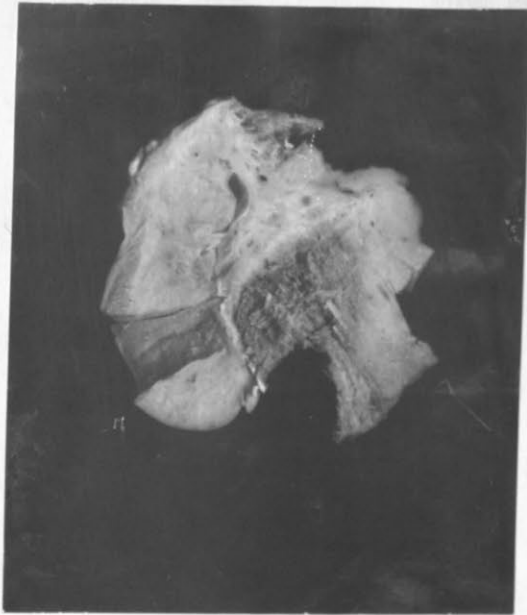


Fig. XLVI. Case 83. Tumor resembles many others which were primary in testicle.

Case 84. (62390 - M.R. Hosp.), Reported by permission of Dr. E. Friend, Chicago. B.B. age 45 years. 6/19/1913. For the past year, patient has noticed that his left testicle was gradually becoming larger. There has been no pain at any time.

Physical Examination: Left testicle firm, tender at upper pole, size of a hen's egg.

Operation: 6/19/1913 - Orchidectomy.

Gross Examination: Specimen is an oval-shaped, well encapsulated tumor mass 6 x 4 x 4 cm. in size. Epididymis is not involved. Cut surface shows a smooth, finely granular surface, grayish in color.

Microscopic Examination: Sections show large polyhedral and rounded cells with relatively large nuclei, brilliant nucleoli and numerous mitoses. Foci of small round cells are scattered throughout.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Not available.

Case 85. (57689 - M.R. Hosp.) Reported by permission of Dr. E.W. Andrews of Chicago. D.S. Age 45 years - 10/14/1912. About seven weeks ago, patient noticed slight swelling of left testicle with pain in the left groin and testicle. It has rapidly increased in size until now it is as large as a lemon. Pain has been quite severe for past three weeks.

Operation: 10/14/12. Orchidectomy.

Gross Examination: Specimen is a well encapsulated ovoid mass 7 x 5 x 4 cm. in size. Epididymis and cord are apparently not involved.

Microscopic Examination: Sections show cells of various sizes and shapes. Certain areas are made up of large polyhedral and rounded cells with large nuclei and very indistinct cell boundaries, while other areas show cells resembling a spindle cell sarcoma. It appears to be a very rapidly growing tumor.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Not available.

Case 86. Reported by permission of Dr. P.C. Boomer of Chicago. A.W. Age 33 years - 1/17/1913. Three months ago, patient first noticed swelling and slight pain in left testicle. It has gradually increased in size since and recently the pain has been much more severe.

Operation: 1/17/1913 - Orchidectomy.

Gross Examination: Specimen is an ovoid mass 6 x 6 x 4 cm. in size, well encapsulated and apparently not involving the epididymis. On cut section, there is seen a zone of normal testicular tissue surrounding a rather small whitish sclerotic area which appears to be tumor tissue.

Microscopic Examination: Sections through tumor area show large areas of necrotic tissue containing islands of large rounded and polyhedral cells with relatively large nuclei and brilliant nucleoli.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Not available.

Case 87. (44925 - M.R. Hosp.) Reported by permission of Dr. S.W. Arthur of Chicago. A.C. Age 39 years - 11/22/10. Eleven years ago, patient was operated upon for bilateral inguinal hernia. At that time, it was discovered that the left testicle was undescended and it was left in the inguinal canal in the region of the external ring. A few days ago, patient was seized with pain in the abdomen, a sense of fulness and vomiting. The pain radiates down his thighs at times.

Physical Examination: A large mass - size of a fetal head - could be palpated between the umbilicus and the symphysis.

Operation: 11/22/10. Mid-line abdominal incision, found a large cystic tumor of left testis with a twisted hemorrhagic vas serving as a pedicle. Removed.

Gross Examination: Specimen consists of an oval mass 10 x 7 x 6 cm. in size. Injected blood vessels can be seen beneath a glistening capsule. On section, one-half is seen to be markedly hemorrhagic, the other half is made up of an encapsulated, lobulated, well defined area, soft in consistency.

Microscopic Examination: Sections are composed of large, rounded and polyhedral cells with large nuclei and numerous mitoses. Prominent connective tissue septa separate these cells into lobule formations.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Patient could not be traced.

Case 88. Reported by permission of Dr. L.A. Greensfelder of Chicago. Jr. G., age 38 years - 6/16/09. Three weeks ago, patient noticed swelling in right scrotal sac. At this time, he had severe shooting pains running from testicle up the cord and into the lumbar region. Since that time, testis has grown very rapidly in size and is now as large as an orange.

Operation: 6/16/09 - Orchidectomy.

Gross Examination: Specimen is a large flattened ovoid tumor mass 10 x 7 x 5 cm. in size. The tunica vaginalis is much thickened and shows dilated and tortuous blood vessels on the surface. On section the tumor presents hard and soft areas, while a few small areas of normal testicular tissue are still seen.

Microscopic Examination: Sections show areas of a typical epithelium, some of which is arranged as papillary structures and some as gland-like structures; numerous areas of young cartilage are seen; still other areas are composed of large rounded cells with large nuclei and fusiform cells with a scanty amount of cytoplasm.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Not available.

Case 89. (10859 - M.R. Hospital). Reported by permission of Dr. W.H. Rubovitz of Chicago. M.G. Age 24 years - 7/21/19. About one month ago, patient noticed sharp pain in right testicle followed by swelling. The swelling persisted and increased rapidly until now testicle is the size of an orange.

Operation: 7/21/09 - Orchidectomy.

Gross Examination: Specimen is a soft, vascular tumor mass 7 cm. in diameter. Cut surface is of a grayish color, soft and finely granular.

Microscopic Examination: Sections show epithelial structures papillary and gland-like in type, other areas resemble intestinal epithelium, cysts lined by low cuboidal epithelium and surrounded by smooth muscle fibres are also seen; in still other areas are large rounded and oval-shaped cells with relatively large nuclei.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: About one week after operation, while patient was apparently enjoying an uncomplicated convalescence, he suddenly developed cerebral symptoms - convulsions, paralyses, unequal pupils, etc., and died in a few days. No autopsy was obtained but competent neurologist diagnosed the case as one of metastatic carcinoma of brain.

Case 90. (52968 - H.R. Hosp.) Reported by permission of Dr. G. Kolischer of Chicago. Mr. E., age 23 years. 1/29/12. One month ago, patient noticed a small firm nodule in right testicle. The testicle suddenly began to enlarge and increased rapidly in size until now it is the size of an orange. There has been no pain at any time.

Operation: 1/31/12. - Orchidectomy.

Gross Examination: Specimen consists of a tumor mass measuring $5\frac{1}{2} \times 3\frac{1}{2} \times 3$ cm. in size with tunic of smooth, glistening appearance. Epididymis is apparently not involved. On section, one finds at the upper pole, a circumscribed area about 3 cm. in diameter which is of a mottled reddish gray color with a glistening surface. Fibrous bands divide the surface into four irregular lobules.

Microscopic Examination: Sections are composed of cystic spaces lined by low cuboidal epithelium, gland-like structures and papillary epithelial folds. The stroma is myxomatous and is infiltrated with lymphocytes.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: November 1920 - living and well, nearly nine years since operation.

Case 91. (79992 - M.R. Hosp.) Reported by permission of Dr. C. Kolischer of Chicago. A.A. - age 42 years. 7/28/15. Five weeks ago, patient noticed pain in left testicle especially when in a standing position. Following that, the testicle began to swell and has increased rapidly in size since. Recently, the pain has extended up along the cord, into the inguinal region.

Physical Examination: Left scrotal tumor size of a small orange; tenderness along cord and in inguinal region. Enlargement of left inguinal glands.

Operation: 7/28/15 - orchidectomy.

Gross Examination: Specimen is a rounded, encapsulated, soft tumor mass 5 cm. in diameter. Cut surface shows large caseous and necrotic areas.

Microscopic Examination: Sections are composed of large areas of necrosis containing a diffuse infiltration of lymphocytes and small islands of large rounded and polyhedral shaped cells with large nuclei and a clear, almost colorless cytoplasm.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: November 1920 - has been well during past five years but in July 1920, there developed a local recurrence of the tumor. Is being treated for that now.

Case 92. Reported by permission of Dr. G. Kolischer of Chicago. B.B. age 23 years. 2/9/16. Patient says that both testicles have been undescended in the region of the external inguinal canals as long as he can remember. About two years ago, he developed a dull pain and a heavy sensation in the hypogastrium associated with frequent urinations. Five weeks ago, patient was seized with sudden very severe pain in the back radiating up towards the kidneys and down the thighs. He has had urinations at intervals of every two hours since this attack of pain. During the past week, the pain has been more localized in the right inguinal region. He has lost twenty pounds in weight during the past five weeks.

Physical Examination: Splenic dullness increased; just above the symphysis pubis is a firm, slightly tender abdominal mass, tender on pressure and freely movable. Rectal examination reveals a firm enlarged mass, size of a large orange, apparently connected with the suprapubic mass.

Operation: 2/9/16. Midline abdominal incision; found a pelvic mass size of a grape-fruit adherent to peritoneum and bladder, found to be a left testicular tumor. Removed.

Gross Examination: Specimen is a large rounded tumor mass 16x12x7 cm. in size of a variegated, mottled appearance. Some areas look like cartilage; some areas are firm, others soft; large areas of necrosis are present.

Microscopic Examination: Sections show areas of myxomatous stroma, containing small areas of young cartilage, areas of bone and still other areas of the typical large rounded and polygonal cells with relatively large nuclei and almost clear, colorless cytoplasm.

Diagnosis: Teratoma Testis (Mixed tumor type).
Subsequent History: Not available.

Case 93. (14826 - M.R. Hosp.) Reported by permission of Dr. L.E. Schmidt of Chicago. F.H. age 45 years. 12/26/19. About three months ago, patient noticed a slight enlargement of the right testicle which has gradually increased in size since. There has been no pain.

Examination: Right testicle size of a hen's egg, firm, regular and not painful to the touch.

Operation: 12/26/19 - orchidectomy.

Gross Examination: Specimen is an oval-shaped, well encapsulated mass 6 x 4 x 4 cm. in size. Cut surface is grayish colored and finely granular.

Microscopic Examination: Sections are made up of large rounded and polyhedral shaped cells with relatively large nuclei, brilliant nucleoli and an almost clear, colorless cytoplasm surrounded for the most part by definite cell boundaries. Foci of small, round cells are scattered throughout the sections.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Not available.

Case 94. (92743 - M.R. Hosp.) Reported by permission of Dr. L.E. Schmidt of Chicago. J. McN., age 38 years - 11/2/16. Five months ago, patient noticed pain in left testicle; next day it was swollen and has gradually enlarged since. There was no pain until two weeks ago. Now he has pain extending up along cord into inguinal region; also has pain and tenderness in right breast.

Examination: Left testicle size of an orange; retraction of right nipple; small nodule in right breast.

Operation: 11/2/16 - orchidectomy.

Gross Examination: Specimen is a large oval-shaped mass 12x 10x6 cm. in size. At one pole is a cyst-like structure 1 x .5x .5 cm. in size. Cross section shows grayish colored gelatinous tumor substance containing large necrotic and hemorrhagic areas.

Microscopic Examination: Some areas of sections show spindle-shaped cells, others show areas of smooth muscle, oval masses of cartilage; scattered about are gland-like structures made up of high columnar epithelium, while still other areas show squamous epithelial nests. Some epithelial areas resemble intestinal epithelium.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Patient has numerous metastases and will probably die.

Case 95. (2591 - M.R. Hospital) Reported by permission of Dr. Friend. D.T. 6/30/1911. History of increased enlargement in testicle extending over a year's time.

Operation: 7/1/11. -Orchidectomy.

Gross Examination: Specimen is a much cut-up mass of soft tissue, yellowish in color, mushy in character contained within a thin glistening capsule.

Microscopic Examination: Sections show large rounded cells with large nuclei, brilliant nucleoli and a faintly basic almost colorless cytoplasm. Numerous mitoses are present.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Patient died about four months after operation with pleural and lung metastases.

Case 96. (83490. Pres. Hosp. Chicago) Reported by permission of Dr. Dean Lewis. C.F. Age 25 years. 1/7/15. Three months ago, patient received a hard blow on left testicle by a falling suit case. A week later, he noticed that the testicle was enlarging. Recently, he has had sharp shooting pain in testicle and up along the cord.

Physical Examination: Mass in left scrotum size of a lemon, firm regular; cord not swollen.

Operation: 1/7/15 - Orchidectomy.

Gross Examination: Specimen is an oval-shaped mass 6 x 5 x 4 cm. in size, well encapsulated and not involving the epididymis. Cut surface is finely granular.

Microscopic Examination: Sections are composed of tumor cells with little or no stroma. These cells are for the most part large and rounded in type with large nuclei, almost clear cytoplasm and definite cell membranes. Scattered throughout the section are foci of small lymphocytes. Several large areas of necrosis are present.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: October 1920 - patient living and well.

Case 97. (20695. M.R. Hosp.) Reported by permission of Dr. A. Strauss of Chicago. W.S. age 20 years. 8/16/20. Seven years ago, patient noticed a swelling in his right testicle. There was no pain at that time nor has there been any since. Recently, the swelling has increased more rapidly than before.

Operation: 8/16/20 - Orchidectomy.

Gross Examination: Specimen is a tumor mass 6.5 x 4.5 x 4cm. in size. Cut surface is yellowish and semi-translucent with several cystic spaces 1-5 mm. in diameter.

Microscopic Examination: Sections show cystic spaces some of which are lined by a single epithelial layer, others by several layers. Throughout the entire sections are nests of epithelial-like cells lying in islands surrounded by a hyalinized stroma. These cells are large rounded and polyhedral in type with large nuclei.

Diagnosis: Teratoma Testis (Carcinomatous type).

Subsequent History: Not available.

Case 98. (707386. Cook Co. Hosp.) Reported by permission of Dr. Stengle. P.O'C. Age 37. 8/19/19. For the past year, patient has noticed a gradual enlargement of right testicle. There has been no pain. Supposed he had a hydrocele and came to hospital to have it operated upon.

Operation: 8/19/19 - Orchidectomy.

Gross Examination: Specimen is a rounded soft mass 6x5x4 cm. in size. Cut surface is finely granular.

Microscopic Examination: Sections are made up of large rounded and polyhedral shaped cells containing large nuclei, brilliant nucleoli and a faintly acid staining cytoplasm.

Subsequent History: September 1920 - living and well one yr. after operation.

- - - - -

Case 99. (21979. M.R. Hosp.) Reported by permission of Dr. David Eisendrath. H.Y. Age 30 years. 10/4/20. Eighteen months ago, patient says he ruptured himself on the right side by heavy lifting. After that, he noticed that his right testicle was swollen and was gradually increasing in size. He now has a drawing pain in testicle and cord. Condition was th^ot to be a hydrocele accompanying a hernia.

Operation: 10/4/20. Small hernial sac found. Tumor of testicle was discovered by frozen section.

Gross Examination: Specimen is an ovoid tumor 8x5x3 cm. in size composed of tissues of varying appearances and consistency, in which are smooth, cystic cavities, the largest 4 cm. in diameter. Some areas are dense and fibrous, others soft and gelatinous. The cord is not involved.

Microscopic Examination: Sections show large areas of necrosis; other areas are composed of very dense hyalin tissue alternating with islands of soft myxomatous stroma; other areas show large rounded cells with large nuclei containing numerous mitoses, gland-like structures and papillary formations, masses of squamous epithelium with pearl formations, hyalin cartilage, smooth muscle bundles and cystic spaces lined by low cuboidal epithelium.

Diagnosis: Teratoma Testis (Mixed tumor type).

Subsequent History: Living and well two months after operation.

Case 100. (132517 - Pres. Hosp. Chicago) Reported by permission of Dr. H.L. Kretschmer. J.W. age 27 years. 2/10/20. In June, 1917, patient had pain in right testicle while at bayonet drill. This cleared up but returned again at intervals during the next two years. In April 1919, he had a severe attack of pain which radiated to the vertebral column and down the thigh. Recently, the testicle has increased rapidly in size until now it is the size of a goose egg.

Operation: 2/10/20 - orchidectomy.

Gross Examination: Specimen is an oval-shaped tumor 7.5 x 4.5 x 5 cm. in size. The parenchyma bulges two to three cm. from beneath the tunica and consists of a narrow strip of fibrous testicular tissue one cm. wide at the upper pole. The balance of the surface is rather friable, pinkish in color and contains numerous focal hemorrhages. 11

Microscopic Examination: Sections are made up of large polyhedral and rounded cells with large nuclei and numerous mitoses. Some areas show giant cell formation and a proliferation of fibrous tissue which has encroached upon and almost obliterated some of the tumor cell areas.

Diagnosis: Teratoma Testis. (Carcinomatous type).

Subsequent History: Living and well six months after operation.

Case 101. W.W.R. Age 37 years. 5/28/1906. Reported by permission of Dr. H.B. Sweetser. The findings in this case were collected after the original paper was written and therefore, it does not appear in the tables.

History: Patient says he "sprained" himself in August 1905 and one week after that, his right testis began to swell. Has had no pain at any time. Two weeks ago, he felt a mass in right iliac region and noticed he had lost ten pounds in weight recently. No history of lues.

Physical Examination: Testis double in size, elastic and contains several small nodules. Two large masses can be palpated in right side of abdomen. These are movable and apparently connected; are not painful.

Operation: May 28, 1906. Incision seven inches long in right rectus and across medially at costal margin. Incised posterior wall of peritoneum. Found and removed two large masses of retroperitoneal glands lying along the vena cava. Owing to the extreme friability of the glands, it was impossible to remove all the tissue, a small portion of which was left adherent to the vena cava. Area was drained. Testis was removed by crushing cord and ligation; cord not removed beyond external ring.

Gross Examination: Glands were size of an orange; soft and friable. Testis about twice the normal size, studded by several yellowish colored nodules.

Microscopic Examination: Sections of glands show large rounded and polyhedral shaped cells with relatively large pale staining nuclei and as almost clear cytoplasm.

Diagnosis: Metastatic teratoma of testis (Carcinomatous

type).

Subsequent History: Shortly after operation, a swelling developed in abdomen and loin which was thought to be a recurrence. K.I. was given in large doses and the swelling disappeared - evidently it was an edema or post-operative inflammatory affair.

July 1911 - Seemed perfectly well. January 1914 - lump in abdomen, movable, not painful. A few months later, patient was admitted to St. Mary's Hospital with ascites and abdominal tumor. 10/23/14. Exploratory laparotomy showed extensive retroperitoneal glandular involvement. Patient died 11/12/1914 over eight years after primary operation.

Case No.	Age of Patient	Interval between first symptom & time of operation	Etiological Factors	Symptoms	Gross Path.	Micro. Path.	Subsequent History and Follow-up Notes.
1	27	5 mo.	trauma	Swelling and pain in testicle	oval in shape 7x5x5cm. Cystic on cut section.	Cartilage, striated muscle, cysts gland-like structures, squamous epi with pearls.	Was given Coley's Serum for 2 years. Died with abdominal metastases 8 years after operation.
2	27	6 mo.	----	Swelling	oval shaped 10x7x7cm. Cystic.	Cartilage, gland-like structures, large polyhedral cells, cysts lined with epithelium	Died with metasoses 5 years after operation.
3	23	12 mo.	----	Pain in lower abdomen & inguinal region followed by enlarged testicle	Hard & smooth 5x3x3cm. multilocular cyst surface	Cartilage, large cysts lined by high columnar epithelium; large rounded & polyhedral cells	Died with abdominal metastases 7 months after operation
4	26	13 yrs.	trauma	Pain & swelling 13 yr. ago cleared up & returned 7 mo. ago after heavy lifting. Pain in testicle & cord	Hydrocele accompanying tumor 6x6x5cm. Cut surface smooth & granular.	Young cartilage, nests of epithelial cells, cysts lined with a double epithelial layer, areas of large polyhedral & rounded cells.	5 mo. after operation patient returned with large mass in abdomen. One month later was operated upon by local doctor and attempt made to remove mass. Patient died following this operation-6 mo. after primary operation.

5	29	3 mo.	----	Pain and swelling in testicle	Hard tumor mass 8x7x7cm. in size wt. 425 g. Areas of hemorrhage & tiny cysts seen on cross section.	Cystic areas lined by flattened epithelium gland like structures, large areas of large polyhedral & rounded cells	6 mo. after operation returned with palpable mass in abdomen, pain and loss of weight. Died 3 mo. later of abdominal metastases.
6	36	2 years	----	Gradual enlargement of testicle	Oval mass 9x7x7 cm. Cut section soft & granular numerous necrotic areas.	Large polyhedral cells with large nuclei, and almost clear cytoplasm Small round cells scattered thruout.	Living and well 9 years after operation.
7	27	2 mo.		Swelling of testicle 6wks. later scrotum broke down & discharged necrotic material.	Soft tumor mass 7x5x5 cm. Central portion necrotic	Large polyhedral and rounded cells same as in preceding case. Few areas of smooth muscle.	Living and well 8 years after operation.
8	25	2 mo.	trauma	Swollen and painful testicle. Recently a sense of fulness in abdomen. Has mass in mid epigastium size of grape fruit. Enlarged glands in both axillae.	Oval shaped mass 5x4x3cm. in size Sharply defined tumor area on cross section.	Diffuse growth of large rounded cells with large nuclei & numerous mitoses.	Following operation was given X-Ray treatments to metastases. Died 3 months after operation.
9	46	6 years	----	Enlarged testicle	Mass 8x15x6cm. capsule broken thru at one point.	Large rounded & polyhedral cells with large nuclei	2 mo. after operation returned with recurrent nodule which was removed. Had several X-Ray treatments following Nov. 1920 nearly 4 years past operation, living and well.
10	35	6 mo.	----	Gradual enlargement of testicle.	Oval mass 6x5x4 cm. in size. Yellow finely granular cut surface	Large polyhedral & rounded cells with large nuclei numerous mitoses and scanty cytoplasm.	4 years after operation returned with a large mass in abdomen. Died 6 months later with abdominal metastases.

11	1 1-2	9 mo.		Swelling in testicle. Orchidectomy 3 mo. ago. Local recurrence 3 wks. later.	Oval rounded mass 4x4x3cm. in size.	Fusiform and polyhedral shaped cells closely packed together giving the appearance of sarcoma.	Died with generalized metastases 1 year after primary operation, 5 mo. after secondary operation.
12	31	1 year	trauma 1 yr. ago	Swelling in testicle first noticed 7 mo. ago. Recently pain in cord & groin.	Soft, coarsely granular tumor 7x6x5 cm.	Nests of squamous epithelium with pearls, cysts lined by high columnar cells, a few striated muscle fibres are seen.	1 mo. after operation returned with glands in left side of neck and large mass in upper left abdomen. Died 3 mo. after operation
13	33	7 mo.		Swelling in left testicle followed by pain test. in groin & lumbar region. Large mass in hypochondrium.	Cystic tumor mass 5x5x4cm. in size.	Cartilage, cysts lined by double layer of epigland like structures nerve trunks.	Died 5 weeks after operation of generalized metastases.
14	75	2 years	trauma	Swelling in testicle and accompanying hydrocele.	Firm tumor mass 5x5x4 cm. in size surrounded by a hydrocele.	Large fusiform & rounded cells with numerous mitoses.	Two months after operation there was a local recurrence and abdominal metastases for which condition the local doctor operated. Patient died 13 months after primary operation.
15	50	?	trauma	Periodic swelling at several different times during past 35 years	Tumor mass 6x5x5cm. containing knob like processes on surface.	Duct and gland like structures cysts, areas of epithelium, young cartilage, large polyhedral cells.	10 months after operation returned to Clinic with involvement of inguinal glands and abdominal metastases. Died 8 mo. later.
16	46	4 mo.		Rapid enlargement of testicle during past 4 mo.	Mass 5x4x4 cm. in size; brownish colored, granular surface on cut section	Large polyhedral cells with large nuclei and prominent nucleoli	Treated with Coley's serum for several months after operation Sept. 1919. over 7 years after operation patient is living and well

17	34	2 years		Enlarged testicle with dragging pain loss of weight.	Mass 7x5x5cm. in size, cut surface mottled with areas of hemorrhage.	Large rounded & polyhedral cells Foci of small round cells scattered thruout.	Living and well 4 yr. after operation.
18	38	4 years		4 yr. ago noticed small lump in testicle. Has slowly and painlessly enlarged since.	Large oval shaped tumor 10x9x6cm. in size.	Large polyhedral cells with large nuclei. Foci of small round cells scattered thruout.	Followed more than 4 years after operation at which time patient was living and well.
19	22	16 mo.	trauma	Injured undescended testicle 16 yr. ago. 1 yr. ago had pain in this area & was operated for "strangulated hernia" different. Wound never healed	Mass which was removed from groin & cannot be identified as testicle	Compact masses of rounded and fusiform cells with large nuclei and numerous mitotic figures.	Mass was not removed at operation; section removed for diagnosis. Given radium and X-Ray treatments. Died 3 months later.
20	34	2 years		2 yr. ago swelling in testicle which was diagnosed as T.B. & orchidectomy done; 3 mo. ago developed recurrent swelling in scrotum.	Mass 7x5x5cm. adherent to scrotum.	Large polyhedral cells with large nuclei and numerous mitotic figures.	Two months after operation he developed an abdominal metastatic mass which was removed by local doctor. Patient died following this operation.
21	43	7 mo.		Swelling of testicle; loss of weight.	Oval mass 8x7x6cm. in size, hemorrhage areas on cross section	Large rounded and polyhedral cells with large nuclei and numerous mitoses.	7 mo. after operation returned to Clinic with large mass in upper right abdomen. Died 2 mo. later of generalized metastases.
22	36	4 mo.	trauma	Gradual enlargement accompanied by pain at times.	5x4x4cm. in size; oval shaped.	Large polyhedral cells with large nuclei and numerous mitoses	22 mo. after operation returned to Clinic with large metastatic mass in upper left abdomen. Died 6 mo. later.
23	28	1 yr.		Swelling for a yr. Dragging pain in cord for past 6 mo.	Rounded mass 6x5x5cm. in size.	Large polyhedral rounded cells with large nuclei & numerous mitoses. Small round cells diffusely infiltrated thruout.	4 mo. after operation patient returned to Clinic with large mass in left upper abdomen; also a mass in epigastrium - prob. in liver. Died 1 mo. later.

24	27	3 mo.	Swelling in testicle began 3 mo. ago has had shooting pains into groin.	Oval tumor mass 8x6x6 cm. in size involving tail of epididymis and cord.	Large polyhedral cells with large nuclei and numerous mitoses. Large areas of hemorrhage & necrosis.	Was given Radium & X-Ray treatments following operation Died 6 mo. after operation with metastases.
25	29	1 yr.	Swelling in testicle. Was diagnosed as strangulated hernia by local doctor and operation performed. Since operation has had pain in back, groin & testicle.	Oval shaped mass 11x7x6 cm. Cut surface finely granular brownish colored.	Large rounded polyhedral cells with large nuclei numerous mitoses clear cytoplasm	Died 13 mo. after operation, with abdominal metastases.
26	28	7 mo.	Swelling & pain coming on at intervals. Secretion from both breasts.	Rounded mass 5x5x4 cm. in size involving tail of epididymis and vas.	Large polyhedral cells with large nuclei and numerous mitoses.	14 mo. after operation was operated upon by home physician for "large abdominal tumor near the spine". Died 3 mo. later.
27	52	12 yr. trauma	Small lump at lower pole of testicle which has grown during period of 12 yr; injured twice. Inguinal glands enlarged.	Round tumor mass 10x8x7 cm.	Large rounded cells with clear cytoplasm and large nuclei.	Took X-Ray treatments at regular intervals for 2 yrs. following operation. 3 yr. after operation living and well.
28	50	5 yr. trauma	Gradual enlargement of testicle	Rounded tumor mass 12x10x10 cm.	Large polyhedral cells with nuclei of ordinary size & only a few mitotic figures.	Living and well 14 years after operation.
29	39	8 mo.	Swelling and tenderness with pain along cord.	Oval shaped tumor 10x7x7 cm. with a necrotic central portion	Large polyhedral cells with large nuclei and numerous mitoses.	8 mo. after operation patient returned with large metastatic mass in upper left abdomen. Given Coley's Serum and tumor reduced in size by one-half in two mo. Died 2 mo. later.

30	38	6 mo.	Gradual painless enlargement of testicle which was later followed by pain extending from left groin up towards kidney & down thigh.	Oval shaped mass 6x6x4cm. brownish colored, granular surface	Large polyhedral cells with large nuclei and clear cytoplasm.	Subsequent history not available.
31	37	6 mo.	Gradual painless enlargement of testicle.	Large oval shaped tumor mass.	Large polyhedral cells with large nuclei and a pale staining cytoplasm	Followed over a period of 4 1/2 years at end of which time patient was living and well.
32	30	6 mo.	Gradual enlargement of testicle. No pain up until 10 days ago.	Rounded tumor 6x6x4cm. in size. Numerous cysts and areas of hemorrhage on cross section	Polyhedral and round cells with large nuclei separated by wide dense conn. tissue septa.	Living and well 15 years after operation.
33	25	2 yr.	3 mo. after swelling commenced, testicle was removed by local doctor; 4 mo. later there was a recurrence with pain; this mass was removed only to recur 8 mo. later. Since that time wound has been open & a new nodule has recurred.	Specimen is a small mass curetted from scrotum.	Large polyhedral cells with relatively large nuclei and clear pale cytoplasm.	11 years after last operation patient was living and well.
34	36	18 mo.	18 mo. ago noticed slight pain in testicle; a year later it began to enlarge & was very painful.	Oval shaped tumor 8x5x4 cm. in size. Cut surface is finely granular	Large polyhedral & rounded cells with large granular nuclei. Foci of small round cells are present thruout.	Has had 5 courses of X-Ray since operation. 1 year after operation has no signs of recurrence.
35	44	1 yr.	Testicle was undescended. About 1 yr. ago it began to enlarge & caused pain in groin, pressure and constipation.	Large tumor mass weighing 1250g. 15x10x9cm. in size. Finely granular out surface.	Polyhedral cells with large nuclei and clear cytoplasm.	2 years after operation living and well.

36	30	1 yr.		Testicle undescended. Operated 8 yr. ago for that condition & hernia. Testicle was not put down into scrotum, 1 yr. ago began to swell & become painful.	Oval shaped tumor 11x7x6 cm. Cut section shows large areas of necrosis.	Large round and polyhedral shaped cells with clear cytoplasm.	2 years after operation living and well.
37	25	10 mo.		10 mo. ago noticed enlargement of testicle which was removed 4 mo. later by local doctor. 1 mo. later mass recurred and has grown steadily since. Had 1 massive dose of X-Ray 2 weeks ago. Inguinal glands enlarged.	Rounded mass 4x4x3cm. Cut surface is matted with 1 black hemorrhage areas.	Large rounded cells for the most part other areas of gland like structures.	Has taken X-Ray treatments every 2 mos. since operation. 30 mo. after operation living and well.
38	38	2 mo.	trauma	Gradual enlargement of testicle, following injury.	Firm round mass 8cm. in diameter. Central portion soft & necrotic.	Polyhedral & rounded cells with large nuclei and numerous mitoses. Foci of small round cells thruout.	Has had 3 X-Ray treatments and one application of Radium since operation. Living and well one year after operation.
39	37	6 yr.		Gradual enlargement of testicle. Patient that he had a rupture	Large rounded mass entirely replacing testicle.	Large areas of necrosis with only a few islands of large polyhedral cells & many mitoses.	Living and well 3 years after operation.
40	26	18 mo.		Gradual enlargement of testicle. Pain extending up towards kidney for past 6 mo.	Round mass 6 cm. in diameter.	Rounded & fusiform cells with heavily stained nuclei & numerous mitoses.	Took X-Ray treatments at regular intervals for 6 mo. 15 mo. after operation was living and well.
41	30	4 mo.		Pain & tenderness in inguinal region associated with enlargement of testicle	Rounded mass 5x5x4cm. Cut surface shows numerous tiny cysts.	Islands of cartilaginous cystic spaces lined by a double layer of epithelium; areas of large polyhedral cells.	7 1/2 years after operation living and well.

42	24	10 wks.	trauma	Tender, painful testicle gradually enlarging over a period of about 2 months.	Oval mass 7x6x5 cm.	Wide zone of edematous fibrous tissue and other areas of large polyhedral cells.	Took 26 injections of Coley's Serum over a period of 15 months following operation. 9 years after operation living & well.
43	55	3 mo.		Stiffness in back followed by enlargement of testicle. Recently pain in epigastium Exam. showed a large mass in upper abdomen & enlarged testicle.	Oval mass 5x4x4cm.	Large rounded cells with deeply staining nuclei and numerous mitoses.	Had Coley's Serum and several X-Ray treatments following operation. Died of generalized metastases 7 mo. after operation.
44	25	9 mo.	trauma	Painful, enlargement of testicle.	Rounded mass 6x4x4 cm. in size. Cut surface coarsely granular.	Gland like structures solid epithelial cords, cystic spaces, cartilage.	8 mo. after operation returned with huge mass in epigastium and large gland in neck. Died 1 mo. later.
45	29	13 yr.		Undescended testicle which has been painful at different times for 13 years.	Mass about size of normal testicle. Cut surface looks normal except for a few whiteish areas in region of rete.	Sections thru rete show large rounded cells with large nuclei & numerous mitoses.	Living and well 3 years after operation.
46	21	5 mo.		Gradual swelling of testicle at first, later pain and dragging sensation in cord.	Large rounded mass 8x5x7cm. Cord thickened & nodular. Cut surface of testicle shows large areas of bluish, gelatinous looking areas.	Areas of gland like structures thickened tiny cysts lined by flattened epithelium & cartilage.	5 mo. after operation patient returned with pain in back & a large tumor mass in epigastrium. Died 2 mo. later with general metastases.
47	29	1 yr.		Gradual swelling of testicle.	Oval shaped mass 6x4x3cm. in size. Cut surface finely granular.	Large rounded & polyhedral cells with large granular nuclei & an almost clear cytoplasm.	Patient was followed for 2 yr. at the end of which time he was in good health.

48	52	16 mo.	trauma	Gradual swelling of testicle following injury. Was tapped several times & a bloody fluid obtained. 1600 c. removed from peritoneal cavity on admission.	Oval mass 12x6x6cm. Epididymis & cord involved.	Diffuse papillary structures and cystic spaces for the most part filled up by these epithelial ingrowths. Resembles a papillary cyst adenoma.	Patient died with generalized metastases 16 mo. after first symptom. No treatment or operation.
49	?	9mo.	trauma	Pain & swelling following injury to testicle. 4 mo. later abdomen hard and tense. No operation.	Tumor oval shaped 6x5 x4cm. Epididymis & cord involved extending up retroperitoneally.	Large polyhedral & rounded cells with large nuclei; brilliant nucleoli & numerous mitoses.	Died 9 mo. after first symptom. No operation. Autopsy showed metastases in nearly all organs.
50	50	1 yr.		Gradual enlargement of testicle with pain during last few months.	Rounded tumor 7 cm. in diameter. Epididymis not involved.	Areas of glandular tissue resembling intestine. Cystic spaces; areas of cartilage.	3 years after operation died with metastases in glands in neck and elsewhere.
51	33	22yr.		17 yr. ago was operated upon for undescended testicle. Operation was not a success testicle remained at external ring under pressure. 2 yr. ago began to increase in size.	Rounded mass 6x4x4cm. Cut surface smooth and finely granular.	Large rounded cells separated by wide dense bands of conn. tissue & infiltrated with small round cells.	Jan. 1920. Died of flu. Previous to death he showed no signs of recurrence. Had lived nearly 3 yr. since operation.
52	33	1 yr.	trauma	Testicle injured 10 years ago. It swelled up at intervals but no distinct enlargement was noticed until 1 yr. ago.	Very large tumor mass 20x12x10 cm. involving the epididymis & large areas of hemorrhage on cut section.	Tiny cysts, multinucleated cells, large nerve trunks large areas of polyhedral cells a diffuse infiltration of small round cells.	Died 10 mo. after operation, with generalized metastases.
53	42	2 yr.		2 yr. ago noticed swelling of testicle which has increased since. Was told it was a hydrocile.	Firm rounded mass 6x6x4 cm. in size.	Large polyhedral cells with large nuclei; few mitoses and an almost clear cytoplasm.	June 1920-over 4 years since operation. Patient had no signs of recurrence.

54	26	2 yr.		Rt. testicle undescended at birth. Two years ago it began to enlarge and has increased steadily since.	Rounded tumor mass cystic on cut section.	Islands of cartilage; small cysts lined by flattened epithelium; areas of squamous epithelium & myxomatous tissue.	Died within 2 yr. with metastases.
55	22	2 yr.		Gradual painless enlargement of testicle extending over a 2 year period.	Rounded mass finely granular on cut section 5x5x4cm. in size.	Large rounded & polyhedral cells with large nuclei & few mitoses.	6 years after operation in good health.
56	24	1 yr.		Gradual enlargement of testicle accompanied by pain which is very severe at times.	Firm rounded mass 5x5x4cm. in size	Large polyhedral cells with large nuclei; brilliant nucleoli & few mitoses.	4 years after operation was in good health.
57	30	18 mo.		Swelling of testicle accompanied by pain tenderness and gradual enlargement.	Oval mass 15x10x10 cm. very firm & heavy. Cut surface appeared mucouslike	Cystic spaces many of which are surrounded by masses of large rounded cells, large areas of myxomatous tissues & smaller areas of striated muscle.	Subsequent history not available.
58	39	7 mo.		Discomfort & dragging sensation 7 mo. ago. Enlargement 4 mo. ago gradual increase in size since.	Rounded mass 6x6x4 cm. in size. Cut surface finely granular with bluish colored areas.	Gland like structures and cysts - some lined by a single epithelial layer - others by several. Several areas of very young cartilage.	Died 3 years after operation, with generalized metastases.
59	20	4 yr.	trauma	Gradual enlargement of testicle since injury 4 yr. ago. 1 yr. ago local doctor that it was hydrocele and aspirated it.	9x6x4cm. in size Finely granular cut surface.	Large rounded cells with numerous mitoses, infiltrated by nests of small round cells.	Died within a year after operation with abdominal metastases.
60	32	2 yr.		Gradual painless enlargement of testicle.	6x6x4cm. in size Cut sections show numerous tiny cysts and necrotic areas.	Areas of gland like structures, cysts lined by flattened epithelium and areas of squamous cell epithelium.	Subsequent history not available.

61	25	1 mo.	Swelling and pain in left testicle 1 mo. ago. Rapid increase in size since.	6x6x5cm. in size Cut sections show large areas of necrosis and hemorrhage.	Gland like structures, nests of solid epithelium, cysts lined by flattened epithelium and large areas of necrosis & hemorrhage.	Patient died two months after operation. He had pulmonary T.B. & it is not known whether he died from T.B. or malignant growth.
62	30	1 yr.	Pain and swelling in testicle for a year with gradual increase in symptoms since.	8x6x6cm. in size Cut surface shows spaces varying in diameter from 1-10 mm.	Mucoid tissue, areas of cartilage, cystic spaces; giant cells, gland like structures.	Living and well 6 mo. after operation.
63	29	4 mo.	Gradual painless enlargement of testicle.	8x6x6cm. in size Cut section shows a shiny rough surface, showing dense conn. tissue, bands & yellowish tissue.	Epithelial structures as glands, cuboidal cells lining cysts & in other places as solid cell nests.	Living and well 6 months after operation.
64	37	8 mo.	8 mo. ago one testicle seemed larger than other. No pain & marked enlargement until 5 weeks ago when it suddenly enlarged & a few weeks later broken open & discharged necrotic material.	Large mass 15x12x12cm. Nearly the entire mass is composed of soft necrotic tissue. A few areas of tumor tissue are seen.	Large rounded cells with large nuclei & numerous mitoses. Definite gland like structures in places.	Living and well 6 months after operation.
65	25	15 mo. trauma	Injured in testicle 15 mo. ago. Sore 2 mo. ago but cleared up. 3 mos. ago it began to increase in size & became quite painful.	Mass 6 cm. in diameter, for the most part necrotic.	Areas of gland like structures and large areas of necrosis. Large number of mitotic figures.	Subsequent history not available.
66	50	11 mo.	Sharp pain in testicle and inguinal region 10 mos. ago. Inside of a week testicle began to swell. Recently has had sharp shooting pains along cord & into lumbar region.	Mass 7x7x5cm. in size. On section large masses of hemorrhage are seen.	Large rounded and polyhedral cells with large nuclei & pale cytoplasm.	Died in 18 months with generalized metastases.

67	24	6 mo.		6 mo. ago developed dragging pain in testicle & later enlargement which has increased steadily since.	Mass 5x5x4cm. in size. Cut sections show surfaces made up of tiny cystic spaces & mucous looking areas.	Gland like structures cysts, myxomatous tissue. Foci of small round cells thruout.	Subsequent history not available.
68	40	3 mo.		3 mo. ago noticed small lump in testicle. Grew slowly until 3 wks. ago. Then suddenly lighted up and grew rapidly. Painful & tender.	8x8x7cm. in size Cut surfaces smooth and granular.	Large polyhedral cells with large nuclei numerous mitoses. Infiltration of small round cells.	May 1920 developed hemoptysis. Exploration of chest cavity showed tumor of lung. Radium used Died Oct. 1920 over 5 yrs. after operation. Specimen of tumor from lung was same as testicular tumor.
69	47	3 mo.		Patient noticed swelling in scrotum and thought he had a hernia.	Mass 14x10x10cm. Epididymis could not be made out. Central portion of tumor necrotic.	Gland like structures; areas resembling thyroid tissue but no colloid like substance seen. Other areas show cysts.	Patient returned 1 yr. after operation with large recurrent mass in scrotum. This was removed but he died in March 1913, 17 mo after primary operation.
70	56	4 yr.	trauma	Injured testicle 4 yr. ago. It enlarged & became painful. Was treated as a hydrocele 1 yr. ago it began to enlarge & increased rapidly in size.	Oval shaped mass 8x4x4cm. in size Cut surface is soft, brownish colored and granular.	Large polyhedral & rounded cells with large nuclei and numerous mitoses.	Died of pneumonia 16 months after operation. There were no signs of recurrent growth at that time.
71	35	2 mo.		2 mo. ago noticed swelling in testicle & inguinal region. (Inguinal glands are enlarged and soft.)	Rounded mass 6x6x5cm, unsize together with an area of fascia.	Large polyhedral cells with large nuclei, bright nucleoli & numerous mitotic figures.	Recurrence in site of old operation removed 6 mo. later. 13 mo. later developed recurrence in inguinal glands. Died of general mitostases 28 mo. after primary operation.

72	22	2 yr.		Gradual enlargement over a 2 year period. Was tapped by local doctor 1 yr. ago for supposed hydrocele.	Large rounded mass 13 cm. in diameter. Cystic on cross section.	Large rounded and polyhedral cells with large nuclei & numerous mitoses.	Subsequent history not available.
73	29	3 mo.		Swelling in testicle. Recently has had pain in cord & groin.	6x4x3cm, in size. Knob like growths. Cord thickened.	Large rounded cells with large nuclei and numerous mitotic figures.	Living and well 8 months after operation
74	62	6(?) yr.		Gradual slow enlargement of testicle.	Rounded mass 7 cm. in diameter attached to testicle. Mass is seen to be a cavity lined by calcified walls.	Walls of sac show hyalinized conn. tissue and calcareous deposits.	Died 6 mo. after operation apparently of "old age."
75	70	6 (?)		Gradual increase in size of scrotal mass which causes pain & dragging sensation. Chief symptoms however are those of prostatic obstruction.	Rounded mass 8 cm. in diameter lined by walls studded with yellow plaques. Contaras hair. Testicle is normal.	Sections thru cyst wall show hyalinized conn. tissue and calcified areas.	Patient died 1 yr. after operation from carcinoma of prostate
76	49	4 yr.		Several years ago noticed enlargement of one side of scrotum & was told he had a hydrocele. Comes to Clinic for hydrocele operation.	Mass 9 cm. in diameter, separated from testicle proper. Hair in cavity.	Section thru cyst wall show hyalinized conn. tissue and calcified areas.	3 years after operation was apparently cured.
77	23		trauma	Injured testicle 11 years ago and 7 yr. ago. Enlarged each time.	Tumor separated from testicle proper; cavity contains hair & cartilage.	Section thru cyst wall show hyalinized conn. tissue and calcified areas.	Oct. 1920--nearly 4 years after operation. Patient is in good health.
78	25	2 yr.		Gradual enlargement of testicle over a period of 2 yr. Pain only recently.	Mass 8x4x4cm. in size. Cut surface is yellowish in color with numerous gray patches.	Large polyhedral cells with relatively large nuclei. Diffusely infiltrated with small round cells.	Dec. 1920--2 1/2 yrs. after operation patient was in good health.

79	26	2 yr.	trauma	Gradual increase in size since injury to testicle. Pain has been present on the slightest pressure.	7x4x3cm. in size dumb-bell shaped.	Large polyhedral cells with large nuclei and numerous mitoses. Large areas of necrosis.	Living and well 9 months after operation.
80	25	2 yr.	trauma	Swelling from trauma to testicle 2 yrs. ago. 1 yr. ago suddenly began to enlarge & has increased rapidly since.	15x9x7cm. in size Epididymis cannot be differentiated Cut surface shows one area resembling thyroid, other areas smooth & granular.	Areas of gland like structures; papillary epithelial areas, large areas of necrosis, polyhedral cells, areas of thyroid tissue.	Radium applied following operation - Living and well 8 mo. after operation.
81	30	4 1/2 yr.		Pain & swelling commenced in undescended testicle. Subsided for a time & then grew rapidly Recently pain has been so severe as to make him vomit.	Oval mass 9x6x5cm. in size, studded with nodules.	Large rounded cells with large nuclei and numerous mitotic figures.	Followed 3 mo. Then disappeared from observation.
82	27	2 yr.		Pain & swelling in testicle 2 yr. ago. Gradual enlargement since.	Mass 6x5x5cm. in size. Cut sections are mottled with bluish colored opaque areas.	Myxomatous tissue areas of cartilage cystic cavities lined by low cuboidal epithelium.	Died within 3 years of metastases.
83	28	18 mo.		First noticed small tumors on surface of thigh and in groin. Later a mass appeared in testicle.	5x5x4cm. in size cut surface granular.	Large polyhedral cells with relatively small dense nuclei and dense cytoplasm.	After operation patient received X-Ray and Coley's treatments. Died 5 mo. after operation with multiple tumors over entire body.
84	45	1 yr.		Gradual painless enlargement during 1 years time.	Oval shaped encapsulated mass 6x4x4 cm. in size. Smooth, granular surface on cut section.	Large rounded cells with large nuclei brilliant nucleoli & a faintly acid staining cytoplasm.	No follow up history available.
85	45	7 wks.		Swelling of testicle with pain in groin & testicle. Rapid increase in size since associated with severe pain.	Oval, well encapsulated mass. 7x5x4cm. in size.	Some areas of large rounded and polyhedral cells; others resemble cells of a spindle cell sarcoma. Evidently a rapidly growing tumor.	No follow up history available.

86	33	3 mo.	3 mos. ago first noticed swelling & some pain in testicle. Rapid increase in size since. Recently pain has been severe.	Well encapsulated ovoid mass 6x6x4 cm. in size. Normal testicular tissue surrounding tumor areas on cut section.	Large areas of necrotic tissue containing islands of large rounded and polyhedral cells with large nuclei.	Subsequent history not available.
87	39	3 da.	A few days ago patient was seized with pain in abdomen, extending down the thighs, vomiting, sense of fullness in abdomen.	Oval mass 10x7x6 cm. Injected blood vessels beneath a glistening capsule. On section one half is soft and markedly hemorrhagic; the other half soft & well defined.	Large rounded & polyhedral cells with large nuclei & numerous mitoses separated by broad septa.	Subsequent history not available.
88	38	3 wks.	Pain and swelling in testicle 3 wks. ago. Rapid increase in size since.	10x7x5 cm. in size. Cut section shows hard & soft areas with a few small areas of normal testicular tissue.	A typical epithelioma some arranged as papillary structures; numerous areas of young cartilage, other areas of large rounded cells & some fusiform cells.	Subsequent history not available.
89	24	1 mo.	1 mo. ago first noticed pain in testicle followed by swelling. Swelling persisted & increased rapidly in size.	Soft vascular well encapsulated tumor mass 7 cm. in diameter. Cut surface is finely granular.	Epithelial structures, papillary & glandular in type; other areas resemble intestinal epithelium; areas of cysts lined by low cuboidal epithelium; large oval & rounded cells.	1 wk. after operation, patient suddenly developed cerebral symptoms & died. No autopsy was performed but condition was diagnosed by a competent neurologist as metastatic carcinoma of the brain.
90	23	1 mo.	1 mo. ago first noticed a small nodule in testicle. Has enlarged rapidly up till present time.	Ovoid mass 5x3 1/2 x3 cm. in size. Circumscribed area of tumor tissue 3 cm. in diameter at upper pole.	Cystic spaces lined by low cuboidal epithelium, gland like structures & papillary epithelial folds.	Living and well nearly 9 years after operation.
91	42	5 wks.	5 wks. ago noticed pain in testis especially when on feet. Then began to swell &	Rounded, encapsulated mass 5 cm. in diameter; cut surface shows large caseous necrotic	Large areas of necrosis containing a diffuse infiltration of lymphocytes and	Was well for 5 years following operation and then developed a local recurrence of the tumor, is being treated

97	30	7 yr.		has increased rapidly in size since. Pain up along cord.	areas.	small islands of large rounded and oval shaped cells.	for that now. Subsequent history not available.
92	23	2 yr.		2 yr. ago had pain in hypogastrium; 5 wks. ago sudden pain in back radiating up towards kidney & down thighs. 20# loss of weight.	Large rounded tumor mass 16x12x7 cm. Cut surface shows some areas of cartilage; other areas of soft necrotic material.	Small areas of cartilage; areas of bone; other areas of large rounded & oval shaped cells with large nuclei & a slightly acid staining cytoplasm.	Subsequent history not available.
93	45	3 mo.		3 mo. ago noticed a slight enlargement. Gradual painless increase in size since.	Oval shaped, well well encapsulated mass 6x4x4cm. in size. Cut surface finely granular.	Large rounded and polyhedral shaped cells with large nuclei, brilliant nucleoli & a slightly acid staining cytoplasm.	Subsequent history not available.
94	38	5 mo.		Pain in left testicle 5 mo. ago followed by swelling & gradual increase in size since. Severe pain last two weeks extending along cord.	Oval shaped mass 12x10x6cm. in size. At one pole is a cyst like structure 1x5x5 cm. in size. Cross section shows grayish colored substance marked necrosis.	Some areas of spindle shaped cells; masses of cartilage; gland like structures areas of squamous epi.	Patient has numerous metastases and probably will die.
95		1 yr.		Gradual enlargement of testicle during past year.	Soft tumor mass, yellowish in color, mushy in character.	Large rounded cells with large nuclei; numerous mitoses; brilliant nucleoli & a faintly acid staining cytoplasm.	Died about 4 mo. after operation with pleural & lung metastases.
96	25	3 mo.	trauma	Received injury to testicle 3 mo. ago. A week later testicle began to enlarge and has grown steadily in size since. Recently has had sharp pain in testicle & cord.	Oval shaped mass 6x5x4cm. in size well encapsulated. Cut surface, grayish in color & finely granular.	Large rounded & oval shaped cells with large nuclei & foci of clyphocytes.	Living and well Oct. 1920, nearly 6 years after operation.

97	20	7 yr.	Noticed enlargement of testicle 7 years ago; subsided for a time but recently has begun to grow more rapidly than before.	Tumor mass 6.5x4.5x4cm. in size. Cystic spaces on cut section.	Cystic spaces lined by single & several layers of epithelium, nests of large rounded and polyhedral shaped cells.	Subsequent history not available.
98	37	1 yr.	For the past year has noticed a gradual enlargement of testicle. No pain. That he had a hydrocele & came for treatment of that condition.	Rounded, soft tumor mass 6x5x4cm. in size. Cut surface is finely granular.	Large polyhedral & rounded cells with large nuclei; brilliant nucleoli & a faintly acid staining cytoplasm.	Living and well 1 yr. after operation.
99	30	18 mo.	18 mo. ago says he "ruptured" himself & shortly afterward testicle began to enlarge. Gradual increase in size since with pain in testicle and cord.	Ovoid tumor 8x5x3 cm. composed of varying types of tissue; some are cystic; others fibrous; others soft & opaque.	Large areas of necrosis; islands of cartilage; nests of large rounded epithelial cells; gland like structures and papillary formations squamous epithelium.	Living and well 2 mo. after operation.
100	27	3 yr.	Noticed pain in testicle 3 yr. ago; cleared up but has returned at intervals since. Recently has rapidly increased in size.	Oval shaped mass 7.5 x 4.5 x 5 cm. in size. Narrow strip of testicular tissue at upper pole; remaining surface friable & hemorrhage.	Large polyhedral & rounded cells with numerous mitoses. Some areas show giant cells.	Living and well 6 mo. post-operation.
101	55	20 yr.	Slow gradual enlargement of testicle beginning 20 yr. ago; 3 mo. ago patient became nauseated; vomited and has had severe pain in epigastium. Recently has had involuntary urinations, tingling of feet, etc.	Large testicular mass size of a man's fist hard and nodular and involving cord. A lobular mass palpated in region of spleen.	Not operated.	Was sent home with a hopeless prognosis. End results not known.

CONCLUSIONS

1. Malignant disease of the testis is relatively rare. In general hospital male admissions, it is seen about once in each 2,000 cases.
2. Cases occur mainly during the period of greatest sexual activity.
3. These tumors are practically always unilateral and when bilateral, are metastatic from other parts (seminal vesicles, skin, etc.)
4. Undescended testicles within the canal are more apt to become malignant than normally placed organs. Abdominally retained testis are relatively immune to malignant changes.
5. The structure of the tumors differs markedly, but most of them are probably teratomata and arise from the sex cells.
6. The term "orchitoma" is suggested to simplify the present unsatisfactory classification and terminology.
7. Symptoms are generally insidious in onset and usually consist of a slow gradual enlargement of the testis with or without pain.
8. Metastasis takes place early along the lumbo-aortic lymph node trunks.
9. The prognosis is bad. Out of 100 cases, only 19 are known to be alive and well four years after operation and two of these have metastases or recurrences. The prognosis in the mixed types, especially those containing cartilage, is much worse than in the large round cell types of tumors.
10. Treatment should be instituted early by the radical operation in all cases in which the disease is apparently limited.

Cases which show abdominal metastases clinically, should not be operated upon, but should receive such treatment as Coley's Serum, X-Ray and Radium.

B I B L I O G R A P H Y

1. Abel, R. Ein Fall von Pseudohermaphroditismus masculinis mit sarcom. cryptorchis sin. Arch. f. Path. anat., 1891, 126, 420.
2. Adami. Textbook of Pathology, 1909, I, 659.
3. Arnold. Ein Fall von glycogenhaltigen Myoma striocel. am Hoden. Beitr. z. path. Anat., 1890, 8, 109.
4. Aschoff. Path. Anat., Vierte Auflage, 595.
5. Aschoff. Path. Anat., Jena 1909, Dritte Auflage, 636.
6. Askanazy. Z. Kennt. d. charionepithelartigen Wucherung ind. Teratomend. Keimdrusen. I.D. Leipsig, 1904.
7. Askanazy. Die Teratome nach ihrem Bau, ihrem Verlauf, ihre Genese, und im Vergleich zum experimentellen Teratoid. Verhandl. d. deutsch. path. Gesellsch, 1907, xi, 39.
8. Baldwin. A Case of Fibro-lipoma of Testicle weighing 23½ pounds West London M.J., 1917, XXII.
9. Bandler. Die Dermoidcysten des Ovariums, ihre Abkunft v.d. Wallf'schen Karper. Arch. f. Gyn., 1900, 61, 277, 455.
10. Bandler. Zur. Entstehung der Dermoidcysten. Arch. f. Gyn., 1899, 60, 377.
11. Bardard Lenoire. La Maladie kystique des organs glandulaires. Arch. gen. de Med., 1890, 2, 319.
12. Barrington. Lancet, London, Aug. 13, 1910.
13. Battaillon. Arch. f. Entwickela, 1904, 18, 17.
14. Bazy. Sarcome a petites cellules du corps Highmori, etc. Bull. Soc. de Chir. de Paris, 1892, 18, 488.
15. Beatson. Sarcoma in an undescended Testis. Glasgow Med. Journal 1890, 22, 283.
16. Benenati. U. ein Fall v. Rhabdomyom. in ein verlagerten Hoden. Arch. f. path. Anat., 1903, 171, 418.
17. Billroth. Zur. Entwicklungsgesch. u. chir. Bedeutung d. Hodencystoids. Arch. f. path. Anat., 1855, 8, 433.
18. Blanck. Zur. Kenntniss der Geschwulste des Bauchhodens. Rostock, 1906.
19. Bland Sutton. Lancet, Nov. 13, 1909, p. 1406.
20. Bland Sutton. Practitioner, London, 1907, lxxxix (Dec.)
21. Blegen. Tumors of the Testis. Railway Surg. Jour., Chicago, 1916, -17, XXIII, 257.

22. Bonnet. Gibt es bei Wirbeltieren Parthenogenesis. Erg. d. Anat. u. Entwicklungsgesch. 1899, 9, 820.
23. Bonnet. Zur Etiologie d. Embryoome. Monatschr. f. Geb. u. Gyn., 1901, 13, 149.
24. Borst. Die Lehre v. d. Geschwulsten. Wiesbaden, 1902, 2, 811.
25. Bougle, Cornil. Tumeur de testicle apres un traumatism. Bull. Soc. anat. de Paris, 1901, 76, 678.
26. Brault. Sarcome angeoplastique. Mon. d'histol. path. (Cornil, Ranvier), 1901, I, 354.
27. Breus. U. einen innerhalb d. Venensystems bis das Herz. gewuchsten Hodentumor. Vien. med. Woch., 1878, 767.
28. Bricka, Pons. Un cas de tumeru tridermique de la region pre-vert. second a un cancer du testicul. Marseilles Med., 1903, 40, 741.
29. Bulkley. Tumors in Undescended Testicle. Surgery, Gynecology & Obstetrics, 1913, XVII, 703.
30. Carey. Report of Two Testicular Teratoma, with a Review of the Recent Literature. Johns Hopkins Bull., 1902, 13, 268.
31. Carnot, Marie. Sarcome aneoplastique. Bull. Soc. Anat. de Paris, 1898, 73, 82.
32. Caron. Am. Jour. Urol., 1913, IX, 483.
33. Cavazanni. U.d. Entstehung d. Teratoide d. Hodens. Beitr. z. path. Anat., 1907, 41, 413.
34. Chevassu. Tumerus du testicule. These de Paris, 1906.
35. Chevassu. La presse Medicale, May 1910, 363.
36. Chevassu. Deux cas d'epitheliome due testicule traites par la castration et l'ablation des ganglions lombo-aortique, Rap. de P. Delbet. Bull. et mem. Soc. de chir. de Paris, 1910, N.S. XXXVI. 236-62.
37. Christian. Neuroglia Tissue and Ependymal Epithelium in Teratoid Tumors. Journal A.M.A., 1903, 41, 593.
38. Codman. Boston Med. & Surg. Jour., Feb. 1914, p 267.
39. Coley. Annals of Surgery, 1915, July, vol. LXIV.
40. Coley. Malignant Tumors of the Testicle. Med. News, 1903, 83, 154.
41. Coley & Buxton. Teratoma of the Testis. Annals of Surgery, 1901, 34, 341, 415.
42. Cook. Bull. Johns Hopkins Hosp., 26, 215, 1915.

43. Cooper, Astley. Observations on the Structure and Diseases of the Testicle. Philadelphia, 1845, 115.
44. Cornil, Berger. Un cas d'inclusion scrotale. Bull. Acad. de Med. Paris, 1885, 2d S. 14, 275.
45. Councilman, Lovett. A case of Double Teratoma. Jour. of Exper. Med., 1897, 2, 427.
46. Cuneo, D. l'Extirpation des ganglions lombaires dans le cure des Cancers du Testicule. These de Paris, 1906.
47. Cunningham, J.H. New Growths Developing in Undescended Testicles. Journal of Urology. May, 1921, 5, No. 5, P 471.
48. Curling. Observations on cystic Disease of the Testicle. Med. Chir. Trans., 1854, 36, 449.
49. Dauve. De l'enchondrome du testicule. Mem. soc. de chir. de Paris, 1868, 6, 291.
50. Davies, A.M. Lancet, London, Feb. 17, 1912, 1, 418-21.
51. Debernardi. Beitr. z. Kenntniss d. malign. Hodengeschwulst. Beitr. z. path. Anat., 1906, 40, 534.
52. Delafield & Prudden. Textbook of Pathology, 11th Ed., p.1021
53. Dopter. Sur un cas de sarcome angeoplastique. Arch. de med. exper., 1900, 12, 769.
54. Downes. Trans. N.Y. Surg. Soc., Feb. 27, 1918.
55. Dupuytren. Lecons orales de clinique chirurgicale; Paris, 1839.
56. Durr. U.d. Kystoma Testis. I.D. Freiburg. 1894.
57. Eberth. U.d. Blut u. Lymphgefasse d. Gehiras. Arch. f. path. Anat., 1870, 49, 48.
58. Eccles. London Lancet, vol. CLSII, P. 569, 762.
59. Ehrendorfer. Beitr. z. Kenntniss Hodengeschwulste. Arch. f. Klin. chir., 1882, 27, 352.
60. Eisendrath. Annals of Surgery, 1916, LXIV, 324.
61. Ewing. Teratoma Testis and its Derivatives. Surgery, Gyn. & Ob., 1911, vol XII,
62. Ewing. Textbook Neoplastic Diseases, 1919.
63. Fansler, W.A. An Unusually Large Testicle. Am. Jour. Surg., 32:10, Jan. 1918.
64. Farwick. Uber Tumorenbildung bei Leiste & Bauchhoden. 8 Bonn 1893.

65. Finotti. Zur path. u. Ther. d. Leistenhoden. Arch. f. klin. chir., 1897, 55.
66. Foulerton. Lancet, Dec. 23, 1905.
67. Frank, A. Frankfurt Ztschr. f. path., 1912, IX, 206 bibl.
68. Frank. Chorioepitheliomatous Proliferations in Teratoma. Jour. A.M.A., 1906, 46, 248, 343.
69. Gartner. U. ein teratoide Mischgeschwulste d. Hodens. I.D. Freiburg, 1897.
70. Geist & Thalheimer. Histopathology of Carcinoma of Testicle. Annals of Surgery, 1917, LXVI, 571-80.
71. Fessner. U. Mischgeschwulste d. Hodens. Deutsche Zeit. f. Chir. 1901, 60, 86.
72. Glaserfeld. Ztschr. f. Krebsforsch., 1910, IX, No. 3.
73. Godevin. A Dermoid Cyst in the Right Side of the Scrotum. Brit. Med. Jour., 1901, 2, 715.
74. Gosset. Bull. et Mem. Soc. de Chir. de Paris, 1910, n.s. XXXVI
75. Grant. Jour. A.M.A., 1916, LXVII, 915.
76. Gregoire. Arch. Gen. de Chir., July 1903.
77. Horsemann. Chorioepitheliom. beim Manne. Zeit. f. Geb., 1904, 51, 400.
78. Hartmann & Peyron. Bull. de l'Academie de Med., June 1919.
79. Harvey. Methods of Artificial Parthenogenesis. Biol. Bull., 1910, 18.
80. Hendrickson. A Teratoma of the Testicle with extensive Angio-sarcomatous Growth. Univ. of Penn. Bull., 1901, 14, 202.
81. Hericourt. Deux leiomyomes de l'epididyme. Rev. de Med., 1885, 5, 54.
82. Hertzler. Treatise on Tumors (textbook).
83. Hinman, F. The Operative Treatment of Tumors of the Testicle. Jour. A.M.A., 1914, LXIII, 2009.
84. Hinman, F. The Radical Operation for Teratoma Testis. Surgery. Gyn. & Ob., XXVIII, May 1919.
85. Houget. Trans. N.Y. Surg. Soc., Feb. 27, 1918.
86. Howard. Practitioner, London, 1907, LXXIX, p. 794.
87. Howard. Lancet, Nov. 12, 1910.

88. Hugueinin. Ein Hodenadenom mit knorpel Einsprengungen, Dresenkal., u. epiderm Heerden. Arch. f. path. anat., 1902, 167, 396.
89. Hutchinson. Lymphosarcoma of both Testicles. Brit. Med. Jour. 1889, 1, 413.
90. Jackson. Chorioepithelioma Testis. Jour.A.M.A., Dec. 19, 1920.
91. Jackson. A case of Chondro-carcinoma of the Testis. Lancet, 1900, 2, 1905.
92. Jamieson & Dakon. Lancet, London, Feb. 19, 1910.
93. Johnson. Cystic Disease of the Testis in an Infant and probably congenital. Trans. London Path. Soc., 1856, 7, 241.
94. Johnson. Med. Chir. Tr., London, 1907, XXVI, 794.
95. Judet. Tumeur mixte du testicule. Bull. soc. anat. Paris, 1901, 76.
96. Kaepplin. Gaz. des Hopitaux Paris, 1902, lxxv, 29.
97. Kanthack & Pigg. Malignant Enchondroma of the Testis. Re-examination of Paget's Case. Trans. London, Path. Soc., 1897, 48.
98. Kaufmann. Deutsch. med. Wchnschr., 1908, XXXIV, 803.
99. Kaufmann. Verhandl. d. deutsch. path. Gesell, 1907, 11.
100. Kockel. Beitr. z. Kenntniss d. Hodenteratome. Festschrift f. Schmidt, 1896, 153.
101. Kocher. Krankheiten d. Mannlich. Geschlechtsorganen. Deutsche chir. Lief., 50 B., 1887, 414-532.
102. Kober. Sarcoma of the Testicle. Am. Jour. Med. Sc., 1899, 117, 53, 535.
103. Koslowski. Ein Fall von Hodensack Teratom. Arch. f. path. Anat., 1897, 148, 36.
104. Lane. Placentation of an Armadillo. Science, 1909, 29, 715.
105. Langhans. Deutsche Chir. Lief., 50 B., 1887, 414-532.
106. Lecompte. These de Paris, 1851.
107. Lang. Beit. z. Kenntniss d. sog. Dermoidcysten. Arch. f. path. anat., 1871, 53, 128.
108. Le Dentu. Teratome du scrotum. Med. moderne, 1889, 1, 27.
109. Lewisohn. Zur Entstehung d. Mischgeschwulste. Deutsch. med. Woch., 1904, 411, 463, 496.
110. MacCallum. On the Intravascular Growth of certain Endotheliomata. Johns Hopkins, 1900, 9, 497.

111. Macewen. A case of Scrotal Inclusion. Glasgow Med. Jour., 1878, 10, 433.
112. Mallassez. Note sur un cas de maladie kystique de testicule. Arch. de Physiol. norm. et path., 1875, 2, 122.
113. Mallassez. Lymphadenome du testicule. Bull. soc. Anat. de Paris, 1877, 52, 176.
114. Marchand. Zur Kenntniss die Embolie d. Gehirnarterien Zugl. ein Beitr. z. Kasuist. d. prim. Herztumoren. Berlin Klin. Woch., 1894, I, 36, 61.
115. Matignon. Sarcome encephaloid du testicle. Jour. de med. de Bordeaux, 1891, 21, 394.
116. Mauclaire, H. Kyste dermoid du testicule. Bull. soc. de Mediatre, 1902, 4, 269.
117. Meyer, Rudolph. Frankfurt Ztschr. f. Path., 1913, XIII, 215.
118. Meiser. Uber ein Fall von sarkomatoser Degeneration des Abdominalhodens, 8, Kiel, 1898.
119. Michon. Bull. de la soc. de Chir., No. 8, 1910.
120. Miyata. Arch. Klin. Chir. (Langenbeck), 1913, ci, 426.
121. Mohr. U. d. Enchondrom d. Hodens, 1 D. Trebigen, 1894.
122. Monckberg. U. syncytiumhaltige Hodentumoren. Arch. f. path.
123. Monod, Terillon. Traite des maladies du testicule. Paris 1889.
124. Monod, Terillon. Essai sur le lymphadenome du testicule. Arch. Gen. de med., 1879, 2, 34, 325.
125. Moran. Notes on a case of Embryoma Testis. Med. Jour. Australia, Sidney, 1917, ii, 5.
126. Morris. Lancet, London, March 9, 1912.
127. Most. U. malig. Hodengeschwulste u. ihre Metastasen. Arch. f. path. Anat., 1898, 154, 138.
128. Muhsam. Adenom. d. Tunica vagin. Deutsch. Zeit. f. Chir., 1898, 49, 457.
129. Muller, A. Zur Kenntniss d. Hodenembryome. Arch. f. klin. Chir., 1905, 76, 661.
130. Nepoen. Tumerus du testicule. Paris, 1875.
131. Neumann. Ein Fall vom Osteom. d. Hodens. Arch. f. Heilk., 1875, 16.
132. Neumann. Ein Fall von Myoma Striocoellularam Hoden. Arch. f. path. Anat., 1886, 103, 497.

133. Neumann. Rhabdomyoma Testis. Arch. f. path. Anat., 1886, 103.
134. Nicholson. Guy's Hospital Reports, 1907, LXI.
135. O'Crowley & Maitland. New Growths of the Testis. Durg., Gyn., & Ob., May 1919, 486.
136. Odiarne & Simmons.
137. Ohkubo. Zur Kenntniss d. Embryoma des Hodens. Arch. f. Ent-
wickelungs. 1908, 26, 509.
138. O'Kelly. Teratoma of the Testis. Tr. Roy. Acad. Med.
Ireland, Dublin, 1915, XXXIII, 377.
139. Oraison, J. Gaz. hebdom. d. sc. med. de Bordeaux, 1919, xi, 33.
140. Orton, S.T., Report of a Case of Chorionepithelioma of the
Testicle. Jour. Med. Research, Boston, 1908, vol. XVII, p. 219.
141. Osler. Abdom. Tumors associated with Diseases of the Testicle.
Lancet, May 25, 1907.
142. Pabeuf. Des Teratomes du Testicule. These de Paris, 1903.
143. Paget. Account of a growth of cartilage in a Testicle and its
Lymphatics and in other parts. Med. Chir. Trans., London, 1855,
38, 247.
144. Panchet. Cancer du testicule. Archives Pror. de Chir., tome
XIX, 1910, p. 239.
145. Paulus. Tumors of the Testicle. Jour. Okla. Med. Assn., Gath-
rie, 1917, X, 58-65.
146. Pean. Tumeurs du testicule. Lecons de Clin. Chir., Paris, 1888,
850.
147. Peperere. Seri Teratomi del Testicolo. La Clin. Mod., 1903, 9, 553.
148. Perrone, Andre De. Mem. de l'acad. Med. (Ollivier), 1833, 480.
Cited by Verneuil.
149. Petit. Teratome du testicule chez le cheval. Bull. soc. anat.
de Paris, 1904, 79, 552, 581.
150. Petrow. Ein Experimentelle erzeugtes Hodenembryom. Cent. f.
allg. Path., 1906, 17, 353.
151. Phillip. U. malign. Mischgeschwulste des kindlichen Hodens.
Zeit. f. Krebsf., 1909, 7, 462.
152. Pick, L. Zur Kenntniss d. Teratome. Berlin Klin. Woch., 1902,
118 9.
153. Pick, L. U. Neubildungen am Genital bei Zwittern. Arch. f. Gyn.,
1905, 76, 195.

154. Pick, L. Ueber adenome der männlichen und weiblichen Keimdrüce bei Hermaphroditismus versus und spurius. Berlin klin. Wehnschr. 1905, xlii, 502.
155. Pick, L. Zur Frage d. Entstehung d. Chorioepithelioms aus angeboren. Anlagen. Arch. f. Path. Anat., 1905, 180, 172.
156. Pilliet, Costes. Etude histologique sur les epitheliomes du testicule. Revue de Chir., 1895, 15, 64.
157. Parges. Ein teratoiden Tumor am Hoden Lipom des Samenstrangs. Wien. klin. Woch., 1897, 649.
158. Posner. Le Cancer genito-urinaire au point de vue de l'etiologie du cancer. Zeit. f. Krebsforsch., 1903, I, 1.
159. Pringle. London Lancet, Jan. 14, 1913.
160. Prochaska. Med. Jahrb. d. osterr. Staates Wien, 1814. Diss. de fetu intra fetum, Amsterdam, 1818 (cited by Verneuil).
161. Rademacher. Hodenretention und Abdominaltumoren 8°, Halle, a.s., 1904.
162. Reclus. Tumeurs du Testicule. Traite de Chir. (Duplay Reclus), 1898, 2nd Ed., 1082, 1191.
163. Ribbert. Die Lehre v.d. Geschwulsten. Bonn, 1904.
164. Ribbert. Beitr. z. Kennt. d. Rhabdomyome. Arch. f. path. Anat. 1892, 130, 249.
165. Risel. Ergebniss d. Allg. path., xi, 928, 1907.
166. Risel. U.d. Chorioepitheliom. u.d. analogen Wucherung in Hodenteratomen. Arbeit a.d. path. Institut. Leipzig, 1903.
167. Roberts. Excision of the Lumbar Lymphatic Nodes and Spermatic Veins in Malignant Disease of the Testicle. Annals of Surgery, XXXVII, 1902.
168. Roux, W. U.d. versbhid. Entwicklung isolirter erster Blastomeren. Arch. f. Entwicklungsm., 1895, I, 596.
169. Rydygier. Ein Fall v. premaren Melanosarcom. d. Nebenhodens. Arch. f. klin. Chir., 1891, 42, 769.
170. St. Hilaire, Geoffrey. Histoire general et particulaire des anomalies. Paris, 1836. (Cited by Verneuil).
171. Saxer. Ein Beitr. z. Kennt. d. Dermoids u. Teratome. Beitr. z. path. Anat., 1902, 31, 459.
172. Sazaria. Contrib. a l'etude des lipomes du cordon spermatique These de Paris, 1895.
173. Scheel. Ein Fall v. Hodensarcom. I.D., Berlin, 1895.

174. Schlagenhauer. U.d. Workommen chorione epitheliom. u. trauben-
emmolenartiger Wucherungen in Teratomen. Wien. klin. Woch., 1902, 209.
175. Schlutz, O.T. & Eisendrath, D.N. The Histogenesis of Malignant
Tumors of the Testicle. Arch. of Surg. May 1921. Vol. 2, No. 3, p.493.
176. Schubert, J. Ein Fall von Hodensarcom. I.D. Greifswold, 1885.
177. Schuckmon, F. Das Sarcom. d. Hodens. I.D. Wurzburg, 1885.
178. Schwartz. U. ein Teratoma Testis. I.D. Konigsberg, 1900.
179. Scott, Longsop. Report of a Case of Malig. Tumor of the Tes-
ticle resembling Chorio-epithelioma. Bull. Ayer Clin. Lab., Phila.,
1905, 2, 56.
180. Seeman, F. U. Castration bei retinirten Hoden. I.D. Berlin,
188.
181. Seyler, E.Z. Casuistik d. Hodensarcom. I.D. Greifswald, 1887.
182. Sheen, W. & others. A case of Chondro-sarcoma of the Testicle.
Lancet, S ept. 1910.
183. Sobatta. Neurre Anschaaungen u.d. Entstehung d. Doppelniss-
bildung. Wurzburg, Abhandlung, 1901, I, 85.
184. Souligoud. Lymphadenom. du testicule. Bull. soc. Anat. de
Paris, 1900, 75, 547.
185. Steinert. U. d. embryoiden Geschwulsten d. Keimdrusen, u.d.
Vork. chorion Bildungen in d. Tumoren. Arch. f. path. Anat., 1903,
174, 232.
186. Steinhaus. U. chorion-epitheliomartigen Wucherungen beim MEnne.
Wien. med. Woch., 1903, 793.
187. Stender. Ein Fall v. Hodenkrebs warschlein. v. einer neben-
niereauehend. I.D. Kiel, 1890.
188. Stenger. U. Hodentumoren in Ausschluss. an d.i., Konig., Klin.
zu Berlin von April, 1883-89, opr. Falle, I.D., Berlin, 1889.
189. Sternberg. Z. Kennt. d. chorione epitheliomartigen Wucherungen
in Hodentumoren. Verhand. deutsch. path. Gesell., 1904, 7, 105.
190. Senftleben. Caneroides Hodencystoid mit verschieden Gewebstyp-
en. Arch. f. path. Anat., 1868, 15, 336.
191. Stoppato. Ziegler's Beitrage, 1911, I, 113.
192. Strassman. U. Embryoma Ovarii. Arch. f. Gyn., 1900, 61, 608.
193. Sturgis, F.R. American Med. Quarterly, 1899.
194. Szulczeroski. Beitr. z. Lehre u.d. sogen. Struma Ovarii. I.D.,
Wurzburg, 1904.

195. Talavero. Lymphadenome du Testicule. These de Paris, 1879.
196. Teacher. On chorio-epithelioma, etc. Jour. Obst. Brit. Emp., 1903, 4, I.
197. Terillon. Castration hatine p. le lymphadenome du testicule. Bull. soc. de chir. de Paris, 1891, 66, 55.
198. Tizzoni. Contrib. allo studio dei tumori del testiculo. Rivista clin. di Bologna, 1876, 6, 145.
199. Trelat. Clin. chir., 1891, 2, 486.
200. Trelat. Diagnostic d. tumerus du testicule. Progress med. Paris, 1877, 5, 41.
201. Velpeau. Clinique. chir., 1841, 3, 198.
202. Verneuil. Mem. sur l'inclusion scrotale et testiculaire. Arch. gen. de med., 1855, I, 641, 2, 24, 191.
203. Verneuil. Tumerus du testicule. Bull. soc. chir. de Paris, 1867, 2nd S. 7, 355.
204. Waldeyer. Die Entwicklung d. Carcinom. Arch. f. path. Anat., 1872, 55, 132.
205. Waldeyer. Eierstock und Ei. Leipzig, 1870. Arch. f. Gyn., 1870, I, 287.
206. Walthard. U. Struma Ovarii colloides cystia in Ovarium. Zeit. f. Geb. u. Gyn., 1903, 50, 567.
207. Warthin. Communicated to American Assoc. Path. & Bact., 1909.
208. Weber. Des Teratomes du testicule. Ref. Cent. f. Chir., 1903, 30, 1287.
209. Westenhofer. Verh. Deutsche path. Gesell., 1904, 7, 107.
210. Wettergren. Bidrag. till Rannedomen om Kystoma testiculi. Nord-ist. med. Arch., 1872, 4, 20, 24.
211. Willard. Report of a Case of Malig. Testicle. Calif. State Jour. Med., San Francisco, 1916, XIV, 134.
212. Wilms. Die Mischgeschwulste. Leipzig, 1899-1902.
213. Wilms. Die Teratoide Geschwulste d. Hodens. Beitr. z. path. Anat., 1896, 19, 233.
214. Wilms. Deutsch. Ztschr. f. klin. Chir., 1898, xlix, i.
215. Wilms. Embryome u. embryoide Tumoren d. Hodens. Deutsche Zeit. f. Chir., 1898, 49, 1.
216. Wilson. Amphioxus and the Masaic Theory of Development. Jour. of Morphol., 1893, 8, 579.

217. Wlassow. U. d. Patho. u. Histogenese d. sog. Sarcome-angio-
plastique. Arch. f. path. Anat., 1902, 169, 220.
218. Woglom. St. Luke's Hosp. M. & S. Rep., N.Y., 4, 188, 1917.
219. Walbarst. Journal A.M.A., April 6, 1907.
220. Wood. A specimen of Rhabdomyoma of the Testis. Proc. N.Y. Path.
Soc., 1902, N.S., 2, 52.
221. Zoja. Sullo sviluppo dei blastomeri isolati dalle uova di
alcune meduse. Arch. f. Entwicklungsm., 1895, I, 4; 2, I.