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University of Minnesota Hospitals
and
Minnesota Medical Foundation

# Early X-Ray Diagnosis of Stomach Tumors

# Cumulative Index 1944-1949

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I.

# UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
## CALENDAR OF EVENTS

June 12 - June 18, 1949

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Sunday, June 12

9:00 - 10:00 Surgery Grand Rounds; Station 22, U. H.

10:30 - 11:00 Bacteriological Survey of the Operating Rooms; L. Kiriluk; Rm. M-109, U. H.

Monday, June 13

8:00 - Fracture Rounds; A. A. Zierold and Staff; Ward A, Minneapolis General Hospital.

9:00 - 9:50 Roentgenology-Medicine Conference; L. G. Rigler, C. J. Watson and Staff; Todd Amphitheater, U. H.

9:00 - 10:50 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff; M-109, U. H.

10:00 - 12:00 Neurology Rounds; A. B. Baker and Staff; Station 50, U. H.

11:00 - 11:50 Roentgenology-Medicine Conference; Veterans Hospital.

11:00 - 12:00 Cancer Clinic; K. Stenstrom and A. Kremen; Eustis Amphitheater, U. H.

12:15 - 1:20 Obstetrics and Gynecology Journal Club; Staff Dining Room, U. H.

12:30 - 1:30 Surgery Problem Case Conference; A. A. Zierold, C. Dennis and Staff; Small Class Room, Minneapolis General Hospital.

1:30 - 2:30 Surgery Grand Rounds; A. A. Zierold, C. Dennis and Staff; Minneapolis General Hospital.

1:30 - 2:30 Pediatric-Neurological Rounds; R. Jensen, A. B. Baker and Staff; U. H

5:00 - 5:50 Clinical Medical Pathologic Conference; Todd Amphitheater, U. H.

5:00 - 6:00 Urology-Roentgenology Conference; D. Creevy and H. M. Stauffer and Staffs; M-109, U. H.

Tuesday, June 14

8:00 - 9:00 Fracture Conference; Auditorium, Ancker Hospital.

8:30 - 10:20 Surgery Seminar; Dupuytren's Contracture; M. D. Chesler; Small Conference Room, Bldg. I, Veterans Hospital.

9:00 - 9:50 Roentgenology Pediatric Conference; L. G. Rigler, I. McQuarrie and Staff; Todd Amphitheater, U. H.

10:30 - 11:50 Surgical Pathological Conference; Lyle Hay and Robert Hebbel; Veterans Hospital.

12:30 - Pediatric-Surgery Rounds; Sta. I, Minneapolis General Hospital; Drs. Bosma, Wyatt, Chisholm, McNelson, and Dennis.

12:30 - 1:20 Pathology Conference; Autopsies; Pathology Staff; 102 I. A.

1:00 - 2:30 X-ray Surgery Conference; Auditorium, Ancker Hospital.

2:00 - 2:50 Dermatology and Syphilology Conference; H. E. Michelson and Staff; Bldg. III, Veterans Hospital.

3:15 - 4:20 Gynecology Chart Conference; J. L. McKelvey and Staff; Station 54, U. H.

3:30 - 4:20 Clinical Pathological Conference; Staff; Veterans Hospital.

4:00 - 5:00 Pediatric Rounds on Wards; I. McQuarrie and Staff; U. H.

5:00 - 5:50 Urology-Pathological Conference; C. D. Creevy and Staff; Todd Amphitheater, U. H.

Wednesday, June 15

8:00 - 8:50 Surgery Journal Club; O. H. Wangensteen and Staff; M-515, U. H.

8:30 - 9:30 Clinico-Pathological Conference; Auditorium, Ancker Hospital.

8:30 - 10:00 Orthopedic-Roentgenologic Conference; Edward T. Evans, Room 1AW, Veterans Hospital.

8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker and Joe R. Brown; Veterans Hospital.

11:00 - 12:00 Pathology-Medicine-Surgery Conference; O. H. Wangensteen, C. J. Watson and Staff; Todd Amphitheater, U. H.

3:30 - 4:30 Journal Club; Surgery Office, Ancker Hospital.

Thursday, June 16

8:15 - 9:00 Roentgenology-Surgical-Pathology Conference; Craig Freeman and H. M. Stauffer; M-109, U. H.

8:30 - 10:20 Surgery Grand Rounds; Lyle Hay and Staff; Veterans Hospital.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; M-109, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:50 Surgery-Radiology Conference; Daniel Fink and Lyle Hay; Veterans Hospital.

11:00 - 12:00 Cancer Clinic; K. Stenstrom and A. Kremen; Todd Amphitheater, U. H.

11:30 - 12:30 Clinical Pathology Conference; Steven Barron, C. Dennis, George Fahr, A. V. Stoesser and Staffs; Large Class Room, Minneapolis General Hospital.

1:00 - 1:50 Fracture Conference; A. A. Zierold and Staff; Minneapolis General Hospital.

2:00 - 3:00 Errors Conference; A. A. Zierold, C. Dennis and Staff; Large Class Room, Minneapolis General Hospital.

4:30 - 5:20 Ophthalmology Ward Rounds; Erling W. Hansen and Staff; E-534, U. H.

Friday, June 17

8:30 - 10:00 Neurology Grand Rounds; A. B. Baker and Staff; Station 50, U. H.

9:00 - 9:50 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:20 Medicine Grand Rounds; Veterans Hospital.

10:30 - 11:50 Otolaryngology Case Studies; L. R. Boies and Staff; Out-Patient Department, U. H.

11:00 - 12:00 Surgery-Pediatric Conference; C. Dennis, O. S. Wyatt, A. V. Stoesser and Staffs; Minneapolis General Hospital.

11:30 - 12:50 Special Luncheon Meeting; Guest Lecturer, Clive Butler, London Hospital, London, England;"Penicillin Therapy in Osteomyelitis and Hand Infections"; Powell Hall Amphitheater.

12:00 - 1:00 Surgery Clinical Pathological Conference; Clarence Dennis and Staff; Large Classroom, Minneapolis General Hospital.

1:00 - 1:50 Dermatology and Syphilology; Presentation of Selected Cases of the Week; H. E. Michelson and Staff; W-312, U. H.

1:00 - 3:00 Pathology-Surgery Conference; Auditorium Ancker Hospital.

1:00 - 2:50 Neurosurgery-Roentgenology Conference; W. T. Peyton, Harold O. Peterson and Staff; Todd Amphitheater, U. H.

4:00 - 5:00 Electrocardiographic Conference; George N. Aagaard; 106 Temp. Bldg., Hospital Court, U. H.

Saturday, June 18

7:45 - 8:50 Orthopedics Conference; Wallace H. Cole and Staff; Station 20, U. H.

8:30 - 9:30 Surgery Conference; Auditorium, Ancker Hospital.

8:00 - 9:00 Pediatric Psychiatric Rounds; Reynold Jensen; 6th Floor, West Wing, U. H.

8:00 - 9:00 Surgery Literature Conference; Clarence Dennis and Staff; Minneapolis General Hospital, Small Classroom.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; E-101, U. H.

9:00 - 10:30 Pediatric Grand Rounds; I. McQuarrie and Staff; Eustis Amph., U. H.

9:00 - 11:30 Surgery-Roentgenology Conference; Todd Amphitheater, U. H.

9:00 - 12:00 Neurology Conference; Powell Hall Amphitheater.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:00 - 12:50 Obstetrics and Gynecology Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.

## II. THE EARLY DETECTION OF TUMORS OF THE STOMACH FROM THE ROENTGEN STANDPOINT

Francis F. Ruzicka, Jr.

At the University of Minnesota Hospitals we are quite fortunate in having for observation three distinct series of cases which have been studied for the purpose of early detection of tumors of the stomach. One series has been reported several years ago by Rigler, Kaplan and Fink[17] who studied the incidence of stomach tumors in patients with pernicious anemia. The most recent figures on the pernicious anemia patients[16] give an incidence of 6.9 per cent of carcinoma and 6.6 per cent of polyps found in a total of 259 cases. This is indeed a profitable group to examine yielding a remarkable number of gastric tumors. However, only 5 per cent of patients with gastric carcinoma have pernicious anemia[14], so that other selected groups have been studied in an attempt to discover more carcinomas. It is obvious that some selection must be exercised since the estimated incidence of carcinoma of the stomach in the living population over forty years of age is less than 3 per 1000[1]. Therefore, a selection of those individuals more likely to develop carcinoma is necessary in order to make the study more fruitful.

The following plan was effected in the establishment of the Frecursor series which has been studied here through the combined efforts of the Departments of Surgery, Medicine and Radiology, since July 1, 1945, and which has been previously reported by State, Varco and Wangensteen[19] and also Rigler[14]. All patients registering for the first time in the Out-Patient Clinic of the University of Minnesota Hospitals who are 55 years of age or older (45 years as of January 1, 1949) are subjected to a gastric analysis. Three successive doses of 0.5 milligrams of histamine are employed as a stimulant to gastric secretion. Those individuals having achlorhydria or hypochlorhydria (below 30 degrees free acid) have a roentgen examination of the stomach. Also included in this group are those individuals with pernicious anemia, relatives of patients with gastric carcinoma, patients with a hemoglobin level of 11.0 grams or less and patients with occult blood in the stools. By far, most of the patients examined roentgenologically have been those with achlorhydria. It would be expected that this would be the group to yield the most cancers since it has been shown by Hebbel and Gaviser[6] that 65 per cent of patients with gastric carcinoma have achlorhydria and an additional 12 per cent have achlorhydria or values below 30 degrees free acid.

The third series of cases studied at this institution for early detection of stomach tumors are those examinees seen at our Cancer Detection Center, which has been in operation since March 2, 1948. Patients accepted for examination at this center are supposedly symptom-free and 45 or more years of age. The following criteria serve as a basis for the determination as to whether an examinee will have a roentgen examination of the stomach:

1. Patients with no free hydrochloric acid or a free hydrochloric acid of less than 30 degrees following a single dose of histamine (0.5 milligrams). If histamine is contraindicated, a barium meal examination is requested if the free hydrochloric acid in the fasting specimen is below 30 degrees.

2. Patients with one positive instance of family history of carcinoma of the stomach.

3. Patients with hemoglobin below 11.0 grams.

4. Patients with occult blood in the stools, i.e., benzidine 1+, and guiac trace or negative (meat-free diet).

5. Patients with signs or symptoms suggesting an indication for a gastrointestinal series.

The first series, that is, the perni-

cious anemia cases would appear to represent a category essentially different from the other two groups. There is no question about their inclusion in any stomach tumor detection program. The other two series, namely, the Precursor group and the Cancer Detection group are quite similar in many respects, yet up to this point of the study have yielded quite different results. Although the study of both of these series is far from finished, an attempt will be made in the first part of this paper to account, at least to some extent, for the differences so far encountered. Recent information concerning the Precursor Group, compiled by State, Gaviser, and Hubbard[18] has kindly been made available for this comparison.

## THE CANCER DETECTION GROUP

From March 2, 1948 through April 21, 1949, 1,289 new examinees (Table 1) have been admitted to the Cancer Detection Center. In addition, 395 patients have been re-examined on their six month check-up bringing the total of patients seen in the Center for this period to 1,684. The total number of stomach examinations performed during this time is 1,056. This constitutes about 63 per cent of the total number of patient examinations. The total number of individuals roentgenologically examined is 888. The number of patients who received more than one stomach examination is 168. No cases of pernicious anemia were encountered.

Table 1

EXAMINATIONS
CANCER DETECTION CENTER
March 2, 1948 to April 21, 1949

| | |
|---|---|
| Total New Patients | 1,289 |
| Total Rechecks | 395 |
| Grand Total Examined | 1,684 |
| Patients Having Gastro-intestinal Examinations | 888 |
| Re-examinations | 168 |
| Total Gastro-intestinal Examinations | 1,056 |

### Carcinoma of the Stomach in Cancer Detection Patients

So far we have found two carcinomas of the stomach. The first, however, we can not include in our statistics since this patient was already aware of his lesion. It had been diagnosed at the Mayo Clinic in 1946 and an inoperable lesion was found there at that time. When seen here, the patient had extensive involvement of the cardia and lower end of the esophagus.

The other carcinoma was entirely unsuspected occurring in a 55-yearjold patient with achlorhydria (no histamine). There were no gastro-intestinal symptoms. It is interesting to note that the patient's father had pernicious anemia. A small, somewhat irregular filling defect was found on the lesser curvature of the stomach in the antrum. The patient had a gastrectomy because of strong suspicion of carcinoma. The microscopic report described a small adenocarcinoma measuring about 7 x 8 millimeters in diameter that had not penetrated the muscularis. No positive nodes were found. The roentgen appearance of this lesion deserves some consideration. Two examinations were performed. Fluoroscopically the lesion was evident on the first examination but its specific characteristics could be appreciated only on the spot films. The films of the first examination suggest a somewhat larger lesion than the actual size of the carcinoma. There are prominent rugae plus defect but the exact location of the carcinoma is difficult to determine. The second examination which more closely depicts the actual carcinoma revealed a more well-defined defect somewhat different from that of the first examination. It may be that the lesion as seen in the first examination appeared larger than the actual extent of the carcinoma because of adjacent edema of the mucosa causing prominence of neighboring rugal folds. In the second examination when the roentgen appearance more nearly conforms to the actual size of the lesion, this phenomenon would appear to be absent, or at most, present to a slighter degree.

## Case of Questionable Carcinoma of the Stomach

We have one case which was reported as a possible carcinoma of the stomach. This patient, a male 80 years of age with achlorhydria and symptoms of poor appetite and occasional diarrhea submitted to surgery six months after the roentgen examinations. The surgeon found large rugae and what appeared grossly to be a benign polyp on the greater curvature of the stomach. Local excision of polyp was performed but unfortunately the specimen was lost so that we have no microscopic report. Therefore, it is necessary to consider this case apart from either carcinomas or polyps, at least for the present.

## Benign Tumors of the Stomach and Duodenum in Cancer Detection Center Patients

We have seen roentgenologically pne case of polyp of the stomach, one benign tumor possibly a polyp and one polyp in the duodenal cap. The case of polyp of the stomach occurred in a 66-year old woman, achlorhydric, who gave a history of surgical removal of a benign polyp of the stomach at this hospital in 1939. In April, 1947, she was gastroscoped and a polyp described in the antrum on the lesser curvature. In this same region a rounded filling defect was seen in a stomach examination in March, 1949.

The benign tumor referred to as a possible polyp was discovered in a 60-year-old female, achlorhydric, with history of indigestion, vague abdominal pain and dysphagia. A large rounded lesion was found on the midportion of the body of the stomach close to the greater curvature. Fluoroscopically it appeared to move about somewhat as if on a pedicle. There is serious question as to whether this is not an intramural tumor of some type which is sub-mucosal and which has developed a pedicle.

The polyp seen in the duodenal cap occurred in a 54-year-old male with a free acid of 22 degrees and 92 degrees after histamine. He complains of "gas on the stomach." It is possible that the polyp seen in the cap has prolapsed through the pylorus from the stomach, but the free acid in the stomach militates against this diagnosis somewhat. The defect was seen in the cap on two separate examinations.

One other case in which neoplasm was diagnosed was encountered. A small oval filling defect was noted on the lesser curvature in the antrum. An intramural tumor, such as a leiomyoma was suggested, particularly because of evidence of ulceration of the surface. At surgery the lesion proved to be a non-specific granuloma with ulceration of the surface.

## Discussion

Consideration may now be given to the results of the survey conducted in the Cancer Detection Center and comparison made with the Precursor group. In 1,056 examinations of 888 individuals we have found only one proven case of carcinoma of the stomach. However, in this group of 888 individuals only 289 were achlorhydric and 187 were hypochlorhydric (total of 476). According to the report of Collins, Gover and Dorn[1], one might expect up to 3 persons per 1000 in the living population above the age of 40 to have carcinoma of the stomach. Templeton[21], using Hoffman's life insurance statistics, estimates the incidence of cancer of the stomach in the living population over the age of 45 at between 1.2 and 2.4 per 1000. St. John, Swenson and Harvey[20] in a fluoroscopic survey found two carcinomas of the stomach in over 2,400 asymptomatic persons over the age of 50. Bailey and Miller[2] examined 500 normal males over 45 years of age free from digestive complaints and found not a single carcinoma and only one polyp. In marked contrast to these results are those to be reported in a Precursor group by State, Gaviser and Hubbard[18] of this hospital. In this group we have found eleven cancers of the stomach in 2,139 examinations of 1,685 patients. Omitting the pernicious anemia patients completely from this series, there remain eight car-

cinomas discovered in 1,967 examinations of 1,591 patients. In this same series we have found 36 polyps of the stomach. What accounts for the difference in findings in the Cancer Detection group as contrasted to the Precursor Group? Probably the most important factor to help account for the difference is the relatively low incidence of achlorhydrics and hypochlorhydrics (Table 2); 54 per cent in the Cancer Detection Center patients examined roentgenologically as compared to 87 per cent in the Precursor group exclusive of the patients with pernicious anemia. Including the latter brings the total of patients more likely to develop carcinoma of polyps to 91.3 per cent. It is true that the other group included in both studies, namely, those with positive family history, occult blood in the stools, etc., may be considered as more likely to develop or have carcinoma than the average patient. The numbers in these groups in both the Cancer Detection Center study and the Precursor experiment still are quite small. Nevertheless, it would appear that they will prove far less fruitful than the achlorhydrics and hypochlorhydrics.

Table 2

Cancer Detection Group

Achlorhydrics
Hypochlorhydrics → 54%

Precursor Group

Achlorhydrics
Hypochlorhydrics
Wetherby List → 87% → 91.3%
Pernicious Anemias

Percentages are on patients that have had Gastro-intestinal Series.

Another important factor to help account for the difference in the two series is the age range of the individuals (Table 3). Drawing again from Hoffman's statistics[7] and quoting Templeton[21], we find that the death rate per 100,000 for carcinoma of the stomach is 56.6 for the ages between 45 and 54; 138.5 between 55 and 64; 231.8 between 65 and 74; and 255.4 over the age of 75. Thus merely considering age alone, we would expect a higher incidence of carcinoma of the stomach in the higher age groups. Break-down of the Cancer Detection Center examinees according to age reveals that 84.9 per cent of the individuals were between the ages of 45 and 64. Only 14 per cent were over 64 years of age. A break-down of 1,383 of the 1,591 individuals in the Precursor group, exclusive of the pernicious anemia cases revealed that 52 per cent of these patients are 65 or more years of age. It may be significant that all of the eight carcinomas found in this group were discovered in patients all of whom were 65 years of age or over. Of course, carcinomas will eventually be found in the younger Precursor groups, but a trend is suggested from these figures.

Table 3

| Age Groups Cancer Detection Center | | Carcinomas Precursors | Age Groups Precursors | |
|---|---|---|---|---|
| Under 45 | 1.1% | 0 | Under 50 | 3.7% |
| 45-54 | 50.5% | 0 | 50-54 | 12.6% |
| 55-64 | 34.4% | 0 | 55-64 | 31.7% |
| 65-74 | 12.4% | 4 | 65-74 | 36.6% |
| 75 and Over | 1.6% | 4 | 75 and Over | 15.4% |
| 14.0% are 65 or Over | | 52% are 65 or Over | | |

In order to determine the incidence of

polyps according to age, a group of 65 polyps diagnosed at this hospital and taken in large part but not entirely from the Precursor group was analyzed. Accepted in this group were cases proven at surgery, cases diagnosed both by x-ray examination and gastroscopy and cases diagnosed repeatedly (two or more times) by x-ray examination alone or gastroscopy alone. As can be seen from Table 4, a majority of the polyps, 82.2 per cent, fell in the group from 55 to 75 years of age and over. Whereas, 83.7 per cent of the Precursors examined fall in this group; only 48.4 per cent of the Cancer Detection Center examinees

Table 4

AGE DISTRIBUTION OF POLYPS

| Ages | Number Polyps | % Polyps | Age Groups Cancer Detection Center | Age Groups Precursor |
|---|---|---|---|---|
| Under 45-54 | 10 | 17.8% | 51.6% | 16.3% |
| 55-64 | 17 | 30.3% | 34.4% | 31.7% |
| 65-74 | 22 | 39.3% | 12.4% | 36.6% |
| 75 and over | 7 | 12.6% | 1.6% | 15.4% |

are in this category. Again, the relative percentages of achlorhydrics and hypochlorhydrics in the two groups may help explain the difference in incidence of polyps, 36 polyps having been found in the Precursor group and two benign tumors having been found in the stomach in the Cancer Detection Center group. Pearl and Brunn[11] studying 24 cases of multiple polyposis of the stomach, made up of their own cases as well as cases collected from the literature, state that 22 of the 24 were achlorhydric. In the Precursor group studied at this hospital polyps were found only in the achlorhydric and hypochlorhydric groups. Hay[5] studying all of the known polyps at this hospital has found anacidity in 92.5 per cent. In those with free acid only two had free acid above 10 degrees. It is quite interesting to note that the relative percentages of benign tumors in the asymptomatic precursor group is greater than that of the cancers, whereas, just the reverse is true in the ordinary clinical, roentgenological or surgical data. In this study, however, we are dealing with asymptomatic individuals so that all symptomatic cancers are automatically eliminated. Thus, the group is selected and does not give a true picture of the actual ratio of benign to malignant tumors. However, the same is true of the figures that have been reported in the literature; i.e., they are selected cases also since they constitute mainly the symptomatic cases. Even autopsy material is not entirely accurate in many instances since small tumors of the stomach are often overlooked in the presence of striking pathology elsewhere in the body, and the true ratio of benign to malignant tumors of the stomach remains undetermined.

As another consideration in the incidence of polyps of the stomach as found at this hospital, we have attempted to analyze the hereditary factor from the standpoint of nationality. This has been prompted by the seemingly high incidence of benign tumors as seen regularly in our Department as contrasted to a lower incidence remarked upon in other institutions throughout the country. In 1936 Rigler and Erickson[15] studying the incidence of benign tumors of the stomach found a relative incidence of benign tumors of 8.8 per cent in their roentgenological material and 23.2 per cent in their pathological material. This was a higher incidence than had previously been reported elsewhere. Eusterman and Senty[3] in 1922 had reported that 1.3 per cent of all tumors of the stomach were benign, their study being based on surgical material. Lockwood[8] in 1932 studying operative and autopsy material reported an incidence of

about 4.3 per cent. Forssman[4] reporting from Stockholm in 1943 stated an incidence of 7 per cent benign tumors in his roentgenological material and 9 per cent in his surgical material. It was decided then to investigate the distribution of polyps as they occurred according to nationality, with the thought in mind that perhaps the large Scandinavian segment of the population played a part since they seemed to constitute the largest portion. It appeared from the report of Forssman[4] that this idea might have some basis in fact. In 6,500 examinations of the stomach 425 tumors were diagnosed. Of these, 30 tumors or 7 per cent were benign. Of this group of 30, 66 per cent were polyps or of the polyp-type lesion. Contrasted to this is the survey of the literature reported by Minnes and Geschickter[9] who report a relative incidence of 35.2 per cent of polyps or lesions of the polyp class. Accordingly, the 56 polyps previously grouped by decades were grouped according to nationality (Table 5). In

Table 5

Race Distribution of Polyps

| Nationality | 56 Polyps | Hospital Population |
|---|---|---|
| Scandinavian | 20 - 35.7% | 31.2% |
| German | 13 - 23.2% | 21.7% |
| Irish | 10 - 17.9% | 12.1% |
| English | 3 - 5.3% | 14.8% |
| Slavic | 3 - 5.4% | 7.4% |
| French | 1 - 1.8% | 4.3% |
| Italian | 1 - 1.8% | 0.5% |
| Swiss | 1 - 1.8% | 0.4% |
| Belgian | 1 - 1.8% | 0.4% |
| Unknown | 3 - 5.3% | 2.0% |
| All Others | | 5.1% |

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order to compare this incidence with the nationality proportions of our hospital population, 1,000 consecutive hospital records were reviewed. This study undoubtedly lacks accuracy since in almost one-half of the cases no nationality was obvious and the nationality had to be determined from the names of the parents. In addition very often mixed nationalities were encountered. Nevertheless, it is believed that some indication of the nationality proportions was achieved. It can be seen from the table that the nationality percentages of the polyps parallel fairly closely those of the hospital population. We have, therefore, assumed that polyps are no more frequent than other diseases in the Scandinavian segment of our hospital and patient population.

There are several other quite satisfactory explanations for the relatively large number of polyps seen at this institution. The Precursor group furnishes us with achlorhydrics and hypochlorhydrics who are more prone to develop polyps than the average patient. However, benign tumors of the stomach were being recognized at this hospital in significant numbers long before the idea of a Precursor study was even conceived. As far back as 1928[13,14] reports concerning benign tumors of the stomach were appearing in the literature from this department. Undoubtedly the "polyp consciousness" which exists at this institution plays an important part in the detection of increased numbers of polyps, and explains best the difference in incidence of benign tumors as seen here and that reported by others. In the latest article to appear in the literature on the subject of mass roentgenological surveys for the detection of stomach cancer (Moore[10]) no mention is made of polyps although they are definitely pre-malignant lesions.

In our search for polyps, a careful mucosal study with a small amount of barium is routinely made, employing bimanual compression and palpation to coat the entire stomach mucosa and attempt to iron out the rugae. Spot films of suspicious areas are made, in addition to the conventional films. Polyps may easily be missed by simply depending on films of the stomach completely filled with barium and made in the routine manner. At times a polyp may quite obviously stand out from the rugal folds even though it be quite small--but it must be looked for. Occasionally differ-

entiation from a foreign body such as a prune pit must be made. Again differentiation of polyps from prominent mucosal folds seen on end is not always a simple matter. Often enough the most we can say from a routine examination is that the findings represent either prominent folds or polyps. In an attempt to arrive at a more definitive diagnosis, Doctor Rigler has recently suggested the plan of coating the stomach with barium and then distending it with air so that normal but prominent rugae would be flattened. This would permit an actual polyp to stand out against a relatively smooth background. The remainder of this paper will deal with the preliminary results of such a study.

## AIR INSUFFLATION OF THE STOMACH

This procedure is by no means intended to replace the ordinary method of examination of the stomach. The well established barium meal using a careful technique as described above is by far the most efficient means yet developed for demonstrating roentgenologically abnormal conditions of the stomach. There is no doubt that better contrast and definition can be obtained with the plain barium meal than with the double contrast technique which is necessarily a part of the air insufflation procedure. The double contrast feature, however, is not primarily intended. What is intended is that by air distention of the stomach, flattening of prominent but otherwise normal folds will be achieved so that abnormal tumor masses alone will remain prominent. The procedure is a supplemental examination used only in selected cases after the routine examination has revealed abnormal findings which might be further clarified by such a maneuver.

There are a number of technical difficulties associated with the procedure. First of all, it is often quite difficult to get a satisfactory thin coating of the mucosa with the ordinary barium mixture. Rugar (a commercial preparation of thick barium) has been tried with indifferent results. So far we have not found a good mixture for coating purposes and this remains one of the chief difficulties in this procedure. There is also the problem of preventing barium from passing through the pylorus and into the small bowel, thus obscuring the field. This may be accomplished at least partially by giving only a small amount of barium with the patient in the upright position and as soon as the coating is complete, placing the patient in the horizontal position supine with the right side raised in order to direct the barium toward the fundus. Sometimes barium pools along the posterior wall of the stomach in spite of this maneuver and additional manipulation of the patient will be necessary. Coating must be done before air is introduced into the stomach when the stomach walls are in contact and barium can be worked into the furrows between the folds by palpation. A stomach tube must be passed in order to get the necessary amount of air into the stomach. The amount of air injected depends on the individual stomach. The average stomach takes quite readily from 1500 to 2000 cubic centimeters. Some patients can retain only a small amount of air, eructating the air when their particular maximums are reached in spite of a determined effort to cooperate. Perhaps this is a fortunate safety valve mechanism that should not be interfered with. Active peristalsis tends to interfere with the examination in that contractions propel the air into the duodenum and prevent adequate distention of the stomach wall. For demonstrating the body of the stomach and the antrum, the Trendelenberg position, flat and also with the right side raised to varying degrees is used. The fundus and the cardia are best demonstrated with the patient in the upright position. Spot films are made immediately after insufflation since the air tends to escape from the stomach quite readily. If air is lost further injection may be made to keep the stomach well distended. The patient is constantly questioned as to the degree of fullness he experiences and spot checks are frequently made fluoroscopically in order to prevent over distention. Apparently, however, there is little danger of over-distention since

most patients will spontaneously eructate before reaching this point.

The appearance of a polyp in the air-distended stomach is that of an oval or circular ring of density. A case of known polyps was studied by this method merely for demonstrating polyps as they appear with this technique. It is obvious that the routine method of examination demonstrates the presence of these polyps to greater advantage. However, the oval and circular outlines of the polyps coated with barium can be made out. The rugae which in this case are not particularly prominent are quite flattened. In another case examined multiple polyps appear to be present as seen in the conventional films. In this instance, there might arise some question as to which of the defects are true polyps and which are really folds. Air distention of the stomach with satisfactory coating and flattening of folds shows two polyps but not the number that might have been expected. This patient has been gastroscoped twice and no definite polyps have been seen. However, the gastroscopic report states that there is some roughening of the mucosa on the posterior wall in the body of the stomach and that polyps could not be ruled out. Im another case, demonstrating of a polyp is accomplished but is not quite as clearly delineated as in the previous case. Once again it is seen that the routine examination demonstrates the polyp more clearly but the air insufflation, we feel, proves its presence.

Four Cancer Detection Center patients considered as possible polyps were examined by this method. Once case showed very strong evidence of polyps on the plain films and spots. However, air distention of the stomach showed no evidence of polyposis. In another instance prominent rugae were flattened by this procedure, showing no evidence of polyps. A third case, already mentioned above under benign lesions of the stomach, was examined in this manner. Depite considerable effort this tumor could not be coated with barium. Although it is true that coating of the mucous membrane in general is poor in this case, the thought occurred that this lesion might represent an intramural tumor with stretching of the mucous membrane over it so that coating would be more difficult. In any event, the possibility of distinguishing between intraluminal and intramural lesions by this method will be investigated further. A fourth case studied showed a polyp of the duodenal cap already referred to above. Here air distention of the stomach shows no polyps in the antrum and the pylorus which is well demonstrated does not contain a stalk. The polyp can be seen in the duodenal cap.

Still another possible use for this method may be the differentiation of folds made prominent by physiological contraction of the muscularis mucosae either locally or generally from folds actually infiltrated or edematous as occurs in some cases of gastritis, in leukemic infiltration of the stomach, and in lymphoblastoma of the stomach.

A common error in the interpretation of films of the barium-filled stomach is that of mistaking a constant localized area of prominent rugae for carcinoma. One case studied recently in which a diagnosis of carcinoma of the stomach was made elsewhere, presented such findings, namely, a localized area of large rugae on the greater curvature. Moreover, there was evidence of thickening of the stomach wall in this region, such as might be seen with tumor invasion. With air distention of the stomach, it was possible to fairly well flatten out these prominent folds of mucous membrane and demonstrate that there was no actual thickening of the stomach wall due to tumor invasion.

The findings described above are all quite preliminary and much additional work and further proof will be necessary to establish the worth of this procedure.

## SUMMARY AND CONCLUSIONS

A comparison of the results attained so far in two distinct groups studied

for the detection of gastric carcinoma has been presented. Both studies are still far from completed so that no conclusions can justly be drawn. However, there is the implication that most of the carcinomas will be found in the older age groups, namely patients 65 and above, that are achlorhydric or hypochlorhydric. The relatively low carcinoma rate in the Cancer Detection Center group suggests that stricter criteria for eligibility for stomach examination may eventually be applied in this group. The recent article by Moore[10] in which he states that over-emphasis has been placed on gastric cancer and calls attention to the point that more and more cancer of other segments of the gastro-intestinal tract are being found more frequently finds some confirmation in our experience so far at the Cancer Detection Center. Here, in the period from March 1, 1948 to March 31, 1949, 510 colon examinations were performed and five carcinomas of the colon were discovered roentgenologically. Two of these were in the cecum, two others were malignant polyps of the sigmoid and the fifth was a malignant polyp of the descending colon. In addition to this, four carcinomas of the rectum were discovered proctoscopically. This, of course, does not mean that we should neglect the stomach, but it does indicate a fruitful yield of carcinomas elsewhere in the gastro-intestinal tract.

An analysis of polyps of the stomach found in the two groups suggests an incidence somewhat similar to that of the cqrcinomas, namely, more frequent occurrence in the achlorhydrics and tendency to occur more frequently in the older age groups. The incidence of polyps has been analyzed from the standpoint of nationality which would appear to have no bearing on their occurrence. The high incidence of benign tumors of the stomach as found at this institution has been noted and discussed. Finally, a supplemental roentgen examination in selected cases to distinguish polyps and carcinomas from enlarged folds of mucous membrane of the stomach has been described and discussed.


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# IV. CUMULATIVE INDEX: 1944-1949

## V. MEDICAL SCHOOL NEWS

### The Minnesota Medical Foundation Its Relations with the Greater University Fund

Members of the Minnesota Medical Foundation, alumni, and friends of the Medical School of the University have occasionally asked about the relationship between the Minnesota Medical Foundation and the Greater University Fund. Are they in conflict? Do their activities overlap? The answer is no.

One plays a very important supporting role to the other. The Greater University Fund is a University department operating under the sponsorship of the University Alumni Association and has headquarters in the Coffman Memorial Union. It offers secretarial, stenographic, and technical facilities such as mimeographing, addressographing, mailing, etc. Its most important function, however, is to help implement the fund raising activity of the Medical Foundation and other similar organizations through its public relations "know how". Its activities and scope of work may be compared in some ways to that of a Community Chest agency.

Mr. Stanley Wenberg and his able staff have been most helpful to the Minnesota Medical Foundation in its current effort to memorialize Dr. E.T. Bell on his retirement by creating and maintaining a Bell Museum of Pathology.

-- Erling S. Platou, M.D.

* * *

### Thank You to Elva Lavers

We wish to thank Miss Elva Lavers and her associates in the Mimeograph Department of the University for their help in the production of the Bulletin. Miss Lavers has always responded most cheerfully to our many demands even when this has meant many hours of overtime work. Without the skilled assistance of Miss Lavers, it would have been impossible to get the Bulletin out on time.

### Dr. Clive Butler to Speak at Special Luncheon Meeting

The entire Medical School staff and any other interested physicians are invited to be the guests of the Hospital at a special luncheon meeting on Friday, June 17. Dr. Clive Butler, surgeon to the London Hospital, will speak on the subject of "Penicillin Therapy in Osteomyelitis and Hand Infections." Dr. Butler worked with Sir Alexander Fleming in some of the early work with penicillin.

Lunch will be served beginning at 11:45 a.m. and the meeting will begin at 12:00 noon in Powell Hall Amphitheater, the location for the regular University Hospital staff meetings.

* * *

### Minnesota Obstetrical Society Honors "Litz"

The Minnesota Obstetrical Society at its recent annual meeting in Duluth unanimously adopted a resolution which provides for an annual assessment of $5.00 per year for each member of the Society. The receipts from this assessment which will be made annually for 10 years will be given by the Society to the Jennings C. Litzenberg Memorial Fund.

It is hoped that the fund will ultimately provide a fellowship in Obstetrics in honor of Minnesota's beloved former Chief of this department. Alumni and friends of the Medical School who wish to have their part in honoring Litz may still send their contributions to the Minnesota Medical Foundation in the Medical School.

* * *

### New Minn. Medical Foundation Members

K. W. Covey, M.D., Mahnomen
Henry C. Doms, M.D., Slayton
A. G. Sanderson, M.D., Deerwood
Bradley W. Kusske, M.D., New Ulm

## Best Wishes

With this present issue, we write finis to the present volume of the Bulletin. Publication will be resumed on September 30 when the University Hospital staff meetings will begin for the next academic year. We would like to extend our heartiest thanks to those who have contributed scientific papers and interesting news material. Our thanks also is extended to those who have added to the value of our staff meetings by their stimulating discussion of the papers presented.

Although June 10 marks the closing of the University Hospital staff meetings of the present academic year, there will be a luncheon meeting on June 17 at which Dr. Clive Butler of London, England, will speak. All physicians are invited to attend this meeting.

Many of the weekly conferences which are scheduled in the Calendar of Events will be held regularly through the summer season. Others will be temporarily discontinued. Information regarding these conferences may be obtained by writing to the Editor of the Bulletin. Physicians are welcome at any and all conferences held in the Medical School.

During this past year, we have endeavored to publish the Bulletin on time. Unavoidable delay has occurred at times due to the fact that the Bulletin is distributed as third class mail. Much can be done to increase the value of the Bulletin to its readers. We welcome criticisms and suggestions from the Minnesota Medical Foundation members and all other readers of the Bulletin. We particularly invite contributions of news regarding the activities of Medical School alumni, faculty members, and students. In closing we extend our best wishes for the summer ahead to the faculty members, alumni, students, and friends of the Medical School.

-- George N. Aagaard, M.D.
Editor