

THE UNIVERSITY OF MINNESOTA
GRADUATE SCHOOL

Report
of
Committee on Examination

This is to certify that we the undersigned, as a committee of the Graduate School, have given Albert John Scholl, Jr. final oral examination for the degree of Master of Science in Urology.

We recommend that the degree of Master of Science in Urology be conferred upon the candidate.

W. F. March

Chairman

Gilbert L. Thomas.

G. L. Cameron

E. J. Bell.

Louis D. Wilson

J. F. Corlett.

Date Dec. 2, 1922

J. O. Sigsmund

Graduate School, University of Minnesota

March 15, 1922.

This is to certify that Albert John Scholl, Jr., a candidate for the degree of Master of Science in Urology, has passed the final written examination for the major in the Department of Urology, which shall also serve as the written portion of the preliminary examination for the degree of Doctor of Philosophy in Urology.

W. F. Braasch

For the Major Department.

Graduate School, University of Minnesota

March 13, 1922.

This is to certify that Albert John Scholl, Jr., a candidate for the degree of Master of Science in Urology, has completed the requirements for the minor in the Department of Pathology.

Louis D. Wilton X

For the Minor Department

REPORT
of
COMMITTEE ON THESIS

The undersigned, acting as a Committee of the Graduate School, have read the accompanying thesis submitted by Albert John Scholl, Jr., for the degree of Master of Science in Urology. 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 Urology.

W. F. Brasch

Louis B. Wilson

Gilbert J. Thomas.

THESIS

FACTORS INFLUENCING THE MORTALITY IN CASES OF TUMOR OF THE BLADDER

Albert John Scholl, Jr., A.B., M.D.

Submitted to the faculty of the Graduate School of the
University of Minnesota in partial fulfillment of the re-
quirements for the degree of Master of Science in Urology.

March, 1922.

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Complete data were obtainable in 262 cases of tumor of the bladder treated by surgery at the Mayo Clinic. Two hundred sixteen of these were operable and thirty-six inoperable. One hundred four (48.2 per cent) of the group of 216 patients from whom the tumors had been removed completely are alive on an average of three and two-tenths years after operation; 112 (51.8 per cent) are dead on an average of eight months after operation.

The mortality following the removal of tumors of the bladder depends primarily on the type of tumor, whether or not it is benign or if malignant, the degree of malignancy. The location and size of the tumor are next in importance; if it is in an accessible area it may be removed completely, making a permanent cure possible. The age of the patient is also important; young adults stand the shock of operation well, but they often have extensive growths of a high degree of malignancy. In infants and in persons more than sixty years of age the mortality is very high.

The mortality of the 216 cases will be considered first from the standpoint of the location of the tumor, secondly in regard to the age of the patient, and finally with reference to the histology of the growth.

Mortality and location of the tumor

The location of the tumor has a decided bearing on the operative result. The most common location of all types of bladder neoplasms is in the base in the region of the trigone. Fenwick found 86 per cent of 380 neoplasms in the inferior zone, 262 being in the immediate vicinity of the ureteral orifice. The trigone is rarely the seat of neoplasm; papillomas, the most common type of bladder tumor, hardly ever originate in this area but they may invade it from adjoining tissues; the dense structure of the trigone does not permit

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the laxity of tissue necessary to produce a soft pedunculated tumor. When papillomas do grow from this area they are usually small and flat with short stubby fronds. Albarran calls attention to this freedom of the trigone from malignant growths; in thirteen cases with extensive involvement of the bladder wall he found the trigone uninvolved in seven. In sixty of sixty-seven cases this author found the bladder growth on the lateral wall and base. In one case there was an involvement of the apex alone. Delbru found twelve apex growths in 1000 bladder tumors. Of these twelve cases there were five extraperitoneal resections with immediate good results in all cases; in contrast to this four of six patients in whom a transperitoneal operation was done died immediately after operation. Delbru was able to collect nineteen cases in all of apex tumors; thirteen of these were malignant tumors in which there were six post-operative deaths.

The following table shows the operable cases of tumor of the bladder classified according to their location and correlated with the postoperative results.

Table 1

Location	Pat- ients	Liv- ing	Postopera- tive life, years	Dead	Per cent dead	Average dur- ation life, months	Patients operated on	Mortal- ity per cent
Lateral wall	58	33	3.5	25	43.1	9.0	7	12.7
Dome	7	4	2.7	3	42.8	2.7	1	14.2
Dome and later- al wall	13	4	2.5	9	69.2	9.0	3	23.0
Base and later- al wall	37	26	2.8	11	29.7	6.0	3	8.1
Base and later- al wall involv- ing ureter	46	16	3.7	30	65.2	8.0	7	15.2
Base	14	5	3.5	9	64.2	6.0	3	21.5
Base and anter- ior wall involv- ing sphincter	11	6	3.0	5	45.4	3.0	2	18.1
Anterior wall	5	3	3.5	2	40.0	11.0	0	
Diffuse	14	3	2.3	11	78.5	5.0	3	21.4
	216	104		112			31	

As might be expected, tumors of the base, especially those involving the trigone show a relatively high mortality. This is undoubtedly due not only to the technical difficulty of the operation but also to the impossibility of completely eradicating malignant tumors in this region. Ureteral involvement does not appreciably increase either the early or late mortality. There is practically no difference in the outcome when the ureter is involved, whether the ureter is transplanted or merely ligated, the mortality is the same. Undoubtedly in some cases the extra time required for the more difficult transplantation overbalances any gain resulting from preserved kidney function.

Tumors of the dome on account of the accessibility of the growth and the freedom from involvement of neighboring structures give a low immediate mortality. The late results are not as satisfactory. This is probably due to the high grade of malignancy of the tumors located in this region. They are mainly of the low, flat, infiltrating variety. In the later stages they not infrequently extend to the lateral wall, accounting for the high mortality for tumors in the upper bladder wall. In five extensive adenocarcinomas of this series four were formed in the apex; the fifth was in an exstrophied bladder. The anterior wall was only rarely involved alone; when this does occur the tumors are generally not of large size.

Mortality according to age

The mortality of tumors in infants and young children is exceedingly high. This is due to the type of malignancy. The majority of growths in early life are of the connected tissue variety, often showing sarcomatous changes. They grow rapidly often attaining a very large size, causing obstruction. When removed they have a marked tendency to recur. Epithelial tumors are rare in young people. In forty-one tumors in infants, Concetti found eight myxomas, six myomas, and one dermoid cyst; the remainder were either

pure or mixed sarcomas. Of 107 cases of sarcoma of the bladder Munves found ten in infants from one to five years old.

Table 2 shows the relation of age to the mortality in the operable cases of tumor of the bladder of this series.

Table 2

Age	Pat- ients	Liv- ing	Postopera- tive life, years	Dead	Per cent dead	Average dur- ation life, years	Operative Patients	mortality Per cent
20 to 30	6	4	1.7	2	33.0	1.0		
30 to 40	12	9	2.0	7	58.3	1.7		
40 to 50	42	24	4.0	18	42.8	4.2	5	11.8
50 to 60	72	32	3.6	40	55.5	1.0	9	12.0
60 to 70	66	30	2.4	36	54.5	0.5	15	22.8
70 to 80	14	5	2.0	9	64.3	0.8	2	14.3
Total	216	104	3.2	112	51.8	0.9	31	14.5

Due to the general good health of most of the patients in early adult life, the operative mortality is relatively low. Contrary to the usual opinion that there is a high percentage of early recurrence and death in young adults operated on for bladder tumors, these figures seem to show that these patients have a comparatively good chance for an ultimate recovery. The optimum period of life for this condition as shown by the figures of this series, is between forty and fifty years. At this time the lymphatics are not so active and the individual still has the robust health and resistance of middle age.

Bladder growths in individuals over seventy years are generally of the malignant papilloma type and are frequently only of small size, resulting in a low operative mortality. Due to their extreme old age, many die of other conditions, consequently the late results seem to be unfavorable.

There were several tumors in infants in this series. They were not charted in the above table but are considered under their respective pathologic groups.

Mortality and histology

The postoperative data concerning 186 of the 216 patients were correlated with the pathologic data in an endeavor to determine the mortality rate accompanying the various types of growth.

Papilloma and epithelioma.— One hundred sixty-eight of the neoplasms originated in the normal bladder mucosa. Seventy-four were papillomas, seventy-one malignant and three benign. Ninety-one were either solid epitheliomas or carcinomas.

It is rarely necessary to remove benign epithelial tumors by surgical measures; the majority respond readily to intravesical fulguration. Occasionally, owing to obstruction, infection or intolerance to manipulation of the bladder, it is necessary to perform an open operation. These papillomas have a definite, and in most cases, a readily recognizable histologic picture. (Fig. 1) They are rarely more than 2 or 3 cm. in diameter. The growth of malignant papillomas is limited only by the capacity of the bladder. They retain their pedicle and are composed of clubbed fronds with a marked irregularity of outline. The free wavy arborescence of the benign tumor is often lost and fusion of adjacent fronds is common. Often a number of villi are matted together and the papillary arrangement is completely obliterated. In some areas the cells retain the regularity of the benign papilloma; in others they are undergoing various stages of alteration with marked variation in size, type, and staining qualities. (Figs. 2 and 3)

Solid tumors are of two types; the wide-spread papillary epithelioma, and the low flat infiltrating carcinoma. The former has a rolled-out advancing border, the upper surface often being covered with short stubby papillomatous protrusions, or the top may have sloughed off, leaving a flat ulcerated surface. These tumors, sometimes firm, are often soft, flabby, and friable, and can easily be scraped off the surface of the bladder. The hist-

ologic picture shows the relation of this tumor to the papilloma; remnants of the central connective tissue axis of altered papillae are quite common and occasionally rounded ends of fairly normal villi are seen. In the infiltrating type the margins slope outward to meet the mucosa and burrow down into the wall of the bladder. These tumors are generally firm and compact, and without a tendency to split in cleavage planes. The only difference in the histology of the solid tumors is that most of the infiltrating tumors show none of the remnants of papilloma commonly seen in papillary carcinoma. The individual cells of the two types are practically the same. They vary markedly in size and shape; at times they are enormous with large nuclei containing one or several very prominent nucleoli. These large cells generally take the stain lightly in contrast to the deep staining of the smaller more compact cells. The form or arrangement is not definite; the cells are crowded together with only a small amount of intervening connective tissue stroma. Giant tumor cells and large atypical mitotic figures are quite common. Many large thin-walled blood vessels are seen, the walls of which are often indented by buds of carcinoma cells.

(Figs. 4,5 and 6)

In all of the 168 cases the tumors were removed surgically. Two of the three patients who had benign papillomas are alive six years after operation; one is alive four years after operation. Twenty-six (36.6 per cent) of the seventy-one patients with malignant papilloma are dead after an average duration of life of eleven and five-tenths months. The forty-five (43.4 per cent) living patients have lived an average of two years and three months.

Sixty-seven (71.2 per cent) of the ninety-four patients with solid carcinoma are dead after an average duration of life of seven and five-tenths months. The twenty-seven living patients have lived an average of three years and three months.

Length of life of patients with malignant papillomas

	Patients dead		Patients living
First month	9	After six months	7
Two months	1	After twelve months	
Six months	6	(3 with recurrence)	10
Twelve months	4	After three years	9
Two years	3	After five years	16
Four years	3	After nine years	3
Total	26		45

Length of life of patients with solid carcinoma

	Patients dead		Patients living
Died in less than one month	19	After six months (3 with recurrence)	4
Three months	2		
Six months	24	After one year (5 with recurrence)	13
One year	14		
Three years	7	After three years	6
Five years	1	After five years	2
		After seven years	2
Total	67		27

Twenty (76.9 per cent) of the twenty-six patients who died from malignant papilloma died the first year after operation. Fifty-nine (88.0 per cent) of the sixty-seven who died from solid carcinoma died the first year after operation. If patients survive the first year with either type of malignancy they have a good chance for ultimate cure. Thirty-one of the forty-eight living patients, 41.9 per cent, of the total number with malignant papilloma, have lived more than three years, while only ten of twelve living patients, 10.6 per cent of the total number with solid carcinoma, have lived more than three years. In the infiltrating type of carcinoma in this group the operative mortality was somewhat higher than in the papillary type. Twenty per cent of patients operated on for infiltrating carcinomas died during the first month, in contrast to 12 per cent following operations for papillary carcinoma. The rarer tumors are discussed by types:

Squamous-cell carcinoma

Squamous-cell carcinomas are distinct individual types of epithelial growths. Their onset is insidious, their growth is rapid, and they cause few distinctive symptoms. They probably develop from metaplastic bladder mucosae which has undergone epidermization as a result of irritation from infection or formation of stones. The tissue in most cases is firm and friable. The growths involve the wall of the bladder extensively, and are flat and frequently ulcerated; the lateral margins slope out toward the mucosa, sinking deep into the underlying tissues. Sometimes patches of leukoplakia, giving a clue to the origin of the malignancy, are found in the region of the tumor. Squamous-cell growths are most often found in early middle life and are not uncommonly preceded by evidence of long standing cystitis. Compared with other epithelial tumors these growths occur relatively more often in females. While metastasis is not uncommon, death in most instances is due to the obstruction and infection resulting from the local lesion. The histologic examination generally shows a marked cellular activity. The cells are large and irregular, they stain deeply and contain many atypical mitotic figures. In some tumors extreme hyalinization and pearly body formation are found, indicating a long standing, possibly premalignant stage. These tumors are the most malignant of the epithelial growths of the bladder. The tumor projects rapidly and extensively into the deeper tissues; even in the region of the advancing border finger-like extensions are seen separating the underlying muscle bundles. (Fig. 7, 8 and 9)

Cases of squamous-cell carcinoma of the bladder are not uncommon. Albarran found four cases in a review of 125 cases of vesical tumors. Three of the patients died very shortly after operation; one was well four months later. Halle collected the reports of a number of cases from the literature and gives the history of four patients observed at the Neckar Hospital. In

three of these four patients the condition was inoperable; the patients died shortly after entering the hospital. The fourth patient was operated on and died immediately after the operation. Montfort collected seven cases; in three there was an extension to the rectum, in a fourth, the growth had spread through the dome of the bladder, a mass "the size of an apple" being found in the adherent great omentum. Montfort states that in all his cases the tumor was complicated by marked cystitis. Of 113 neoplasms of the bladder, Buerger regarded five as squamous-cell carcinoma. He states that they rapidly penetrate the muscular coats and that they offer a very poor prognosis for the patient.

13

Fenwick cites two cases, one in which a benign papilloma was surrounded by a dense squamous-cell epithelioma. There was marked infiltration of the wall of the bladder, the vesical surface being flat and necrotic. The second case was that of an extremely large tumor arising from the posterior wall of the bladder and having a history of only six months' duration.

16

Geraghty states that squamous-cell carcinoma is exceedingly rare. He found only one case in 180 epithelial tumors of the bladder observed in Johns Hopkins Hospital. Busse describes a case associated with a papillomatous growth in the ureter and extensive metastasis. Casanello reports two cases, one in which the histologic structure of the growth resembled a chorio-epithelioma. He states that the growth in his cases was very malignant, rapidly and extensively infiltrating the surrounding tissues.

8

In the series of 262 cases there were six squamous-cell carcinomas; three were seen in an operable stage and are included in the classification of solid carcinomas. The average preoperative duration of symptoms in the three cases was only three months; one patient had a recurrence four months after operation, and died eight months later; one died six months after operation, and the third patient, is living and well nine years after operation.

The conditions of the other three patients were inoperable; they were seen on an average of twelve months after the onset of symptoms referable to the growth in the bladder.

Adenoma and adenocarcinoma

Adenoma and adenocarcinoma are observed occasionally. In all probability the majority of such growths arise from the glands of Linbeck and Brunn, or from the degeneration of small pinched-off epithelial buds. Mucosal glands, well described by Albarran, are found throughout the bladder, especially in the region of the trigone. They are readily recognized and often show colloid degeneration, especially if the mucosa has been subjected to irritating influences, such as stone in the bladder, or exstrophied bladder. The adenomas are usually small, soft, and vascular; occasionally they are pedunculated, but more often flat and circumscribed. In most cases the growths are located in the base of the bladder and are often covered with papillomatous excrescences, especially the pedunculated type. The adenomas are composed of tubules which open on the mucous surface; the glandular lumen is often dilated in its deeper part, forming a cyst. The glands are lined with many layers of cells, often showing mucoid degeneration, as in a case described by Kaltenbach. Watson found two adenomas in 653 tumors of the bladder; Motz found three in eighty-¹⁵ seven tumors examined histologically, while Geraghty found only one in 145 tumors. Cassanello,⁷ in 1908, collected fifteen cases from the literature and added one case of his own.

Adenocarcinomas of the bladder are closely allied to adenomas and develop similarly. They are usually extensive, flat and ulcerated, involving the deeper tissues only moderately. Stoerck and Zuckerhandl have showed the relationship of these malignant tumors to the mucosal glands; they reported three cases. Rauenbusch, in 1905, collected ten cases of this type of carcin-

oma, citing one case with metastasis to both kidneys. He asserted that the prostate and other neighboring glandular organs must be investigated thoroughly before it can be stated that the tumor is primary in the bladder. These tumors differing from all other growths of the bladder have a predilection for the upper areas of the bladder, particularly the dome, which suggests an origin from remnants of embryonal inclusions.

DeKorte has described a glandular carcinoma removed from the apex of the bladder in a woman aged fifty years. The growth did not return, but the patient died shortly after operation. Adami, who examined this tumor, concluded that it originated from urachal remains in the wall of the bladder. Barringer reported a very unusual adenocarcinoma involving only the apex of the bladder; the larger part was above the bladder. Ewing, who examined the tumor, said that the growth was unique and quite possibly came from a remnant of the allantoic end of the bladder, or possibly developed from a cloacal inclusion. Geraghty¹⁶ found three adenocarcinomas in his series of tumors of the bladder; one was in an exstrophied bladder. In one of Stoerck and Zuckerkandl's cases the tumor was in an ectopic bladder. They believed that the malignant area developed from the transformation of glandular cystitis which resulted from the continual irritation of the exposed mucosa.

In the series of 262 cases there were five adenocarcinomas. A man (Case 270742) aged forty-eight years, complained only of a painless hematuria of fourteen months' duration. At operation a large tumor in the dome of the bladder and one-third of the bladder were resected. Two years later an inoperable recurrent growth appeared on the anterior wall of the bladder extending into the posterior urethra. The patient died six months later. (Figs. 10 and 11) A woman (Case 208263) aged forty-three years had been troubled with mild frequency and suprapubic pains for twelve months. Cysto-

scopic examination showed a low sessile tumor of the dome and left wall of the bladder. A transperitoneal resection of the growth, which was 6 cm. in diameter, was successfully carried out; six months later there was no evidence of recurrence. A man (Case 51514) aged twenty-nine years had had hematuria and dysuria for six months. Four months before coming to the Clinic he had been operated on and a large tumor removed from the bladder. Hematuria recurred, and on examination a tumor was found in the dome of the bladder. At operation an indurated growth 10 by 7 cm. was removed, with the upper half of the bladder. Two years later a recurrent growth in the perivesical space 6 cm. in diameter was removed. One year later this patient was perfectly well. A woman (Case 346328) aged fifty years had a tumor of the apex of the bladder similar to that described by Barringer, and possibly with a similar etiology. At operation a growth 5 cm. in diameter was removed from the roof of the bladder. Histologically the growth contained only a few irregular glandular areas embedded in extensive masses of colloid material. Four months later a small local recurrent growth was found in the bladder; it responded readily to fulguration and radium. (Fig. 12) A woman (Case 190146) aged twenty-one years had adenocarcinoma on an exstrophied bladder. This case is similar in etiology to those of Stoerck and of Geraghty. The ureters, in this case, were transplanted to the large bowel and the bladder and malignant area were completely removed. Two years later the patient died from recurrence. The cases of malignancy in exstrophy of the bladder form an interesting group. As a result of constant irritation and trauma they develop an extensive glandular covering, a hyperplasia of the glands of the mucosa. (Fig. 13) The glandular structures often show characteristics approximating malignancy. In a series of exstrophied bladders studied histologically there was a gradual increase in the extent of the hyperplasia and the approximation of malignancy that varied to a certain extent directly with the age of the patient. In the cases where malignancy

develops the tumor is always an adenocarcinoma, a type which would develop directly from hyperplastic adenomatous tissue. (Figs. 14 and 15)

Angioma

Angiomas are rarely found in the bladder. They may be small, and their only symptom a persistent profuse hematuria; or they may be extensive, penetrating into the perivesical tissues, and simulating growths of other pelvic organs. In most cases they are composed of anastomosing dilated cysts filled with blood; rarely they occur as branching masses of apparently recently formed blood vessels, supported by a fibromyxomatous stroma. Watson found only two angiomas in 653 collected cases. Albarran collected three cases from the literature and reported one of his own which occurred in a series of 106 cases observed personally. In Albarran's case the tumor, which he removed surgically was very small; it was attached to the trigone and bled profusely. Thomas has described a similar small angioma which was removed by fulguration. Lane has described a large inoperable cavernous angioma in a child of three years. Jungano has described a massive cauliflower angioma in the region of the trigone undergoing sarcomatous degeneration in a man aged fifty-four years. Lamay has reported the case of a girl aged nineteen years in whom a large submucous angioma was removed from the posterior and lateral wall of the bladder. The tumor was firm in spite of many cavernous dilatations.

In the series of 262 cases there were three angiomas. A girl (Case 14928) aged nineteen years had had pus and blood in the urine, and mild incontinence for two years. At operation a large polypoid tumor was found filling an enormous bladder. The tumor extended into the perivesical space through an area about 3 cm. in diameter. The tumor was completely removed. Four months later a small recurrent growth was successfully fulgurated. Five years later the patient was in excellent health; her bladder appeared normal and its function was normal. The tumor in this case was firm, and contained many blood cysts

and sacculations, but the larger part of the growth was composed of fine interlacing blood vessels supported by connective tissue stroma, simulating a highly vascular myxoma. (Fig. 16)

A man (Case 151866) aged seventy-six years had had occasional attacks of hematuria and moderate frequency for the last eight months. On examination an inoperable sessile growth covered with papillomatous excrescences was found on the left base of the bladder reaching up to and involving the urethral sphincter. The growth was extensively fulgurated. Seventeen months later, after a period of comparative relief, the urinary symptoms returned. Examination revealed a wide-spread mass covering the entire

left half of the bladder and involving the prostate and posterior urethra. (Fig. 17)

A girl (Case 16434) aged seven years had had persistent slight hematuria for six years; recently a small amount of blood had passed from the rectum. A mass 6 cm. in diameter was palpated in the region of the bladder. Cystoscopic examination revealed an ulcerated bleeding tumor in the base of the bladder. Soon after, before operation could be performed, the patient had a severe hemorrhage from the rectum and died. Necropsy revealed an extensive cavernous angioma growing from the base of the bladder and invading the rectal mucosa.

Fibromyoma

Fibromyomas of the bladder are similar to myomas of the uterus.

They are rarely a pure type; they are generally fibrous and benign, although they sometimes show malignant characteristics. They are submucous, interstitial or peripheral types. Profuse hematuria is a common symptom and is occasionally combined with a palpable obstructing tumor. They are about equally divided between the sexes and have no predilection for any special period of life, although relatively they are found more often in infancy and childhood. Six of forty-one cases reported by Concetti in children were myomas. These growths

are generally located on the trigone or posterior wall of the bladder, and are often pedunculated. Blum reports a case of torsion of a myomatous pedicle. The myomas are generally covered with a thinned-out mucosa which often presents an ulcerated, easily bleeding surface. Because of this covering the tumors are not infrequently considered extravescical when examined cystoscopically. The surface of the tumor is often marked with a network of dilated veins. Myomas, in most cases, are relatively large. Polaillon reports a case in which the tumor, removed by laparotomy, weighed 3 kg. Kouznetski described an enormous fibromyoma weighing more than 9 kg. and with a circumference of 68 cm. This tumor, which was pedunculated, grew from the posterior and superior wall of the bladder; it extended to the umbilicus and markedly compressed the uterus and rectum. The growth was resected through a median abdominal incision.

Myomas are probably the most common of the connective tissue tumors of the bladder. Motz found three in eighty-seven neoplasms of the bladder. In Watson's 653 cases sixteen myomas were removed surgically. There were three operative deaths in the sixteen cases and five early recurrences; only 23 per cent of the patients were alive and free from recurrence one year after operation. Heitz-Boyer and Dore' (1910) collected thirty-two cases; twenty-five were simple myomas and seven were undergoing malignant degeneration. There were three operative deaths in the twenty-three cases in which operation was performed; death occurred in four cases shortly after operation, giving an immediate operative mortality of 30 per cent.

There was one case of fibromyoma in this series. The patient (Case 62897) a man, aged fifty years, had had a painless hematuria for years. At operation a hard, smooth tumor 9 cm. in diameter was enucleated from its attachment to the anterior wall of the bladder just above the sphincter of the urethra. Eight years later the patient was living and well. (Fig. 16)

Myxomas

Generally myxomatous tumors are found in infancy and childhood, rarely in adults. They are usually small, although they vary greatly in size, at times almost filling the bladder. They are often multiple and pedunculated, arising from the mucosa in the base of the bladder or from the region of the internal meatus. They are soft, gelatinous, and practically always covered with bladder mucosa, greatly resembling nasal polyps in their structure though they are firmer and more fibrous. Because of their location and pedunculated attachments the tumors often cause obstruction; they grow very rapidly and if not completely removed have a marked tendency to recur. Sims reported the case of a child, aged three years who had almost complete obstruction for eighteen months from a myxomatous tumor which blocked the urethral outlet. The tumor was removed through the dilated urethra but promptly recurred. Myxomas have a tendency to become malignant. Mandelbaum reported the case of a child, aged three years, from whom specimens removed for examination at different times showed only simple myxoma. Five months later the tumor was removed suprapubically and at this time histologic examination revealed myxosarcoma. Myxomas comprise only a small proportion of neoplasms of the bladder. Sixteen were found in Watson's series of 653 cases. Fourteen of the patients died immediately or shortly after operation. Albarran collected five cases and added one of his own. Eight of Concetti's forty-one tumors of the bladder in infants were myxomas.

There were two cases of myxoma in this series. One (Case 229590) was a child aged two years who had been having urinary difficulty and retention for several months; a soft mass protruded from the urethra. At operation a large, lobulated, soft, friable tumor 8 cm. in diameter was found. The tumor was completely removed, but the patient died two months later. The

second child (Case 323590) aged sixteen months had had gradually increasing dysuria for four months with recent hematuria. At operation an inoperable tumor was found involving the right wall and urethral sphincter. Nine days later the child died. At necropsy the tumor was found to be pedunculated; in its greatest diameter it measured 6 cm. The patient also had an extensive generalized miliary tuberculosis. (Fig. 19)

Sarcoma

Sarcoma, like other connective tissue tumors of the bladder, occur earlier in life than epithelial tumors. They are exceptionally rare and extremely malignant. They are soft, friable, and not infrequently villous. In the early stages they are small, single and well localized. Although occasionally they are pedunculated, they usually are sessile, with broad bases. Ulceration is rare; infiltration and extension to neighboring organs is common. Metastasis is extremely frequent. In forty-six necropsied cases collected by Munves (1910) metastasis was found in 50 per cent. Geraghty found only two sarcomas in 180 cases. Gardner found seven in 369 cases in which operation had been performed by various urologists. Six of the seven patients died shortly after operation; the seventh lived four years. Watson found fifty-two sarcomas in 653 collected cases; operation was performed in thirty-five. Twenty-two (63 per cent) of the thirty-five patients died at operation or immediately after. In twenty-six cases collected by Albarran thirteen patients (50 per cent) died as a result of the operation, and ten had rapid recurrences or died in a short time after operation. Munves collected 107 cases; operation was performed in sixty-nine; thirty-eight of the patients died soon after operation; only three were considered completely cured, having been traced for from five to thirteen years after operation.

Undoubtedly some of the cases reported as sarcoma are not sarcoma. Fenwick cites a case from Guy's Hospital which had been diagnosed as round-cell

sarcoma. Targett reexamined the specimen and found it to be merely round-cell infiltration in a fibropapilloma.

Only one case (Case 3111) of sarcoma was found in the series of 262 cases. The patient was a woman, aged thirty-nine years, who had been troubled with frequency and hematuria for eighteen months. On examination a large, hard mass was felt in the area of the bladder. An inoperable tumor was found in the dome of the bladder. The growth extended into the suprapubic tissues. An excised specimen showed the condition to be a sarcoma. The patient readily recovered from the exploratory operation, but died two years later.

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Fig. 1 (Case 110539) Benign papilloma. X50.

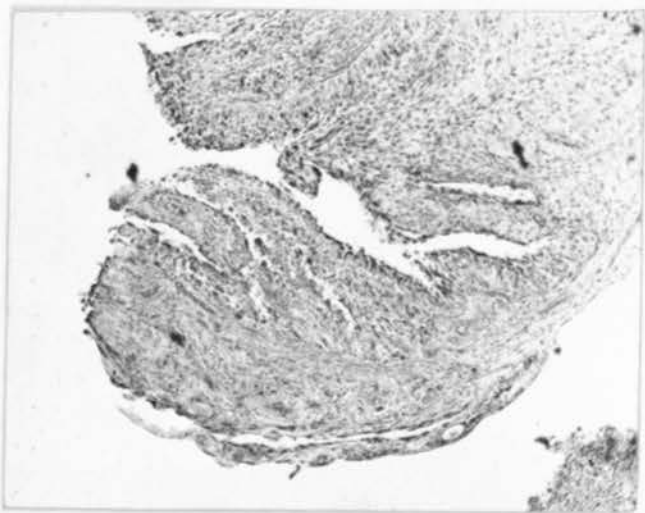


Fig. 2 (Case 113205) Papilloma, showing nests of malignant cells.X50.

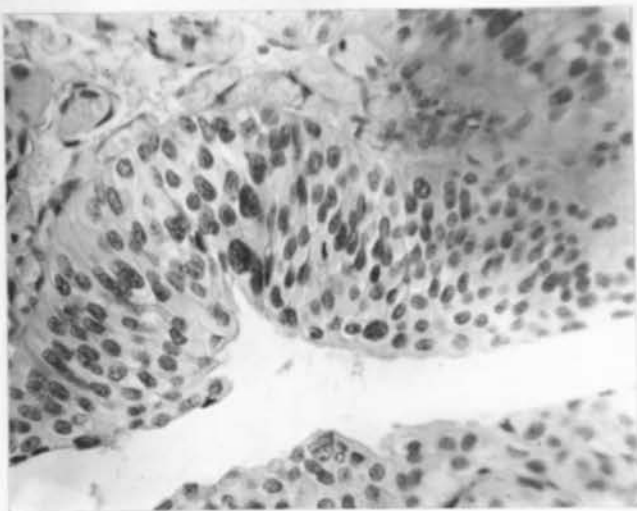


Fig. 3 (Case 331733) Grossly benign papilloma histologically malignant. X200.

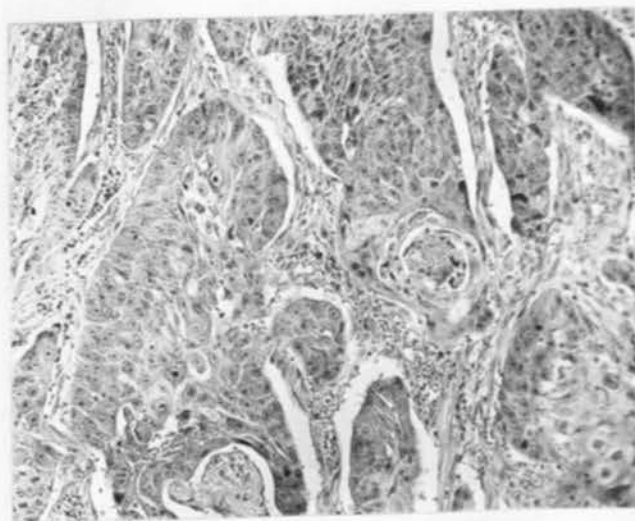


Fig. 4 (Case 203917) Squamous cell carcinoma, extensive epithelial pearl formation and malignancy of individual cells. X100.

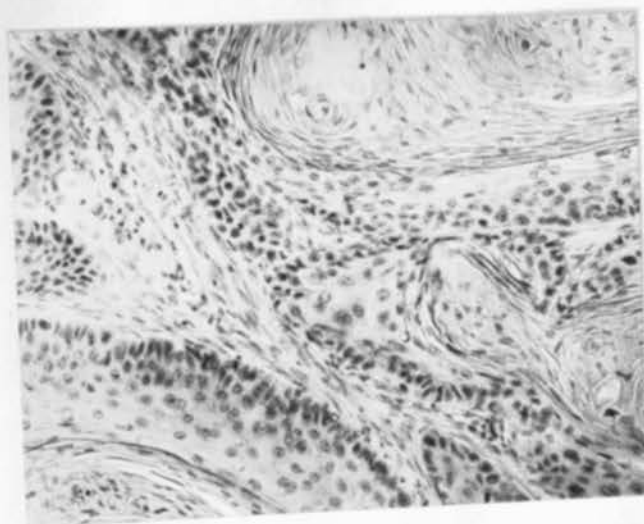


Fig. 5 (Case 313258) Extensive pearly body formation with many rapidly growing malignant cells. X100.

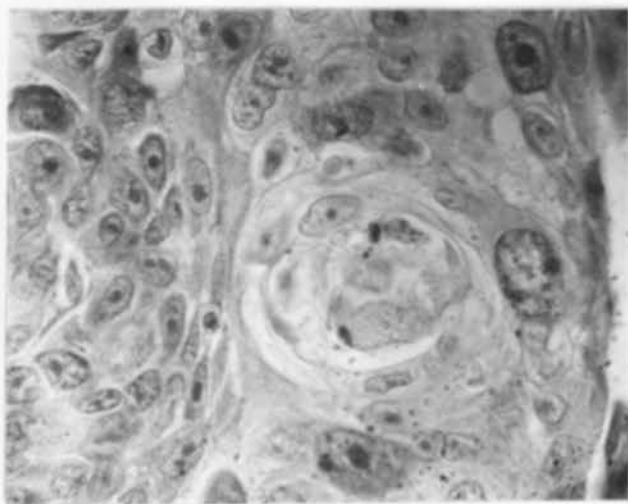


Fig. 6 (Case 203917) Atypical mitotic figures, irregularity in size and staining qualities of cells and large deeply staining nucleoli. X500.

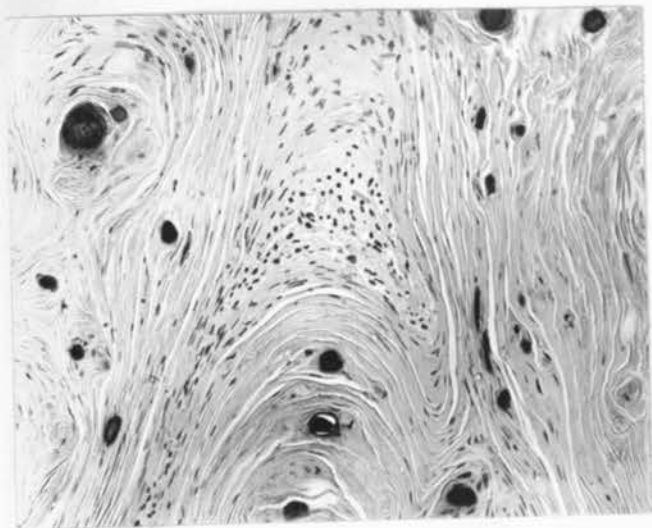


Fig. 7 (Case 332791) Extreme hyalinization of tumor masses. X100.

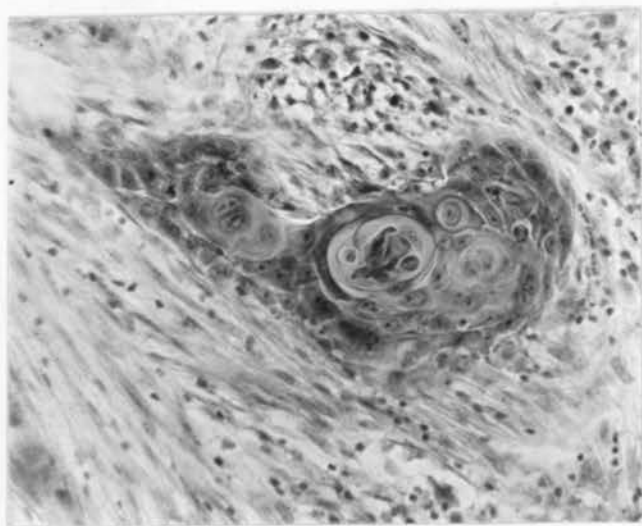


Fig. 8 (Case 203917) Isolated area of epithelioma found in muscular wall of bladder. X200.

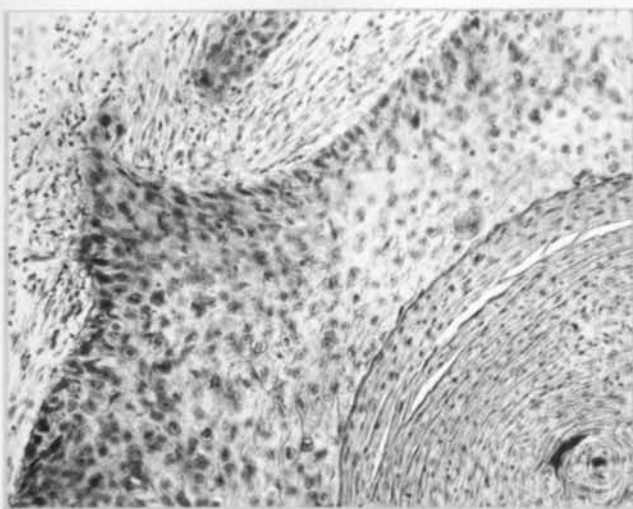


Fig. 9 (Case 313258) Wide spread hyalinization showing layered clearance planes of hornified areas. X100.

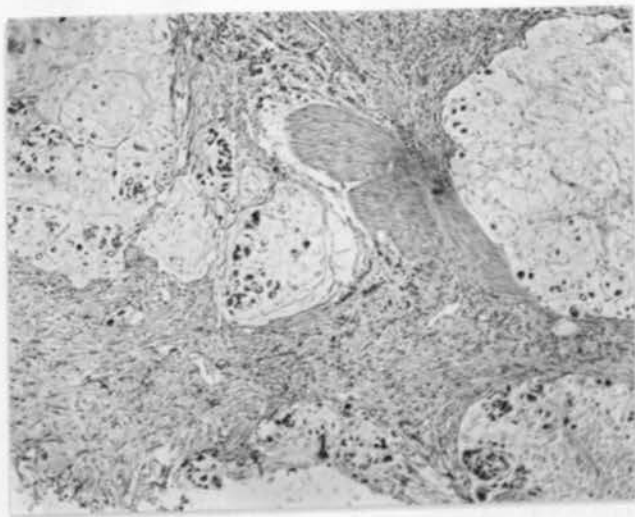


Fig.10 (Case 270742) Colloid carcinoma; extensive areas of colloid degeneration and scarcity of cellular element. X50.

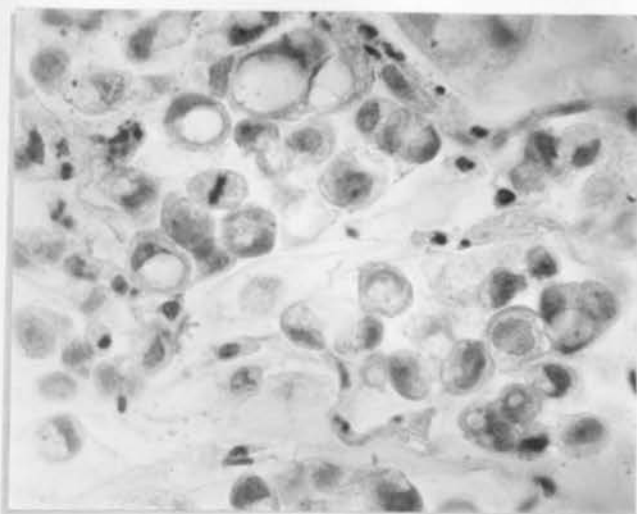


Fig. 11 (Case 270742) Colloid carcinoma -
Mucous degeneration of individual cells
and an occasional mitotic figure. X500.

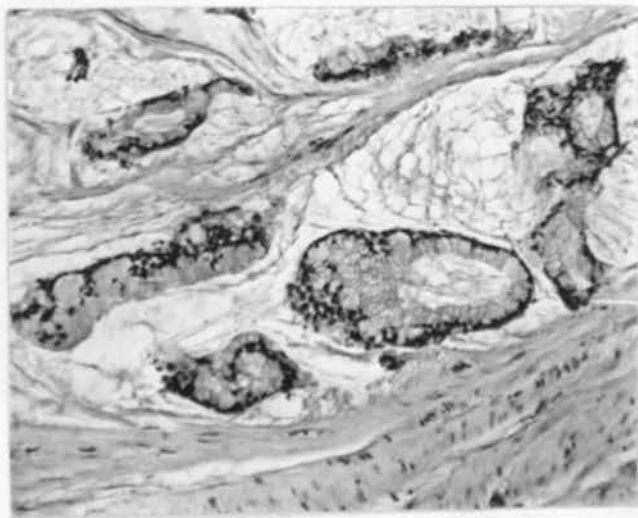


Fig. 12 (Case 346328) Colloid adenocarcinoma of
unusual type and location possibly arising
from a remnant of the allantois. X100.

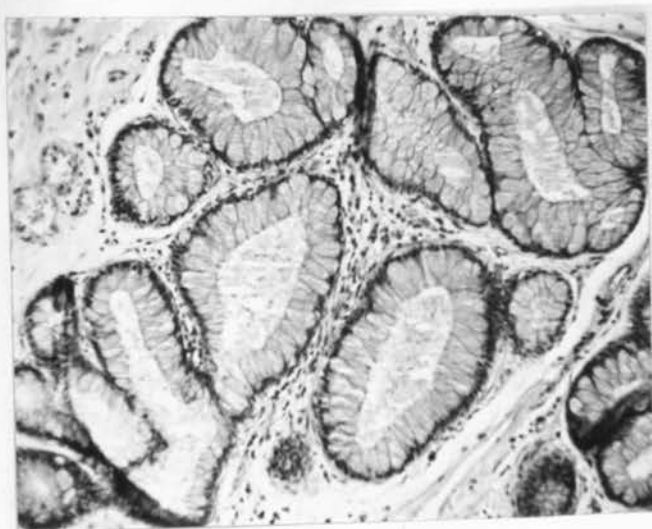


Fig. 13 (Case 193182) Glandular hyperplasia occurring in the mucosa of an exstrophied bladder. X100.

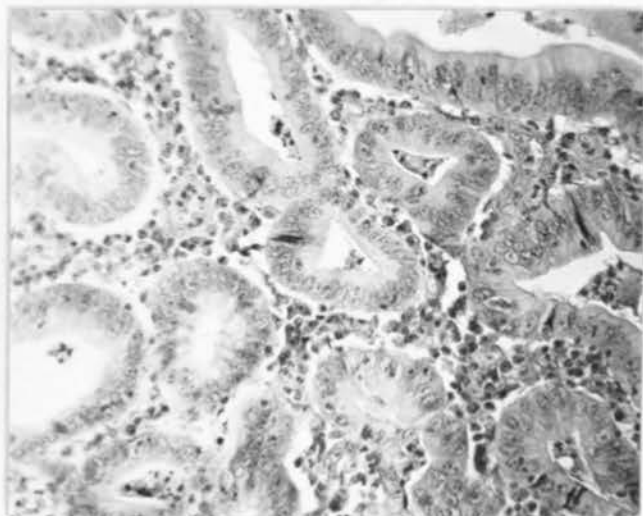


Fig. 14 (Case 190148) Colloid adenocarcinoma of intestinal type, occurring on an exstrophied bladder. X100.

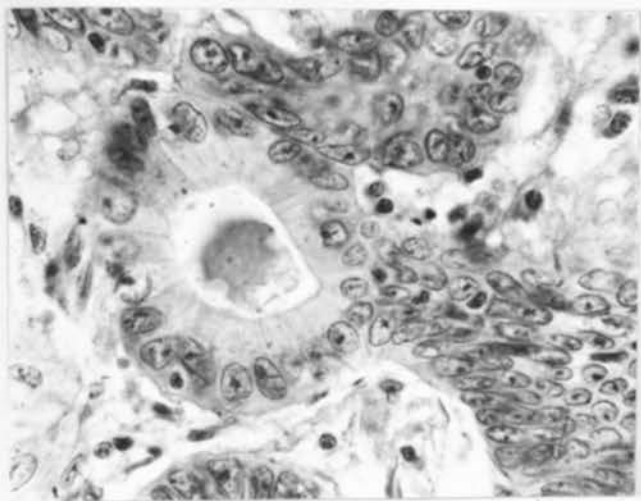


Fig. 15 (Case 190148) Higher magnification of bladder adenocarcinoma. X500.

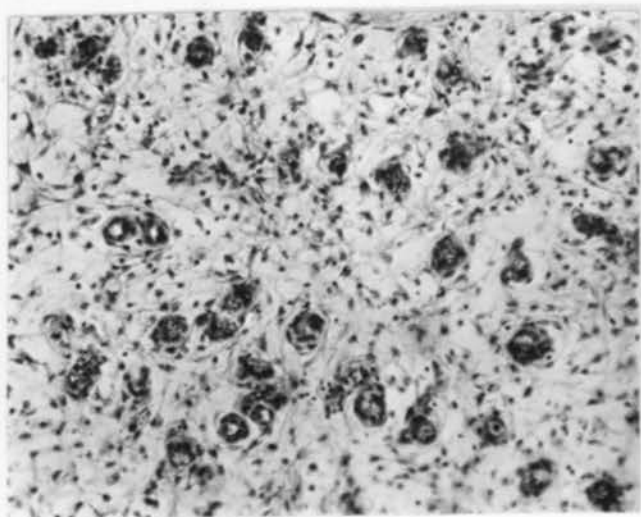


Fig. 16 (Case 149248) Outer border of an angioma composed of many fine blood vessels; main bulk of tumor is composed of markedly dilated blood vessels. X100.

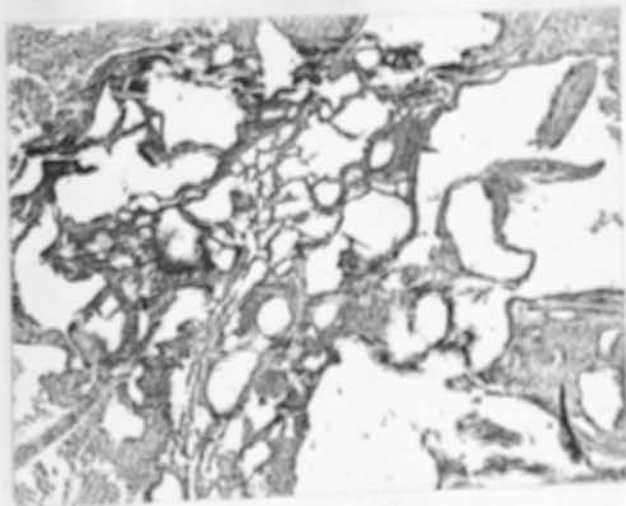


Fig. 17 (Case 151866) Angioma of the bladder composed of sacculation and dilated blood vessels. X50.

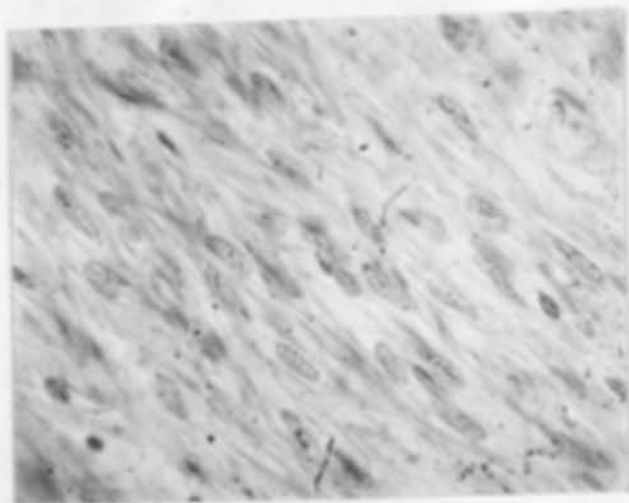


Fig. 18 (Case 62897) Fibroma, showing connective tissue cells with large oval nuclei. X500.

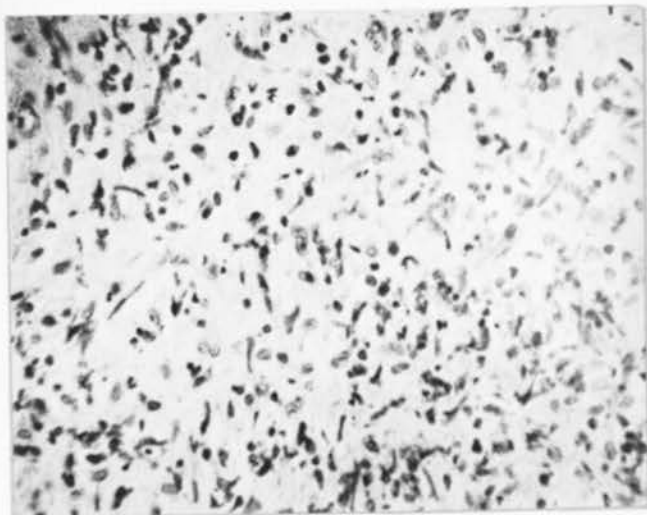


Fig. 19 (Case 323590) Myxoma of the bladder composed of round-cell and elongated cells buried in a mass of collagenous material. X200.