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C O U R T E S Y O F C I T I Z E N S A I D S O C I E T Y

I. LEO G. RIGLER

Professor of Radiology, head of the department, presents his departmental report today. Born Minneapolis, graduate South High School (Minneapolis): pre-medic course University of Minnesota, M.B. 1919, M.D. 1920; Intern St. Louis City Hospital 1919-20; private practive New England, North Dakota 1920-22; Fellow in Medicine, Minneapolis General Hospital 1922-23; charge of X-ray Department, Minneapolis General Hospital 1923-26; appointed head of department, succeeding Dr. R. G. Allison, 1926 and Director of Diagnostic Division, Minnesota General Hospital, 1926; graduate study 1926-27 in Stockholm, Vienna and many others, spent most of time with Professor Gösta Forssell noted European radiologist, who is Director of Caroline Institute at Stockholm.

Member of Hennepin County Medical Society, Minnesota State Medical Association, American Medical Association, Radiological Society of North America, American Roentgen Ray Society, American Association of Thoracic Surgeons, Sigma Xi, Minneapolis Clinical Society, Minnesota Radiological Society (past - president, present - secretary-treasurer), member of Board of Directors of Jewish Family Welfare, Phi Delta Epsilon Fraternity. Prize winner Southern Minnesota Association medal at Minnesota State Medical Association Meet 1930, subject - Roentgen Studies of Pleural Effusion.

It can be said without fear of contradiction that few members of our Staff make so great a contribution to all departments as Dr. Rigler. His report, today, indicates the character and diversity of his assistance. Keen, energetic, cooperative, a brilliant teacher, and tireless worker, one of the best of good fellows, are but a few of the attributes which might be applied to his character and personality. Critically alert not only to his own shortcomings but to those of the rest of us, he has made himself invaluable to his Alma Mater. He has found time with his many duties to take an active interest in the affairs of organized medicine, graduate and undergraduate teaching, organization of radiology in the state, and is one of of the few from our group who is usually represented at the annual meetings of the American Medical Association (scientific exhibits). The Staff joins in extending to him our thanks and best wishes for the future. In the preparation of this report today, he was assisted by his associates, Jacob Sagel, John E. Eneboe, Chauncey M. Borman, Lester G. Erickson and Frederick B. Exner.

II. INTRODUCTION

The department of diagnostic radiology performs multiple functions as a service department for the hospital, out-patient department and students' health service. It acts as a teaching unit of the medical school for both undergraduate and graduate instruction. It also enters into a certain amount of research and investigation on problems related to roentgen diagnosis.

Obviously its most important duty is that of a service department of the medical institutions previously referred to. This occupies the largest part of the energy of the members of the department because a tremendous amount of this type of work is being done. The importance of diagnostic radiology in the ordinary conduct of hospital and out-patient cases is illustrated by a few simple figures. We investigated 1000 cases which had entered the out-patient department without ever coming into the hospital. These were selected entirely at random and included numerous urological, infant feeding, obstetrical, dermatological, minor surgical and other cases in which, obviously, x-ray examination is of no importance whatever. Nevertheless, of 1000 cases entering the out-patient department 338 were sent to the x-ray department for some type of diagnostic procedure. An investigation of 1000 hospital cases, selected likewise entirely at random, and including, obviously, numerous obstetrical, infant feeding, some dermatological and other minor cases, reveals that 547 of them were sent to the x-ray department at

one time or another for some type of diagnostic procedure. In other words, approximately 34% of the patients seen in the out-patient service and 55% of the patients seen in the hospital service at one time or another required x-ray examination. Many of these, of course, must be examined repeatedly. This indicates the tremendous amount of work which the department is called upon to do in proportion to the number of patients in the hospital. While a certain amount of routine procedure is practiced by some of the services, and this increases the percentage of cases which pass thru this department, nevertheless, there are no absolutely routine requirements that I know of at this time in any of the departments. In many institutions every patient entering the hospital must have an x-ray examination of the chest. This, it seems to me, might be a desirable procedure, as certainly a much larger percentage of tuberculosis cases would be discovered in this way. This is a matter for future consideration of the staff. At the present time the staff and facilities of the department are loaded to such a degree that any large increase in its work would hardly be feasible.

The tables below are published with a view to informing the staff as to the quantity and character of the work being done in this department.

III. ANALYSIS OF CASES

July 1, 1932 to July 1, 1933

	Hospital	Out-Patient	Health Service	Miscellaneous	Totals
Abdomen	471	29	-	7	507
Ankle	67	66	13	45	191
Bowel Stasis	37	17	1	-	55
Cervical Spine	95	70	27	14	206
Chest	2466	1446	1840	362	6114
Clavicle	10	11	2	4	27
Colon	261	244	14	28	547
Cystogram	47	5	1	3	56
Dorsal Spine	137	124	30	12	303
Elbow	60	33	2	33	128
Esophagus	148	36	11	10	205
Femur	203	54	1	8	266
Fluoroscopy	833	1016	129	133	2110
Foot	246	90	7	84	427
Gall Bladder	232	403	17	37	689
Hand	105	78	9	28	220
Heart	286	54	49	13	402
Hip	399	115	11	10	535
Humerus	92	26	6	7	131
Iodized Oil in Bronchi	52	22	-	4	78
Iodized Oil in Sinuses	21	2	2	2	27
Iodized Oil in Spine	4	-	-	-	4
Iodized Oil in Tubes	5	3	-	-	8
Jaw	67	42	3	4	116
Knees	162	198	15	16	391
K.U.B.	395	235	6	21	657
Mastoids	118	16	3	28	165
Nose	2	1	2	7	12
Pelvis	212	79	9	36	336
Pregnancy	13	3	-	14	30
Pyelogram	192	88	-	15	295
Intravenous Urography	140	15	-	3	158
Radius & Ulna	102	52	3	7	164
Ribs & Sternum	23	27	31	9	90
Sacroiliac & Lumbar Spine	226	352	47	57	682
Sella	42	12	6	1	61
Sinuses (Paranasal)	223	330	17	86	656
Sinuses (Injected)	35	80	-	9	124
Shoulder	84	96	12	17	209
Skull	276	73	28	40	417
Stomach & Duodenum	452	768	97	102	1419
Thorotrast	120	-	-	-	120
Tibia & Fibula	271	34	9	13	377
Ventriculogram	23	-	-	-	23
Wrist	57	58	4	62	181
Miscellaneous	108	35	6	-	149
Total	9617	6868	2470	1371	20,026

Comment:

As is usual in most large institutions the lungs represent by far the largest number of cases to be examined. The stomach and duodenum are next in frequency. Following this comes the gall bladder, the lower spine, and the urinary tract. The character of the work done in this hospital and out-patient department is reflected by these figures. In municipal and emergency hospitals, for example, the skeleton forms a much larger part of the work due to the practically routine x-ray examination of every case of injury.

Certain types of cases stand out in our list which are, to some extent at least, unique and characteristic of this institution. The large number of abdomen and bowel stasis examinations reflects the interest in intestinal obstruction. The relatively large number of cases of iodized oil in the paranasal sinuses reflects the present interest of the oto-laryngological service in this procedure. The large number of esophagus examinations is an indication of the increased use of this method as an aid in the diagnosis of heart disease. The thorotrast examinations are, of course, unique and reflect the interest of the roentgen diagnostic department itself. On the other hand, the small number of cases in which iodized oil was injected into the Fallopian tubes, and into the spinal canal indicates either a lack of interest or of faith in the efficacy of these methods or the infrequency with which we here encounter cases of this type.

It can be seen from this list that the activities of a department of diagnostic radiology cut completely across the activities of all the hospital and out-patient services. This department responds to the varied interests of the staff at any particular time and the character of the cases we are called upon to examine often gives a fairly good picture of the attitude of the staff.

COMPARISON OF CASES BY YEARS

	Number of Cases					
	1930-31		1931-32		1932-33	
	Number	Percent	Number	Percent	Number	Percent
Hospital	7048	55%	7470	46%	9617	48%
Out-Patient	3561	28%	4567	28%	6568	33%
Health Service	1297	10%	3180	19%	2470	12%
Miscellaneous	884	7%	1093	7%	1371	7%
Totals	12,790		16,310		20,026	

Comment:

The above table indicates the importance of each one of the groups which send their patients to this department. The miscellaneous group includes private cases, examinations of the hospital staff, physicians and their families, ex-hospital patients who are followed without registration in the out-patient department, cases of particular importance from a teaching or investigation standpoint which are being followed, and numerous cases whose origin is not clear at the time they come to the department and whose status has never been clearly established in our records.

The notable increase in the work of the department during the past two fiscal years is most striking. As can

in retrograde pyelograms during the past fiscal year was more or less coincident with the increased facilities afforded by a special room and table for this purpose and by Dr. Creevy's tremendous activity. The stomach and duodenum examinations, by contrast, have remained relatively the same. The introduction of Thorotrast has, of course, added another examination to our recent list.

Only a few of the types of examinations have been selected for this comparison as they illustrate well what is taking place. Attention should be directed to the important part which the cooperation of this department plays in the research projects of other departments. At the same time we must express our gratitude to the other departments for their whole hearted cooperation in our own enterprises. This is well illustrated by the help of the surgical service in our studies with Thorotrast, of the pathology department in our investigation of the inferior accessory lobe of the lung, of the obstetrical service in our studies of paraesophageal hernia, of the outpatient department in our studies of arthritis, of the pediatric service in our studies of the epiphyses and of all the services with regard to our studies of individual cases.

IV. ABSTRACTS OF PAPERS TO BE PUBLISHED ELSEWHERE

1. THE EARLY DIAGNOSIS OF CARCINOMA OF THE STOMACH

The fact that the roentgen examination of the stomach is a very accurate procedure and affords the best possibility for a correct diagnosis of carcinoma at an early stage of the disease is now generally accepted. There still remains a serious doubt as to how early in the course of the disease the diagnosis can be made. The truth is that the vast majority of cases of carcinoma of the stomach which present themselves for roentgen examination are far advanced and relatively easy to recognize. It is rare that the roentgenologist has even the opportunity to test his diagnostic skill upon very small lesions. For this reason it is justifiable to report cases of this type as they serve in establishing more finally the value of this method in the early recognition of carcinoma.

Case I

L.F. Female aged 44. Admitted 10-29-27.

P.I. Complains of pain in left upper quadrant, epigastric distress following meals relieved by vomiting, and 24 lb. loss of weight in past 6 months. Has lassitude, nervousness and irritability for past 6 months.

P.H. In 1924 began with apparently typical gall bladder symptoms. X-ray examination in 1926 "Chronically inflamed gall bladder." Cholecystectomy in August 1926 with no relief. Stomach explored at this time but negative. X-ray examination of stomach in February 1927 negative.

Phys. Exam. Negative.

Laboratory - Hgb., 90%, ? positive benzidene in stool on one examination. Gastric contents - free Hcl 8°, total acid 20°.

Clinical Impression Probably neurosis.

X-ray Examination 11-4-27. Scirrhous carcinoma, very small, lesser curvature of stomach.

Operation Small scar found with great difficulty on lesser curvature. Gastric resection.

Microscopic Scirrhous carcinoma about 1½ cm. in diameter, quite flat.

Subsequent course Very well. Marked gain in weight. Living and well one year ago.

In this case the lesion was correctly diagnosed and accurately localised altho it was so small that it was recognized with considerable difficulty both by the surgeon handling the intact stomach and the pathologist examining

the gross specimen. The pathological diagnosis was not entirely certain until the specimen had been cut. This patient represents one of the few five year cures of carcinoma of the stomach.

Case II

A.P. Male, aged 63.
Admitted 8-28-33.

P.I. Vague epigastric pain and heaviness in stomach past 8 months, more severe of late. Food distress increasing. Weight loss of 10 lbs. in last 3 weeks. No vomiting or hematemesis. X-ray outside, diagnosis of cancer or tumor; advised to be examined further at once.

P.H. Abdominal distress 4 years ago interpreted as "lead colic" (trade - painter). Recovered and returned to his work.

Phys. Exam. Palpable mass ?? over pyloric region on deep palpation.

Laboratory No free HCl acid in gastric contents.

X-ray Examination 8-18-33. Very small scirrhous carcinoma localized to pre-pyloric region.

Operation 8-30-33. No tumor localized. After opening stomach a very small ulcer found on lesser curvature near pylorus. Excised this with all surrounding tissue.

Microscopic Adenocarcinoma of extremely small size.

Subsequent course Discharged feeling fine. Advised to return for resection but refused.

In this instance the result is even more surprising in that the lesion could not be recognized at all in the gross specimen. The roentgen findings are obviously the result not only of the carcinomatous infiltration itself but of the secondary spasm in this portion of the stomach.

Case III

J.R. Male, Aged 57.
Admitted 1-12-31.

P.I. Pain in chest during meals began August, 1930. Slight feeling of food not going down. Followed by pain in epigastrum after meals and at bedtime. Relieved by milk and water. Began to lose weight. 9-20-30 went to a physician who found something wrong with stomach on x-ray examination, either ulcer or carcinoma. Referred to University Out-Patient department. Came there 11-12-30 with this history.

Phys. Exam. 11-12-30 ? mass in epigastrium.

Laboratory Hgb. 101%. Couldn't get tube into stomach.

X-ray Examination 11-14-31. Probable early carcinoma high up on lesser curvature.

Course Put on ulcer regime with marked improvement in symptoms. Increased weight. Reexamination x-ray shows ulcer but malignancy still considered. Failed to return as instructed. Returns 1-5-31 not so well as before.

X-ray 1-7-31 - Characteristic scirrhous carcinoma of lesser curvature high up. Definite increase.

Entered Hospital 1-12-31. Phys. Exam. negative. Laboratory Hgb. 112%. No free HCl in gastric contents. Total acid 38°. Stool negative.

Operation 1-21-31. Scirrhous carcinoma 4 x 3 cm. in size on lesser curvature almost at esophageal orifice. Total gastrectomy was necessary.

Subsequent Course Post-operative death.

Autopsy Bronchopneumonia.

It is unfortunate that this patient was not operated upon after the first

examination as it seems certain from the roentgen findings that the growth would have been very small. In spite of the lapse of ten weeks and the marked increase in size of the lesion observed during this period of time, the area of carcinoma was only moderate in size.

Summary

These cases would seem to indicate that careful roentgen examination may reveal carcinoma of the stomach at a very early stage. Obviously the errors in diagnosis would increase greatly if this type of case were more frequently seen by the roentgenologist, but those cases which were correctly diagnosed would be given a much better opportunity for cure.

2. STRICTURES OF THE STOMACH AND ESOPHAGUS

Stricture of the stomach following ingestion of acids or alkalis is a rare condition and stricture of both stomach and esophagus is very rare. The literature on this subject is meagre and few cases have been recorded. Orator states that in Europe acid burns are less frequent than burns from caustics. The number of burns from alkalies is much greater but involvement of the stomach from them is very rare, and pure involvement of the stomach without injury to the esophagus is almost impossible. In alkali burns, damage to the esophagus predominates. In acid burns, damage to the stomach predominates and usually affects the pylorus.

The two cases that we are presenting today show involvement of both the stomach and esophagus due to ingestion of alkalis.

The first case is that of a woman, aged 42, who came to the University dispensary October 30, 1930, complaining of choking sensations on swallowing. This was located in the lower esophagus and had been present since July 1930, altho she had had slight intermittent choking for many years. When about 4 years old she drank a solution used for bleaching clothes (probably an alkaline solution) which was the only etiological factor we could find. General physical and laboratory examinations were negative.

X-ray examination at this time showed narrowing of the prepyloric region of the stomach which was smooth in character and very suggestive of a benign stricture, following ingestion of an acid or an alkali. Slight stasis of the barium was also present in the distal end of the esophagus which was slightly suggestive but not diagnostic of a stricture here also. The patient had no symptoms referable to the stomach which would tend to rule out a malignancy. Subsequent examinations at intervals over a period of three years showed no appreciable change in the stomach and esophagus. The slight persistent delay in the passage of barium thru the lower esophagus warranted a definite diagnosis of stricture which was subsequently proved by the passing of sounds into the esophagus. This slight stricture of the esophagus was successfully dilated by Dr. Leven with relief of symptoms.

The fact that the patient has gotten along so well for three years and has no symptoms referable to the stomach quite definitely ruled out gastric malignancy, indicating that our original diagnosis of benign stricture of the stomach was correct.

There are two interesting features of this case; first, the long interval between the alleged swallowing of the caustic solution and the onset of marked symptoms of vomiting following swallowing of solid food; second, the involvement of both stomach and esophagus, with most marked cicatrization in the stomach.

The second case is a man aged 55 who came to the University dispensary June 24, 1933, complaining of pain in the epigastrium and inability to swallow solid food. He stated that 4 weeks previously he drank a pint of moonshine and awoke at four the following morning with pain in the epigastrium and vomited about a glassful of brownish black fluid. He repeated this several times. The next day he began to have difficulty

swallowing solid food, which has gradually increased so that now he can swallow only milk. He has lost 20 pounds in weight since the onset and feels weak. He has had several tarry stools. His local doctor made a diagnosis of carcinoma of the stomach. The clinical diagnosis here was carcinoma of the esophagus or pylorus and, secondly, peptic ulcer. General physical and laboratory examinations were negative.

X-ray examinations at this time showed a marked stricture of the lower half of the esophagus and a second stricture of the antrum of the stomach, which extended for a short distance into the duodenum. The esophageal stricture was successfully dilated to a 31 French by Dr. Leven. The stomach, on admission, was very markedly dilated and extended into the pelvis. Subsequent examinations showed a slight increase of the stricture with almost complete retention of gastric contents.

The patient was operated on July 21, 1933, and the strictures of the stomach and duodenum were demonstrated. A posterior gastro-enterostomy was done. The patient had some vomiting thruout the entire post-operative course. Due to his poor condition, he did not withstand the operation well and expired on August 12, 1933. Postmortem examination showed strictures in the lower half of the esophagus, the antrum of the stomach and the first part of the duodenum.

The onset of symptoms soon after the ingestion of the moonshine indicates definitely that this was the etiological agent. No doubt some corrosive material (probably lye) was present in the moonshine. An unusual feature was the presence of a large stricture in both stomach and duodenum as well as the esophagus.

3. BENIGN TUMORS OF THE STOMACH

Since a report in 1930 from the department on this subject, we have observed many more cases of benign tumors of the stomach. In some 4,200 examinations of the stomach during the past five years there were seen some 287 cases of carcinoma of the stomach and 27 cases which were diagnosed as benign tumors. Of these we have had opportunity to observe, either at autopsy or operation, only 8. Of these 7 were confirmed. The 8th was a case of neurosarcoma of the stomach wall which resembled a benign lesion in its gross appearance. These figures would indicate that, roughly, ten per cent of the tumors of the stomach which we see are benign. This figure is at marked variance with the statements in the literature to the effect that benign tumors of the stomach are exceedingly rare or that they represent one-half to at most two percent of stomach tumors. A study of the records of the Department of Pathology reveals that in autopsy and operative specimens about twenty-five percent of stomach tumors are benign. While this includes many small myomata which are probably much more correct than those reported by other roentgenologists. Care in the technique of examination and a particular search for these lesions probably accounts for this difference.

The diagnosis of benign tumors depends upon the use of pressure and small amounts of barium in the stomach, as they may be completely obliterated by an overfilled stomach.

The diagnosis is of first importance because of the relief of symptoms which may frequently be afforded by operative procedure and because many of these tumors often degenerate and become malignant. We have observed three such cases where the transformation from a clinically, roentgenologically, and microscopically benign lesion to one clearly malignant took place.

Summary

Benign tumors of the stomach are far more frequent than has been thought.

They can be readily diagnosed by x-ray examination and their detection is important because they are precursors of malignancy.

4. THE EPIPHYSIS OF THE TUBEROSITY OF THE FIFTH METATARSAL BONE

The appearance of a small fragment of bone on the latero-plantar surface of the proximal end of the fifth metatarsal has occasioned a considerable literature. The question as to whether this represented a constant epiphysis (or apophysis) for the tuberosity of the fifth metatarsal, an inconstant epiphysis, an extra tarsal ossicle, or, in some cases, a fracture, has caused much investigation and discussion. Unfortunately a confusion between this bone and the Os Vesaliavium, a rare supernumerary tarsal ossicle, has caused numerous errors. Lack of knowledge of the existence of this epiphysismhas frequently led to a false diagnosis of fracture.

The epiphysis appears relatively late in life, the earliest period being at the age of ten, and unites with the shaft of the bone at the age of fifteen or sixteen. Hence it is present in independent form for only a few years. This fact, no doubt, has been largely responsible for the numerous opinions as to its constancy.

With the hope of deciding the question of its constancy more definitely we have made x-ray examinations of the feet of 141 children between the ages of nine and fifteen. Obviously the most satisfactory method would be to examine a group of children at frequent intervals over a period of six or seven years. This is most difficult, however, so we determined to examine a large enough group in each age period so that a statistical analysis might give clearly the information as to whether the epiphysis was constant. The study is not yet complete. The results so far are as follows:

Age	No. of Cases	Epiphysis present	%age
9	17	0	0
10	20	5	20
11	27	12	32
12	29	12	31
13	19	4	21
14	22	7	32
15	7	1	14

Further data is available bearing on the question of whether increased weight produces an earlier appearance of the epiphysis and whether its appearance corresponds in any degree with that of the epiphysis of the os calcis.

As many as possible of these cases will be re-examined at the end of one year and with this further data we can arrive at a conclusion as to the average time of appearance, the average time of ossification and the constancy of this epiphysis.

5. ROENTGEN STUDIES OF MULTIPLE BIRTHS

Through the cooperation of Dr. Royal Gray and of Dr. S. Torsten Lund and Miss Howard of the Institute of Child Welfare, we have had the opportunity of studying a pair of identical twins, a set of presumably identical triplets, and seven sets of dizygotic and one set of trizygotic triplets. Roentgen studies of the epiphyses, the paranasal sinuses, mastoids, skulls, spines, hearts and lungs of these children have revealed a large number of unusually interesting findings.

Anatomical variations in the growth of the bones can thus be studied as to their genetic or acquired character. For example, a double nucleus of the patella is a very unusual anatomical variation but in the pair of identical twins it was found in both knees in both children. This seems reasonably good evidence to indicate the genetic origin of this variation. On the other hand a wide variation was found in the occurrence of spina bifida occulta of the fifth lumber vertebrae in the identical triplets. Numerous other observations of a similar character have been made. In the dizygotic triplets there is shown a striking tendency toward uniformity of appearance and growth of the epiphyses in the identical pair while the odd member of the set may have a very different type of growth.

These are the first extensive observations that have been made by the

roentgen method in multiple births and may possibly indicate a method of considerable importance in adding to our knowledge of the importance of heredity in physical development.

6. FURTHER OBSERVATIONS ON THE USE OF THORIUM DIOXIDE SOL (THOROTRAST) IN THE DIAGNOSIS OF DISEASES OF THE LIVER AND SPLEEN

We have now had the opportunity of observing some 150 cases in which thorium dioxide has been given. Because of the increasing concern which is being expressed over the fate of this substance after it is injected, we have restricted its use much more sharply. We recommend it for use in cases of carcinoma and in older individuals. In exceptional cases it may be used otherwise but in relatively small doses. It seems wise to use the smallest dose possible, so we recommend that a dose of .8 cc. of the suspension per kilo of body weight be not exceeded in any case. In most cases .6 cc. is sufficient. When it is necessary only to obtain an idea of the size and contour of the liver and spleen without any detail, .4 cc. per kilo should suffice.

Since the report which appeared in the Journal of the American Medical Association, 100:1758,1933, we have made errors in diagnosis both negatively and positively on a number of occasions but the accuracy of the method is still very high.

We have observed one case of carcinoma of the colon in which the examination of the liver and spleen was negative. Resection of the colon was done and exploration of the liver revealed nothing. Three months later when the patient returned for closure of the colostomy stump, re-examination without further injection of the contrast material revealed numerous characteristic metastases.

We have now observed four cases of primary liver tumors. In one of these, a cholangioma, only a single area of destruction was apparent. In two others the appearance was that of extensive metastases, numerous areas of destruction being present. In the fourth case the thorotrast examination appeared negative except for some enlargement of the liver. This was a primary hepatoma with very extensive infiltration of the liver. In this case the opaque medium apparently was taken up by the tumor almost as well as by the normal liver so that there was little differentiation between them. This would seem to indicate that a negative diagnosis does not always mean the absence of a primary hepatoma.

7. HERNIA OF STOMACH AT ESOPHAGEAL HIATUS

Paraesophageal hernias were previously thought to be very rare as compared to the total number of diaphragmatic hernias until Åkerlund published his paper in 1926.

Åkerlund has given us the classification which is commonly accepted. He divides the cases into three groups:

Group I: Esophageal orifice hernias with congenitally short esophagus, making reposition of the hernia impossible.

Group II: Paraesophageal hernias where the esophagus is not abnormally short and does not form part of the contents of the hernia.

Group III: Esophageal orifice hernias where the esophagus, of normal length, itself forms part of the contents of the hernia.

Many theories are advanced as to the causation of the hernia. Schatzki goes so far as to consider the condition rather a normal phenomenon in subjects of advanced age. By increasing the intraabdominal pressure, either by inflation of the colon or by having the patient exert an abdominal pressure while lying prone, he has succeeded in producing esophageal herniation in 22 out of 30 subjects chosen at random between the ages of 65 to 83 years. In none of these were there any marked dyspeptic symptoms, and Schatzki therefore thinks that in subjects of that age group the condition must be very common, and that in most cases it does

not give rise to special symptoms.

Sauerbruch, Chaoul and Adam have recently given the opinion that paraesophageal hernia is really very rare and that the numerous cases recently reported are really dilatations of the distal end of the esophagus or simple protrusions of the stomach upward with the diaphragm.

But the more common conception of the matter, supported by the work of Åkerlund, Öhnell and Key, Ude and Rigler, Morrison, Healy, C. C. Anderson, Harrington, etc., is that the hernia is caused by a congenital weakness or defect in the diaphragm at the hiatus and such things as increased intraabdominal pressure, trauma, excessive obesity, abdominal musculature straining, etc. will then produce the hernia.

In a series of 4200 gastro-intestinal examinations where we had cause to examine the lower esophagus and cardiac end of the stomach, we observed 44 hernias of the esophageal hiatus.

This represents about 1% of patients with gastro-intestinal complaints. It is a much higher figure than has been reported by other clinics with the exception of that of Åkerlund, and of von Bergmann, Knothe and Berg.

Recently we have attempted to decide whether increased intraabdominal pressure plays much of a role in the production of a hernia such as described previously. The pregnant uterus when over six months in size produces an increase in pressure. Hence our material has been the examination of pregnant females, the gestation period being six months or more.

With the cooperation of the Department of Obstetrics we have been enabled thus far to examine 67 such patients. In this group small hernias were demonstrable in 8 cases or 11.9%.

There were 32 primipara amongst whom only one case of hernia was found, roughly 3%.

There were 35 multipara amongst whom 7 cases were found, or 20%.

While the number of cases is still rather small the striking difference between the figure of 11.9% for pregnant women and 1% for patients with gastro-intestinal symptoms is sufficient to constitute a significant fact. The further difference between primipara and multipara supports thoroughly the theory that increased intraabdominal pressure is a large factor in the production of this type of diaphragmatic hernia.

8. THE LATEST PERIOD IN THE ROENTGEN DIAGNOSIS OF PULMONARY TUBERCULOSIS

Although it is well known that pulmonary tuberculosis manifests itself in the roentgenogram at an early stage, the duration between the occurrence of the infection and the appearance of roentgen signs has never been clearly defined in man. Aside from a few casual references to individual cases there is nothing in the literature on this subject.

In routine examinations of medical students who have been exposed to tuberculosis, some evidence has been obtained. Five cases in which originally the roentgenograms of the chest and the tuberculin skin test were repeatedly negative have been carefully followed. After an exposure to tuberculosis a change in the tuberculin skin test from negative to positive occurred. Repeated roentgenograms thereafter demonstrated the appearance of signs of pulmonary tuberculosis within a period of three to six months following the earliest date of exposure. This probably represents a fair estimate of the minimal latent period before the roentgen diagnosis of a first infection of pulmonary tuberculosis in the human adult can be made.

The maximum latent period cannot be readily determined because of the impossibility of isolating humans from repeated infection.

These cases also appeared to demonstrate that it may be difficult to distinguish roentgenologically a primary

tuberculous infection in the young adult from an adult lesion.

V. CASE REPORTS

1. JEJUNO-GASTRIC INTUSSUSCEPTION AT GASTRO-ENTEROSTOMY STOMA

_ _ , Male aged 59, admitted March 4, 1926.

3-4-26 Had symptoms of ulcer. Operation Mar. 12, 1926 and duodenal ulcer found. Ordinary short-loop antiperistaltic posterior gastro-enterostomy done. Multiple diverticula of the jejunum were also found. Following the operation there was complete gastric retention for several days with vomiting, but this cleared up.

3-31-26 X-ray. Gastro-enterostomy functioning well. No stasis.

5-14-26 X-ray. Multiple diverticula of jejunum. Gastro-enterostomy functioning poorly.

5-15-26 Bilateral inguinal herniae repaired. No gastric symptoms.

6-21-26 Attack of vomiting associated with diarrhea. Probably an acute gastro-intestinal upset.

3-1-30 Readmission P.I. 3½ yrs. post-operative. In Sept. 1929 began to notice food retention and occasional vomiting. Becomes constipated, then epigastric distress. Has lost 23 lbs. since Sept. 1929. At Christmas, 1929 had attack of pain in back, became very severe. Bowel seemed "paralyzed" and abdomen was "doughy". Recovered after "electric treatments."

Phys. Exam. Negative.

Laboratory Negative.

X-ray Multiple diverticula of jejunum. Poorly functioning gastro-enterostomy. Duodenal ulcer.

3-5-30 Operation. Gastro-enterostomy apparently functioning well found. Scar in duodenum. Diverticula found with thickening of bowel wall and dilatation. Resection of four feet of jejunum with side to side enter-anastamosis. Gastro-enterostomy not disturbed. Very large diverticula some 6-7 cm. in diameter.

3-9-30 Vomiting. Gastric lavage - 700 cc.

3-18-30 X-ray. Gastro-enterostomy functioning well. Diverticula of duodenum and upper jejunum. Discharged feeling well. Dilatation of stomach and bowel. Entero-entero anastomosis.

3-27-30 Readmitted. Vomiting again with retention. Enema gives relief.

3-30-30 Gastric lavage. 1500 cc.

3-31-30 Gastric lavage. 600 cc.

4-1-30 Emesis of 2000 cc., 800 cc., and 1250 cc. in a short period.

4-2-30 to 4-18-30 Gastric lavage repeatedly showing 700 to 2000 cc.

4-5-30 X-ray. Marked dilatation of duodenum and stomach. Meal passes thru pylorus. Defect on greater curvature and posterior wall of stomach showing lines of mucosa of small bowel characteristic of intussusception.

Diagnosis Intussusception of jejunum into stomach at gastro-enterostomy stoma.

4-23-30 Symptoms and gastric lavage the same.

4-23-30 X-ray Findings the same.

8-20-30 X-ray Gastro-enterostomy and entero-enterostomy functioning well. No evidence of intussusception or dilatation.

9-19-30 Improved greatly. Increased weight from 134 to 168. Feels well.

5-5-33 Feeling fine. No symptoms.

2. SPONTANEOUS GASTRO-ENTEROSTOMY

., Male, aged 49,
Admitted 1-10-33.

P.I. Onset December 24, 1932 with burning pain and epigastric distress, radiation to right upper quadrant. Not relieved by food. Vomiting severe for 2 weeks with relief. Has had belching of gas, occasional vomiting and constipation for 2 years. Moderate weight loss.

P.H. Has had crooked spine and small stature since childhood.

Phys. Exam. Marked deformity of lumbar spine. Very short. Tenderness in epigastrium.

Laboratory Normal findings except stool. Benzidine + repeatedly from 1-13-33 to 2-28-33.

X-ray 1-9-33 Marked deformity of stomach secondary to deformity of spine. Very large ulcer lesser curvature of stomach middle third with accessory pocket, some hour glass deformity and marked obstruction and retention.

Course in hospital. Evidences of retention, epigastric pain, crampy feeling in abdomen and diarrhea were the outstanding findings. Numerous gastric lavages showed retention.

X-ray 1-30-33 Findings the same.

Improvement 2-28-33 No retention and feels better.

X-ray 3-3-33 Anastomosis between ulcer pocket and jejunum is shown. Distal half of stomach not visualized. No retention.

Diagnosis Spontaneous gastro-enterostomy.

X-ray 3-30-33 Same findings.

Discharged 4-1-33 Feeling good. Benzidine stool negative.

VI. RESEARCH PROJECTS and RECENT PUBLICATIONS

A. Research Projects

1. Bedside fluoroscopy. Apparatus is being constructed to make a study of the feasability of bedside fluoroscopy, particularly in post-operative cases.

2. Thorium dioxide sol for intra-spinal and intracranial contrast. A study on animals of the possibility of the use of this substance as a substitute for iodized oil in the radiography of the central nervous system is being made.

3. The use of intravenous substances which will secrete into the ventricles of the brain and produce contrast for radiographic purposes.

4. Thorium dioxide sol for the visualization of joints. There is a possibility that joint function may be studied in this way.

5. A study of the relationship of hypertrophic pyloric stenosis, localized gastritis in the prepyloric region, and invagination of the pylorus into the duodenum.

6. A study of the effect of paralysis of the diaphragm upon the lower end of the esophagus.

7. The visualization of the placenta by the intravenous injection of opaque media.

8. A study of the value of certain x-ray signs in the diagnosis of congenital syphilis.

9. A study of the normal markings in the inner table of the skull in young children.

B. Recent Publications

1. Fracture of Sesamoid Bones.
Jacob Sagel, M.D.,

American Journal of Surgery, 18:507-509. 1932.

2. Roentgenologic Diagnosis of Broncho-pneumonia.
Leo G. Rigler, M.D.,
Piersol's Cyclopedia of Medicine, '32.

3. Roentgen Observations on the Inter-lobar Pleura.
Leo G. Rigler, M.D.,
Journal-Lancet, 53:288. 1933.

4. Roentgen Diagnosis as a Factor in Preventive Medicine.
Leo G. Rigler, M.D.
Journal-Lancet, 53:215-221. 1933.

5. The Value and Limitations of the Roentgen Examination of the Heart.
Leo G. Rigler, M.D.
Journal-Lancet, March 1, 1933.

6. The Inferior Accessory Lobe of the Lung.
Leo G. Rigler, M.D. and L. G. Ericksen, M.D.
American Journal of Roentgenology and Radium Therapy, 29:384-392. 1933.

7. The Roentgen Diagnosis of Right Paraduodenal Hernia.
Frederick B. Exner, M.D.
American Journal of Roentgenology and Radium Therapy, 29:585-599. 1933.

8. Roentgen Visualization of Liver and Spleen with Thorium Dioxide Sol.
Lester G. Ericksen, M.D. and Leo G. Rigler, M.D.
Journal of the American Medical Association, 100:1758-1764. 1933.

9. Roentgen Findings in Chronic Polyarticular Arthritis.
Leo G. Rigler, M.D. and MacNider Wetherby, M.D.
American Journal of Roentgenology and Radium Therapy, 29:766-773. 1933.

10. The Roentgenologic Differentiation of Lesions of the Right and Left Heart.
Leo G. Rigler, M.D.
Radiology, 20:463. 1933.

11. Diagnosis of Extra-Gastro-Intestinal Abdominal Masses.
Leo G. Rigler, M.D.
Radiology, 21:229-237. 1933.

VII. NURSES' HOMECOMING

The Alumnae Association of the School of Nursing of the University of Minnesota extend a cordial invitation to the Staff and Personnel of the Minnesota General Hospital to attend the dedication exercises of the New Nurses' Hall on Friday, October 27, at 2:30 o'clock in the Recreation Room of the Nurses' Hall. The program will be as follows:

Dean Richard E. Scammon, Presiding

PROCESSIONAL -- Piano Trio.

From the University Symphony Orchestra
Piano - Miss Ellen Hulbert
Violin - Miss Joan Koupi
'Cello - Miss Sylvia Flagstad

WELCOME

Katharine J. Densford, Director
School of Nursing
University of Minnesota

PRESENTATION OF GUESTS

Louise M. Powell
Marion L. Vannier
Paul H. Fesler

DEDICATION ADDRESS

Dr. Richard Olding Beard

ADDRESS

President Lotus D. Coffman

"Hail, Minnesota"

RECESSIONAL -- Piano Trio

DANCE Also, on Friday evening, October 27th, we will have an

informal Dance and Bridge at the Minnesota Union - Tickets 50¢ each. We hope you will all be there.

Mabel L. Larson,
Publicity Chairman
Homecoming

VIII. LAST WEEK'S MEETING

Date: October 12, 1933

Place: Recreation Room, Nurses' Home

Time: 12:15 to 1:15

Program: Medical Meets
An Office is Opened
Aplastic Anemia

Present: 122

Discussion: R. G. Hinckley
E. V. Kenefeck
R. Koucky
James Carey
A. D. Hirschfelder
Moses Barron
K. W. Stenstrom
H. A. Reimann
Leo G. Rigler
Reuben Johnson
H. S. Diehl

Theme: R.G.H.: Repeated blood Wassermanns on patient negative. About 1 month prior to entrance to hospital was seen by private physician (no change). There was an immediate reaction to pentnucleotide consisting of palpitation, dyspnea and severe pain over precordium followed 2 hours later by chills and fever ranging around 100 to 103°. The blood smears were studied throughout the course and there was apparently no evidence of regeneration although some must have been taking place in order to maintain the blood picture. There were no immature cells thrown out in his blood stream. Before each blood transfusion seemed to droop, had severe headaches and could not eat; otherwise apparently normal. Liver extract and bone marrow and various forms of iron were of no avail.

E.V.K.: Subsequent course was practically same as in hospital. Given blood transfusions, fresh bone marrow, iron, and various other preparations. His hemoglobin would go down to 30 or 35%, but following transfusion would go up to about 50, which was usually maintained for a period of 10 to 14 days. Probably had some slight regeneration? While at home we tried a course of adrenalin which has been described in literature as a stimulant of bone marrow but it apparently had no effect. A few weeks before death had a fairly large ulcer at base of tongue with high temperature. Following transfusion it disappeared for about 10 days. After ulcer cleared his blood went to highest level during course at home. The boy died of hemorrhage. He had large post-nasal hemorrhage with marked tarry stools. About 10 days before death developed hard, indurated ulcer in left deltoid which was red, hard, and slow in disappearing. Rather sore on movement. At no time was there redness hemorrhage or fluctuation. It was thought to be due to infection although we considered terminal a leukemic infiltration.

R.K.: Slide of bone marrow. At first glance it appears to be section of lipoma. Note cells in interspaces between the fat.

Section of lung shows dilated bronchi filled with pus. Patient was producing neutrophiles. Remainder of lung shows old interstitial pneumonia.

Section of muscle, taken away from the abscess and not exactly at the edge, shows a good deal of fibrosis. In this stroma you can identify neutrophiles and small mononuclears.

J.C.: I find that the bibliography and case reports have been pretty well covered between 1924-1931. I found only about 30 cases dealing with red cell type. I had the opportunity of carefully studying 2. One case red cell count (observation only 10 days) leucocytes never went over 2000, their percentage of neutrophiles. The other case had red cells of million and a half with leukopenia. When he developed mouth

sepsis showed leukocytic response. I was interested also in this case since the use of liver disproved pernicious anemia of aplastic form. One other case reported no response to this therapy. It seems that the combination of red cell anemia and platelet deficiency is more common than the combination of all 3. Agranulocytic phenomenon with relatively little effect on the red cells is most common. As in true purpura, leukemia, or aplastic red cell anemia, infections seem to post date the occurrence of blood dyscrasia itself.

In 2 other cases of red cell aplasia, both showed evidence of aplastic tendency immediately following tonsillectomy and removal of abscessed teeth. At any rate it is a rather serious proposition. Was this patient susceptible to minor infections? One wonders what his white counts were all the time, probably quite low? The literature from 1931 to present day adds nothing so far as is etiology concerned. Our own experience with nucleotide preparation is not very satisfactory.

A.D.H.: We did experiment with benzolized rabbits in 1902. We found that in rabbits whose red count were knocked down to 3,000,000 and leukocytes to about 2,000 per cu. mm. the rabbits were much more sensitive to experimental pneumonia produced by intratracheal injection of pneumococci. Lungs were very similar to appearance of this lung today. The exudate was rich in red cells, fibrin, but extremely poor in leukocytes, and especially poor in neutrophiles (much more so than in the case of sections of this lung). Of course, the leukocytes in this animal were reduced very much further than those in this patient. I would like to mention it because this patient seems to show general phenomenon than we obtained.

M.B.: Course downhill in which they always die. The prognosis is absolutely hopeless no matter what the medication. This case helps us to realize this, that all we can do is to make patient live a little longer. Transfusion is only aid. I read about a case that was kept alive by 100 transfusions. This case to me is typical. In classifying them according to suggestion made by the Englishmen as this is panmyelitis (consummation of marrow). A pure red cell anemia? which has a million red cells, leukopenia and a low platelet count, is a typical case of panmyelitis (not red cell anemia). In the primary or essential aplastic anemias, symptoms are out of proportion to their anemia. They complain of headaches, loss of appetite, (anemia of 40 to 50%). In secondary anemia or deficiency anemia patients come in with 30% hemoglobin and feel only a little weak. Something here we do not know about. The secondary type of aplastic anemias may be due to x-ray and radium. I feel in some cases over-radiation may produce this type of anemia. Drugs, toxic states, severe abscess may temporarily depress bone marrow. One of the characteristic features of primary aplasticannia is early development of petechiae. We find occasional bilirubin in blood and urobilinogen in urine but destruction is extracapillary and not intracapillary.

When we make definite diagnosis of aplastic anemia we should give transfusions and repeated transfusions. (Knowing that we do make mistakes). If patient starts to regenerate blood it is wrong diagnosis, not true aplastic anemia. Unfortunately is one of the diseases we can do very little for.

K.W.S.: It must require a very heavy dose of radiation to produce aplastic anemia. As much as 60% over the entire body has been given, usually over a period of time. We must not make the mistake of confusing radiation osteitis of the alpha particles in the bone marrow as reported by Hartland, and radiation anemia. It is very difficult to know in a given case whether the radiation has produced the aplastic effect on the bone marrow or the disease itself (Hodgkin's and leukemia). There is an old idea that small doses of radiation are stimulating and larger doses depressing. Some case reports would indicate that agranulocytic angina has been treated with stimulating marrow doses. One investigator using large doses got exactly the same effect. The idea that small radiation

doses are stimulating is probably not true.

H.A.R.: It has been shown that leukocytic response is not the entire story of the mechanism of the lung changes in pneumonia. Other factors are involved. We attempted to produce the blood picture in rabbits by giving them benzol, and found a varying response. In some instances a small dose would do it; in others a larger one was required. This shows the individual variation on a biological basis in animal experimentation.

L.G.R.: I am surprised that more mention was not made of the possibility of splenectomy in these cases. I remember one case reported by Dr. Ulrich. The patient had a very severe anemia. Because the spleen was enlarged it was thought to be Banti's disease. She was entirely aplastic as far as bone marrow reaction was concerned. Spleen was removed. Immediately the blood picture changes, although she was an ordinary case of pernicious anemia.

R.J.: I do not care to discuss primary aplastic anemia, but I think we should remember that bone marrow depression may not always be primary. I recall one woman who became very toxic and delirious with a Garres' abscess of the femur. When this was drained, not only her symptoms of toxicity disappeared, but her neutropenia and other bone marrow deficiency changes promptly cleared up.

H.S.D.: One of the characteristics that Dr. Barron spoke of was apparently not present in this case, at least at the beginning. When he first came in with a hemoglobin of 50%, it was very difficult to convince him that he should go to bed.

Gertrude Gunn
Record Librarian

N E X T W E E K

HAND INFECTIONS