Bulletin of the

University of Minnesota Hospitals
and
Minnesota Medical Foundation

Biopsy Studies of the Gastric Mucosa

Volume XXV | Friday, March 5, 1954 | Number 19

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UNIVERSITY OF MINNESOTA HOSPITALS
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Published weekly during the school year, October to June, inclusive.

The Bulletin is sent to members of the Minnesota Medical Foundation.
Annual membership fee - $10.00.

Address communications to: Staff Bulletin, 3330 Powell Hall, University of Minnesota, Minneapolis 14, Minn.

The Publication and distribution of the Bulletin are supported in part by a grant from Lancet Publications Incorporated, Minneapolis, which we gratefully acknowledge.

I. BIOPSY STUDIES OF THE GASTRIC MUCOSA

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In 1945 we presented before the Medical Staff of the University of Minnesota Hospitals,[25] a review of the subject of chronic gastritis. At that time we could find histologic data on only six cases of atrophic gastritis among the many hundreds of gastroscopic examinations which had been done prior to that time in the gastroscopy clinic. In other words, virtually all of the diagnoses of the various types of gastritis were based on gross descriptions of the gastric mucosa as seen through the gastroscope. We cited at that time the crying need for more histopathologic information to serve as an important foundation for these diagnoses.

Along with most gastroscopists, we have used Schindler's classification of the gastritides as a convenient outline of the gross appearance of the various forms of gastritis. This classification along with descriptions was completely detailed in Schindler's original monograph "Gastroscopy".[20] This treatise, together with his later monumental work "Gastritis",[21] has served as a tremendous impetus to the further study of gastritis as well as other conditions affecting the gastric mucosa.

Schindler, himself, has seen the need for more histologic data and has devised a method of obtaining full thickness biopsies of the gastric wall at laparotomy.[21] Unfortunately, this method does not lend itself to any large scale study of the gastric mucosa.

Hebbel[7,8,9] has continued his studies and has further clarified knowledge as to the detailed histologic appearance of gastritis as well as its incidence and its topographical distribution in otherwise normal stomachs, those with gastric and duodenal ulcer and those with gastric carcinoma. He questions the validity of the objections of Schindler, Necheles and Gold[22] to the use of surgically resected specimens for the study of gastritis.

On the clinical side, questions are being raised by many, notably W. L. Palmer and his group[19], as to the significance of the gastritides in the production of symptoms. One senses this questioning in the, at times, rather lengthy philosophical dissertations on this subject in Schindler's monograph on gastritis.[21] This does not, in our opinion, measurably detract from the wealth of factual data presented. Nevertheless, this healthy doubting has further pointed up the need for more correlation between the histologic and the gross appearance of the gastric mucosa.

Although the appearance of Benedict's operating gastroscope in 1948[1] was greeted with a good deal of caution by those interested in this field, it has gradually assumed an important position in the study of both diffuse lesions of the stomach such as gastritis and the diffusely infiltrating neoplasms, and the more localized lesions such as ulcer and the more circumscribed tumors. In 1950 Benedict[2] reported on the first 63 specimens which had been taken for biopsy without accident with his instrument. He called attention to the value of these biopsies in the differential diagnosis of gastritis and tumor and in the diagnosis and study of gastritis. This report was soon followed by that of Shallenberger, DeWan, Weed, and Reganis[23] They report their experiences in 60 cases including cases of gastritis, gastric ulcer, malignancy, gastric polypi and marginal ulcer, detailing not only the advantages, but also the difficulties and limitations they had encountered. They concluded, among other things, that the instrument is valuable and safe for general use and that indication for gastroscopy is indication for biopsy. In 1951, Benedict[3] reported further on his experience and included 203 biopsies thus far taken without accident. He did not report on his over-all experience with these cases, but detailed 10 illustra-

tive cases, in 5 of which positive diagnoses of carcinoma was established by biopsy and 5 others in which diffuse gastric malignancy was excluded with reasonable certainty by gastroscopic examination and biopsy. He reported on the value of a positive biopsy finding but warned against the acceptance of a negative report especially in focal lesions. In 1953 Selesnick and Kinsella [24] reported their study of 56 gastroscopic examinations with mucosal biopsies in 50 patients in which only gastric mucosas that were interpreted as appearing normal or manifesting some form of gastritis were reviewed. He reported 91% agreement with the pathologist in 33 cases showing gross evidence of gastritis, but only 60% agreement where the gross diagnosis was that of a normal mucosa. In other words, the greatest disparity existed where the gastroscopist called the mucosa normal, overlooking pathology in 40% of the cases. He also called attention to the fact that where a gross diagnosis of chronic hypertrophic gastritis was made, the pathologist usually found a normal mucosa.

In 1949 Doig[4] reported his use of a new flexible gastric biopsy tube devised by him. With this instrument a fragment of mucosa is drawn into a side opening in a flexible tube by suction and then cut off by a sharp blade. He found this method of value chiefly in the study of diffuse lesions such as gastritis, its main disadvantage being that it is a blind biopsy and usually reaches only one area - the greater curvature of the lower pars media. By 1952 Doig and Wood[5,6] had studied 112 cases of gastritis diagnosed by this method and compared them with groups of cases of duodenal and gastric ulcer. They found that the age of onset of both superficial and atrophic gastritis compared with that of gastric ulcer, but that the age of reporting was later for atrophic gastritis. They studied the symptomatology and course of gastritis extensively and concluded that this disease is a definite clinical and pathological entity, showing a recognizable, though variable and usually mild clinical picture. They also studied cases of subacute combined degeneration of the spinal cord and pernicious anemia and concluded that many cases without the characteristic blood picture could be diagnosed by finding true gastric atrophy on gastric biopsy.

In the United States the method of Doig and Wood has been used extensively by E. D. Palmer[10-18]. In his clinic, the use of the suction biopsy is followed by gastroscopic examination so that he is able to see the area biopsied and study its gross appearance. In this way he early obtained a remarkable correlation of gastroscopic and histologic findings, but some of his later reports admit to more frequent disagreement. He has studied the gastric mucosa in normal subjects, patients with duodenal ulcer, virus hepatitis, staphylococcus gastroenteritis, atrophic gastritis, postoperative gastritis, sarcoid disease and chronic superficial gastritis. Apparently one advantage of the suction biopsy over the biopsy taken with the Benedict operating gastroscope is that the fragment of tissue obtained is thicker and included the muscularis mucosa and some submucosa.

The present report deals with the total gastroscopic biopsy experience in the gastroscopy clinic in the University of Minnesota Hospitals. The Benedict operating gastroscope has been used. This has been a cooperative enterprise. The gastroscopic examination and the taking of biopsies has been carried out by four different men, all well grounded in this procedure. To some, this would appear to be a disadvantage. To us it has been an advantage in that it affords a better over-all picture of the gross gastroscopic interpretation. Furthermore, in the few cases where more than one of the four persons has examined the same patient at different times, the agreement in interpretation has been remarkable. The histopathological studies were made by Dr. Robert Hebbel of the Department of Pathology of the University of Minnesota, who has had a large experience in the microscopic study of the gastric mucosa[7,8,9]. We feel that

we have been fortunate in having Dr. Hebbel's cooperation and advice in this work.

A few words of explanation in regard to the instrument used might be pertinent. Its value in affording an opportunity to obtain biopsies of the gastric mucosa under direct vision is obvious. Certain disadvantages should be mentioned. In the first place, the instrument is definitely more cumbersome for the operator to handle and for the patient to tolerate than the Schindler instrument. This disadvantage can be overcome by being more deliberate with the examination. In the second place, it seems that the objective lens becomes more easily smudged and is less effectively "wiped off" on the posterior wall of the stomach, necessitating occasionally the removal of the instrument for cleaning and reintroduction, a procedure which in our opinion should be avoided. In the third place, it has been difficult at times to direct the biopsy forceps to the area of involvement. In a more or less diffuse lesion such as gastritis, this difficulty has not become too important. However, we have not been successful in obtaining biopsies from the antrum. On only one occasion did the biopsy specimen reveal antral mucosa, although the attempt to obtain specimens from the antrum has been made often. A few specimens showed the so-called transitional type of mucosa.

It is well to mention, too, that the specimens which we have obtained are often thin, including only parts of the mucosa without the muscularis mucosae. Then, too, it is not possible, even with several biopsies of the same stomach (we have made up to four) to study the whole gastric mucosa. We are studying merely samplings of the mucosa. The fact that the samplings are taken under visual control helps overcome this difficulty and affords an opportunity to study at least the area visualized.

Most of the examinations detailed in this report have been made during the past year, a few prior to that time. Although the series includes some focal lesions other than gastritis, it has been the distinct purpose of each investigation to study the gastric mucosa in its entirety. This study can, therefore, properly be called a study of the gastric mucosa as related to the appearance and incidence of gastritis. Except in a few instances, the operating gastroscope was used routinely during the past ten months. Since the series is small, we wish to designate this a preliminary report.

Examinations were done in 84 patients. On one occasion the gastroscopic examination was unsatisfactory; in eight others, the biopsies were unsatisfactory; leaving 75 patients with satisfactory gastroscopic examinations and biopsies. In a few other instances the gastroscopic examination was incomplete in some details, but enough visualization of the mucosa was obtained to make the correlation with the histologic findings satisfactory. There were 11 other individual biopsies which were unsatisfactory, but in these cases multiple biopsies had been taken, leaving other satisfactory biopsies in each case. Two patients were examined twice with biopsies, making a total of 77 satisfactory examinations in 75 cases. There were 30 examinations with one biopsy each, 47 with two to four biopsies each. A total of 141 satisfactory biopsies were taken.

Two complications should be reported. These were complications of the gastroscopic examination, not of the biopsy taking as such. One patient developed a mediastinitis with subcutaneous emphysema of the lower cervical region. This subsided on antibiotic therapy after a short febrile course. The other developed severe esophageal pain and dysphagia, sufficient to require hospitalization. Protective antibiotic therapy was given and the symptoms subsided after a brief afebrile course. Both of these cases had required removal and reintroduction of the gastroscope.

Histologically each sample was classified as showing normal mucosa, superficial gastritis, or atrophic gastritis. In order to be classified as normal the sections were required to show intact

glandular elements with a normal component of specific cells and little or no cellular infiltration in the stroma. Those with superficial gastritis showed excessive cellular infiltration in the stroma but no change in the glandular elements including no significant loss of specific cells. Those with atrophic gastritis included any that showed loss or change in the glandular elements, i.e., loss of specific cells and/or total glandular substance, and/or metaplasia of the glandular elements. No attempt was made to distinguish between atrophic gastritis and gastric atrophy nor do we believe that any clear-cut distinction exists. We do not believe that any one case of superficial gastritis can be stated as being acute or chronic from its histologic appearance. Repeated biopsies over a period of time would be needed to determine this.

Tables I, II and III show our over-all experience based on histologic diagnoses. No attempt at statistical analysis has been made because the series is small. Only certain obvious trends can be shown. Percentage figures are given for the larger totals. There were 53

DISTRIBUTION OF GASTRITIS ACCORDING TO AGE AND GASTRIC CONTENTS

TABLE I.

FEMALES.

Age	Total Cases	Cases with Free HCl				Cases with Achlorhydria				Cases with no Gastric Analysis			
			Gastritis				Gastritis				Gastritis		
		Normal	Superficial	Atrophic	Both*	Normal	Superficial	Atrophic	Both*	Normal	Superficial	Atrophic	Both*
20 to 29	1		1										
30 to 39	3	2	1										
40 to 49	4	2	1							1			
50 to 59	7	2	1					3		1			
60 to 69	5	1					1 (1 adenocarcinoma)	1				1	
70 to 79	3		1					2					
80 to 89	1							1					
Total		7	5	0	0	0	1 (1 adenocarcinoma)	7	0	2	0	1	0
Total	24	12				9				3			

* This signifies one type of gastritis in one sample and the other type in another sample from the same mucosa.

DISTRIBUTION OF GASTRITIS ACCORDING TO AGE AND GASTRIC CONTENTS

TABLE II.

MALES.

Age	Total Cases	Cases with Free HCl				Cases with Achlorhydria				Cases with no Gastric Analysis			
			Gastritis				Gastritis				Gastritis		
		Normal	Superficial	Atrophic	Both*	Normal	Superficial	Atrophic	Both*	Normal	Superficial	Atrophic	Both*
20 to 29													
30 to 39	4	3			1								
40 to 49	9	4		1		1		1		2			
50 to 59	10	3	2	1				1		1		2	
60 to 69	21	9		4	1	1		5	1				
70 to 79	7	1		2		1		2	1				
80 to 89	2			1						1			
Total		20	2	9	2	3	0	9	2	4	0	2	0
Total	53	33				14				6			

* This signifies one type of gastritis in one sample and the other type in another sample from the same mucosa.

males and 24 females. Grouped according to ages, there were four males from 30 to 39, nine from 40 to 49, ten from 50 to 59, twenty-one from 60 to 69, seven from 70 to 79, and two over 80. Among the females, there was one between 20 and 29, three between 30 and 39, four between 40 and 49, seven between 50 and 59, five between 60 and 69, three between 70 and 79, and one over 80.

Of the total group, 45 had free HCl in their gastric secretions, 23 had achlorhydria, and 9 had no gastric analysis performed. In all instances of achlorhydria it was histamine past. Many of these patients had repeated determinations. Histologically, 36 showed normal mucosae, 8 superficial gastritis, 28 atrophic gastritis, 4 superficial gastritis on one or more samples and atrophic gastritis on other samples from the same stomach and one had adenocarcinoma on a single biopsy from a tumor. The tables clearly demonstrate the usual preponderance of atrophic gastritis in

TABLE III.

TOTALS FOR MALES AND FEMALES

Total cases	Normal	Superficial gastritis	Atrophic gastritis	Both*	Adenocarcinoma
77	36	8	28	4	1
(100%)	(46.75%)	(10.39%)	(36.36%)	(5.20%)	(1.30%)

Total	Cases with Free HCl				Cases with Achlorhydria				Cases with no Gastric Analysis			
77	45				23				9			
100%	(58.44%)				(29.87%)				(11.69%)			
		Gastritis				Gastritis				Gastritis		
	Normal	Superficial	Atrophic	Both*	Normal	Superficial	Atrophic	Both*	Normal	Superficial	Atrophic	Both*
	27	7	9	2	3	1	16	2	6	0	3	0
	35.06%	9.09%	11.69%	2.60%	3.90%	1.30%	20.77%	2.60%	7.79%	0%	3.90%	0%
						1 adenocarcinoma						

* This signifies one type of gastritis in one sample and the other type in another sample from the same mucosa.

the group with achlorhydria. Whereas biopsies from patients with free HCl in their stomach contents showed normal mucosa in 27 instances, and atrophic gastritis (including 2 with both superficial and atrophic)in only 11, those from patients with achlorhydria were normal in 3 instances but showed atrophic gastritis in 18. Seven out of 8 of those with superficial gastritis had free HCl in their stomach contents. Only 2 of the 8 patients with superficial gastritis were males, whereas 24 out of 32 patients with atrophic gastritis were males. None of the females with free HCl showed atrophic gastritis and none of the females with achlorhydria had normal mucosae. There was one instance of proven pernicious anomia and one of subacute combined degeneration of the spinal cord with a normal blood picture. Both showed atrophic gastritis on gastric biopsy.

Grouped according to ages, 56 or 72.7% of the 77 patients were over 50 years of age. Of the 32 patients showing evidence of atrophic gastritis (including the 4 which showed both superficial and atrophic gastritis) only one was under 40 years of age and 3 under 50; 90.6% were over 50 years of age. Conversely, of the 56 persons in the series over 50, 51.8% had evidence of atrophic gastritis and 60.7% had evidence of one type of gastritis or the other or both, while only 14.3% of those under 50 showed atrophic gastritis and 28.6% one type of gastritis or the other or both. This high incidence of atrophic gastritis in the older age group agrees with the findings of Hebbel[8] and others.

Correlation of gross gastroscopic findings with the histologic findings brought out some very interesting results. Table IV shows the gastroscopic appearance in 36 cases with normal histology.

TABLE IV

Histology	Gastroscopy
Normal - 36 cases	Normal . . . . . 21 cases Superficial gastritis. . 0 " Atrophic mucosa. . . . . 1 " Hypertrophic mucosa. . .13 " Probable carcinoma . . . 1 "

The patients with hypertrophic mucosae will be commented upon later. As it will be seen, these patients should probably henceforth be classified as having normal mucosae. The patient with the probable carcinoma turned out actually to have a carcinoma which was missed by biopsy. This case points up the warning of Benedict previously mentioned, that a negative biopsy in a focal lesion should not be accepted as a final diagnosis. The one patient diagnosed as having atrophic mucosa, then, becomes the only error in gastroscopic diagnosis in this group. If allowance is made for the possibility that the atrophic area might have been missed on biopsy (even though three areas were sampled) the correlation between gross gastroscopic and histologic findings in this group becomes remarkable.

TABLE V.

Histology	Gastroscopy
Superficial Gastritis - 8 cases	Normal . . . . . 3 cases Superficial gastritis . . . . . 0 " Atrophic mucosa . . . . . 1 " Hypertrophic mucosa . . . . . 0 " Small raised area . . . . . 1 " Edematous, hyperemic mucosa . . . 2 " Increased high-lighting . . . . . 1 "

Table V shows the gastroscopic appearance in 8 cases diagnosed as superficial gastritis histologically.

It will be noted that no diagnoses of chronic superficial gastritis were made on gross appearance in this series. There were probably two reasons for this. In the first place, as time went on there was an agreed upon tendency among the four cooperating gastroscopists to describe what was seen rather than to make diagnoses. In the second place, none of the cases in this series showed the mucosal exudate or sticky mucus thought to be characteristic of chronic superficial gastritis. In this group, then, there were 4 mistaken diagnoses and 4 cases in which a raised white area, the hyperemic edematous mucosa, and the increased highlighting were not considered sufficient evidence by the gastroscopist to make a definite diagnosis. These proved however to be the only surface indications of an underlying, superficial gastritis.

Table VI shows the gastroscopic appearance in 28 cases of atrophic gastritis.

TABLE VI.

Histology	Gastroscopy	
Atrophic gastritis - 28 cases	Normal	8 cases
	Superficial gastritis	0 "
	Atrophic mucosa	14 "
	Hypertrophic mucosa	1 "
	Edematous mucosa with multiple, small, irregular ulcers	1 "
	Rim of gastric ulcer	1 "
	Postoperative gastritis	1 "
	Polypi with red mucosa	1 "
	Probable carcinoma	1 "

It will be noted that there were 14 cases in which the gastroscopist definitely agreed with the histologic diagnosis, 8 cases in which he definitely missed the diagnosis and called the mucosa normal, one case in which he called the mucosa hypertrophic (the only case of hypertrophic mucosa showing gastritis histologically), one case with multiple small, irregular ulcers - probably a true case of ulcerative gastritis, one case in which the biopsy was taken from the rim of a gastric ulcer, one case of postoperative gastritis, one case with benign polypi and a very red mucosa, and one case thought to be carcinoma by the gastroscopist. The rather large number of normals in this group tends to confirm the finding of Selesnick and Kinsella[24] and others that the greatest disparity between the gastroscopic appearance and histologic findings lies in the gastroscopist missing gastritis when it is definitely present in a fairly large number of cases. The case thought to be carcinoma was one in which the patient had bone lesions interpreted as being metastases, but who died elsewhere without an autopsy being performed.

Table VII indicates the gastroscopic findings in 4 cases found to have both superficial and atrophic gastritis histologically on different samples by biopsy. It will be seen that various types of gastritis likewise were found gastroscopically.

If we reverse the situation and investigate the various histologic diagnoses when definite gastroscopic diagnoses had been made, equally interesting results are obtained. Table VIII tabulates these results. It will be noted that only those cases are tabulated in which a definite diagnosis was made gastroscopically.

TABLE VII.

Histology	Gastroscopy
Superficial and atrophic gastritis on separate samples	Hypertrophy anterior wall and greater curvature, atrophy posterior wall . . . . . 1 case Pseudopolypi antral floor. . . 1 " Atrophy anterior wall. . . . . 1 " Slight atrophy . . . . . 1 "

TABLE VIII.

Gastroscopy	Histology
Normal - 26 cases	Normal . . . . . .14 cases Superficial gastritis . . . . . 3 " Atrophic gastritis. . . . . 9 " *Both. . . . . 0 "
Atrophic mucosa - 19 cases	Normal. . . . . 1 case Superficial gastritis . . . . . 2 " Atrophic gastritis. . . . . .14 " *Both. . . . . 2 "
Hypertrophic mucosa - 12 cases	Normal. . . . . .11 cases Superficial gastritis . . . . . 0 " Atrophic gastritis. . . . . 1 " *Both. . . . . 0 "

* This signifies one type of gastritis in one sample and the other type in another sample from the same mucosa.

Equivocal diagnoses or those with merely descriptive accounts without a definite gastroscopic diagnosis are not included. Here again, when a diagnosis of a normal mucosa was made gastroscopically, a considerable number of atrophic gastritides were overlooked; whereas, when a diagnoses of atrophic mucosa was made, a good correlation with atrophic gastritis histologically is seen. Again, those gastric mucosae which were diagnosed as hypertrophic all proved to be normal histologically except one. It should be explained in this connection that the fragments of tissue obtained by this method of biopsy are often thin and the pathologist was unable to measure the full thickness of the mucosa in the great majority of cases. A true evaluation of the presence or degree of hypertrophy was, therefore, not possible. However, it can be stated that none of the sections of mucosae designated as hypertrophic by the gastroscopist showed any of the other evidences of gastritis nor was there any visible piling up of the glandular elements. We shall have to agree with Selesnick and Kinsella[24], therefore, that on the basis of our findings, patients with the usual evidences of hypertrophy should be called normal and that this finding should be considered a normal variation probably related chiefly to the functional state of the muscularis mucosae. It might appear that mucosae showing hypertrophy gastroscopically are more apt to be normal histologically than those that are normal gastroscopically.

Certain other features of this series should be mentioned. There were 26 in-

stances of peptic ulcer: 9 duodenal, 8 gastric, 2 gastric and duodenal, 5 pyloric, 1 duodenal and stomal, and 1 stomal. The 5 pyloric ulcers included those which might be either just pre- or post-pyloric, most cases being difficult to determine roentgenologically.

Table IX shows the type of mucosa found histologically in the body of the stomach in the various types of ulcer.

The group is too small to make any comments but, in general, the findings agree with those of Hebbel[7] that gastritis is

TABLE IX.

Distribution of Gastritis in Ulcer Cases.

Type of Ulcer	Total	Type of Mucosa				
		Normal	Superficial Gastritis	Atrophic Gastritis	Normal & Gastritis	Mixed Gastritis
Duodenal	9	6	0	1	2	0
Gastric	8	2	0	4	2	0
Gastric & duodenal	2	2	0	0	0	0
Pyloric	5	3	0	1	1	0
Duodenal & stomal	1	1	0	0	0	0
Stomel	1	1	0	0	0	0
Total	26	15	0	6	5	0

common in the body mucosa in patients with gastric ulcer and unusual in patients with duodonal ulcer.

In regard to the distribution of the gastritis, in the case of atrophic gastritis we shall have to agree again with Hebbel[8] that the lesions show a wide range between focal and ifffuse. The only exception, as he points out, lies in those instances in which the greater curvature is involved. When this is the case, according to him, the lesion is more apt to be diffuse. In our series, atrophic gastritis of the greater curvature, was found in only 7 instances among those with mutiple biopsies. In all of these, atrophic gastritis was found in all other areas sampled. On the other hand, atrophic gastritis was found on the lesser curvature in 9 patients, and in only 5 of these were all other areas similarly involved.

Table X indicates the types of symptoms complained of in the cases without ulcer, gallbladder disease, or cancer. Again, the series is too small to draw any conclusions. The only symptoms which seem to be more common in patients with gastritis than in the normals are pain after eating and flatulence. On the other hand, the asymptomatic patients fall almost entirely in the gastritis group. In other words, no definite symptom complex for gastritis is present.

TABLE X

Symptoms in Cases without Ulcer, Gallbladder Disease, or Cancer

Symptom	Normal	Gastritis
Pain after eating	3	7
Flatulence	1	4
Asymptomatic	1	8
Asymptomatic - (post-gastrectomy)	0	2
Vague epigastric distress	3	3
Abdominal pain other than epigastric	4	6
Nausea and/or vomiting	4	2
Typical ulcer distress	2	3
Weight loss	1	3
Nervousness	0	2
Spells of violent epigastric pain	1	0
Pyrosis	0	1
Weakness	2	1
Alternating constipation and diarrhea	0	1

Summary and Conclusions

This report has presented a review of the literature in regard to histologic findings by gastric biopsy in gastritis with special reference to its correlation with the gastroscopic appearance, and has detailed the total gastroscopic biopsy experience at the University of Minnesota. In the latter work the operating gastroscope of Benedict was used. Some of its advantages and disadvantages as well as those of the type of biopsy obtained have been pointed out. A total of 77 gastroscopic examinations with 141 biopsies were done.

Although the total number of patients studied is not sufficiently large to allow for any final conclusions, some very definite trends are brought out.

1. The well known increased incidence of atrophic gastritis with age and in achlorhydria is confirmed.

2. The correlation of gastroscopy with histology in patients whose gastric mucosae proved to be normal histologically is found to be excellent if patients showing hypertrophic mucosae gastroscopically are included with the gastroscopic normals. The finding of normal mucosae microscopically in those with hypertrophy gastroscopically agrees with the finding of Selesnick and Kinsella. We are inclined to agree with their suggestion that mucosal hypertrophy as seen gastroscopically is due to a functional derangement of the muscularis mucosae and does not represent a true gastritis.

3. A definite disparity in the correlation of gastroscopy with histology

in patients showing atrophic gastritis histologically is confirmed. In other words, no surface evidence of an underlying atrophic gastritis was found in a considerable number of patients. Conversely when gastric atrophy was seen gastroscopically, atrophic gastritis was found histologically in a high percentage of patients.

4. Superficial gastritis shows a comparatively low incidence and a varied gastroscopic picture in this series. Surface exudate or sticky mucus does not appear to be an essential finding.

5. Hebbel's finding of the unusual occurrence of atrophic gastritis in the body mucosa in patients with duodenal ulcer as well as its common occurrence in patients with gastric ulcer is supported in this series.

6. Likewise, Hebbel's finding of a wide range in distribution of gastritis from focal to diffuse, and the definite tendency for it to be diffuse when the greater curvature is involved, finds support.

7. No characteristic symptom complex for gastritis is found.

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23. SHALLENBERGER, P.L., DE WAN, C.H., WEED, C.B., and REGANIS, J.C.: Biopsy through the flexible operating gastroscope. Gastroenterology, 16: 327-340, 1950.

24. SELESNICK, S., and KINSELLA, E.D.: Gastritis and gastroscopic biopsy. New Eng. J. Med., 248: 842-844, 1953.

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II. MEDICAL SCHOOL NEWS

Coming Events

March 8 - 10	Conference on Coroners' Problems
March 22 - 24	Continuation Course in Cardiovascular Diseases for General Physicians
March 23 -	George E. Fahr Lecture; "Some Pitfalls in the Care of Cardiacs;" Dr. Samuel A. Levine, Clinical Professor of Medicine, Harvard University Medical School; Owre Amphitheater; 8:15 p.m.
April 1	Clarence M. Jackson Lecture; "Management of Massive Upper Gastro-Intestinal Bleeding;" Dr. J. Garrott Allen, Professor of Surgery, University of Chicago Medical School; Owre Amphitheater; 8:00 p.m.
April 1 - 3	Continuation Course in Emergency Surgery for General Physicians
April 5 -	Seminar on History of Medicine; "One Thousand Years of Medicine and Surgery 600-1600 A.D.;" Dr. August C. Krey, Professor of History, University of Minnesota; Todd Amphitheater, University Hospitals; 7:30 p.m.
April 5 - 7	Continuation Course in Eye, Ear, Nose, and Throat for General Physicians
April 8 -	Duluth Clinic Lecture; "The Role of the Ionic Environment in Carbohydrate Metabolism;" Dr. A. Baird Hastings; Owre Amphitheater; 8:00 p.m.
April 8 - 10	Continuation Course in Urology for General Physicians

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Dr. Boyden Honored

Edward Allen Boyden, Professor and Head of the Department of Anatomy, has been given a special honor in celebration of his 68th birthday, March 20, 1954. This honor is the Boyden Birthday Volume of The Anatomical Record, in four issues, January-April. Doctor Boyden served as managing Editor of the Record for twenty years, 1928-48; hence it is especially fitting that a number of his friends chose this journal as a medium for honoring an esteemed colleague.

The January issue has appeared. It begins with a note of introduction by the present editor of the Record. It has a portrait of Dr. Boyden as frontispiece. A short biography of him is a tribute to a man of broad interests, unsurpassed standards of excellence and rare twofold competence as morphologist and experimentalist. Then follows a chronological list of his publications. Three books, the latest being a monograph on the segmental anatomy of the lung (in press), and 111 articles in journals are cited. Some 50 abstracts and reviews are omitted. The other pages of the January issue are devoted to five scientific papers which were written by eleven of Dr. Boyden's departmental associates.

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Continuation Course

The University of Minnesota and the Minnesota Heart Association will jointly present a continuation course in Cardiovascular Disease for General Physicians from March 22 to 24, 1954, in the Center for Continuation Study on the University of Minnesota Campus. The course will stress management of practical problems in the cardiovascular field. Dr. Samuel A. Levine, Clinical Professor of Medicine, Harvard University Medical School, will present the annual George E. Fahr Lecture on

March 23 as a part of the course. Dr. Levine's subject will be "Some Pitfalls in the Care of Cardiacs." The course will be presented under the direction of Dr. C. J. Watson, Professor and Head, Department of Medicine, University of Minnesota Medical School, and the remainder of the faculty will include clinical and full-time members of the faculty of the University of Minnesota Medical School and the Mayo Foundation.

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Faculty News

Several members of the Department of Surgery attended the recent meeting of the Society of University Surgeons in Rochester, New York. Those attending included Doctors Ivan D. Baronofsky, F. John Lewis, C. Walton Lillehei, and Richard L. Varco. Dr. Varco was named President-Elect of the Society. Dr. Lewis presented a paper on "Repair of Atrial Septal Defects Under Direct Vision with the Aid of Hypothermia," and Dr. Baronofsky spoke on "Fate of Esophageal Hiatus Hernia: A Clinical and Experimental Study."

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Publications of the Medical School Faculty

In Honor of Edward Allen Boyden. Anat. Rec., 118: 1, 1954.

Briggs, John F.: Pregnancy in Heart Disease. Dis. of the Chest, 25: Feb., 1954.

Edmondson, Page R. and Schwartz, Samuel: Studies of Uroporphyrins. III. An Improved Method for the Decarboxylation of Uroporphyrin. J. Biol. Chem., 205: 605, 1953.

Hartmann, J. F.: Electron Microscopy of Motor Nerve Cells Following Section of Axones. Anat. Rec., 118: 19, 1954.

Kubicek, W. G., Kottke, F. J., Laker, D. J., and Visscher, M. B.: Adaptation in the Pressor-Receptor Reflex Mechanisms in Experimental Neurogenic Hypertension. Am. J. Physiol., 175: 380, 1953.

Larsell, O.: The Development of the Cerebellum of the Pig. Anat. Rec., 118: 73, 1954.

Pitel, Martha and Boyden, Edward A.: Variations in the Bronchovascular Patterns of the Left Lower Lobe of Fifty Lungs. J. Thoracic Surg., 26: 633, 1953.

Richards, A. G., Simonson, E., and Visscher, M. B.: Electrocardiogram and Phonogram of Adult and Newborn Mice in Normal Conditions and Under the Effect of Cooling, Hypoxia, and Potassium. Am. J. Physiol., 174: 293, 1953.

Sundberg, R. Dorothy, Schaar, Frances E., Powell, M. J., and Denboer, Donna: Tissue Mast Cells in Human Umbilical Cord, and the Anticoagulant Activity of Dried Extracts of Cords and Placentae. Anat. Rec., 118: 35, 1954.

Swigart, R. H. and Kane, D. J.: Electron Microscopic Observations of Pulmonary Alveoli. Anat. Rec., 118: 57, 1954.

Wells, L. J., Cavanaugh, M. W., and Maxwell, E. L.: Genital Abnormalities in Castrated Fetal Rats and their Prevention by Means of Testosterone Propionate. Anat. Rec., 118: 109, 1954.

III. UNIVERSITY OF MINNESOTA MEDICAL SCHOOL

WEEKLY CALENDAR OF EVENTS

Physicians Welcome

March 8 - 13, 1954

Monday, Mareh 8

Medical School and University Hospitals

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; W-612, U. H.

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

11:30 - Tumor Conference; Doctors Hitchcock, Moore, and Stenstrom; Todd Amphitheater, U. H.

11:30 - 12:30 Physical Medicine Seminar; Cerebral Edema; Sarah Gault; Heart Hospital Auditorium.

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

12:30 - 1:30 Physiology Seminar; Hemodynamic Changes Following Breathing of 30 % Carbon Dioxide by Dogs; E. B. Brown; 214 Millard Hall.

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

1:30 - 3:30 Dermatology Hospital Rounds; H. E. Michelson and Staff; Dermatology Histopathology Room, M-434, U. H.

4:30 - Infectious Disease Rounds; Station 43, U. H.

4:30 - Public Health Seminar; 15 Owre Hall.

5:00 - 6:00 Physiology-Surgery Conference; Todd Amphitheater, U. H.

5:00 - 6:00 Urology-Roentgenology Conference; C. D. Creevy, O. J. Baggenstoss, and Staff; Eustis Amphitheater.

Ancker Hospital

8:30 - 10:00 Tuberculosis and Chest Conference; Auditorium.

2:00 - 3:00 Surgery Journal Club; Classroom.

Minneapolis General Hospital

9:30 - Pediatric Rounds; Eldon Berglund; Newborn Nursery, Station C.

10:30 - 12:00 Medicine Rounds; Thomas Lowry; Station F.

11:00 - Orthopedic and Fracture Rounds; Drs. John Moe and Arthur Zierold; Station A.

11:00 - Pediatric Rounds; Erling Platou; Station K.

12:30 - Surgery Grand Rounds; Dr. Zierold; Station E.

1:30 - 2:30 Tuberculosis Conference; J. A. Myers; Station M.

Monday, March 8, (Cont.)

Minneapolis General Hospital (Cont.)

2:00 - Pediatric Rounds; Stations I and J.

Veterans Administration Hospital

9:30 - Infectious Disease Rounds; Drs. Hall, Zinneman, Lubin and Sherman.

1:30 - Cardiac Conference; Drs. Berman, Smith, Hoseth, and Wexler; Conference Room, Bldg. I.; Rounds immediately following conference.

Tuesday, March 9

Medical School and University Hospitals

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

12:30 - Bacteriology Seminar; Sexuality in Neurospora; Dr. Hirsch; 214 Millard Hall.

12:30 - 1:20 Pathology Conference; Autopsies; J. R. Dawson and Staff; 102 I. A.

12:30 - 1:30 Physiology 114C -- Respiration; E. B. Brown; 129 Millard Hall.

3:30 - General Physiology-Biophysics Seminar; 323 Zoology Building.

3:30 - Pediatric Seminar; Diagnosis of Brain Damage in Children; Wentworth Quast; Sixth Floor, U. H.

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

4:30 - 5:30 Clinical-Medical-Pathological Conference; Todd Amphitheater, U. H.

5:00 - 6:00 X-ray Conference; Presentation of Cases from Ancker Hospital; Drs. Aurelius, Peterson, and Niknejad; Eustis Amphitheater, U. H.

*8:00 - The Minnesota Pathological Society Meeting; Toxicology of Alcohol; Walter W. Jetter, M.D., Boston University School of Medicine; Owre Amphitheater.

Ancker Hospital

9:00 - 10:00 Medical X-ray Conference; Auditorium.

Minneapolis General Hospital

10:00 - Psychiatry Grand Rounds; R. W. Anderson; Station H.

10:00 - Cardiac Rounds; Paul F. Dwan; Classroom, Station I.

10:00 - Pediatric Rounds; Spencer F. Brown; Stations I and J.

11:30 - 12:30 Neurology-Neurosurgery Conference; Classroom Station M

12:30 - 2:30 Dermatology Rounds on Clinic; Carl W. Laymon and Staff.

12:30 - ECG Conference; Boyd Thomes and Staff; 302 Harrington Hall,

1:00 - Tumor Clinic; Drs. Eder, Coe, and Lipschultz; Classroom.

3:00 - 5:00 Child Psychiatry Conference; Jack Wallinga; Station I.

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* Indicates special meeting. All other meetings occur regularly each week at the same time on the same day. Meeting place may vary from week to week for some conferences.

Tuesday, March 9, (Cont.)

Veterans Administration Hospital

7:30 - Anesthesiology Conference; Conference Room, Bldg. I.

8:45 - Surgery Journal Club; Conference Room, Bldg. I.

9:30 - Surgery-Pathology Conference; Conference Room, Bldg. I.

10:30 - Surgery-Tumor Conference; L. J. Hay, J. Jorgens and Donn Mosser; Conference Room, Bldg. I.

1:00 - Review of Pathology, Pulmonary Tuberculosis; Conference Room, Bldg. I.

1:30 - Combined Medical-Surgical Chest Conference; Conference Room, Bldg. I.

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

4:00 - Thoracic Surgery Problems; Conference Room, Bldg. I.

Wednesday, March 10

Medical School and University Hospitals

8:00 - 9:00 Roetgenology-Surgical-Pathological Conference; Paul Lober and L. G. Rigler; Todd Amphitheater, U. H.

11:00 - 12:00 Pathology-Medicine-Surgery-Pediatrics Conference; Todd Amphitheater, U. H.

12:30 - 1:20 Radioisotope Seminar; Underground Cobalt Unit, U. H.

12:30 - 1:30 Physiology 114B -- Transport Seminar; Nathan Lifson and M.B. Visscher; 214 Millard Hall.

1:00 - 2:00 Dermatology Clinical Seminar; F. W. Lynch; 300 North Clinic.

1:30 - 3:00 Pediatric Allergy Clinic; Albert V. Stoesser and Lloyd Nelson; W-211, U. H.

3:30 - 4:30 Dermatology Pharmacology Seminar; J. D. Krafchuk; 3rd Floor Conference Room, Heart Hospital.

4:00 - Medicine-Physiology Cardiovascular Conference; Medicine and Physiology Staffs; Heart Hospital Theater.

4:30 - 5:50 Dermatology Infectious Disease Seminar; J. D. Krafchuk; 3rd Floor Conference Room, Heart Hospital.

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

5:00 - 6:00 Residents' Lecture; Subject to be announced; Leo G. Rigler; Todd Amphitheater, U. H.

5:30 - 7:30 Dermatology Journal Club and Discussion Group; Hospital Dining Room.

7:30 - 9:30 Dermatology Pathology Seminar; Review of Interesting Slides of the Week; Robert W. Goltz; Todd Amphitheater, U. H.

Ancker Hospital

8:30 - 9:30 Clinico-Pathological Conference; Auditorium.

12:30 - 1:30 Medical Journal Club; Library.

Wednesday, March 10, (Cont.)

Minneapolis General Hospital

8:30 - 9:30 Obstetrical and Gynecological Grand Rounds; William P. Sadler and Staff; Station C.

9:30 - Pediatric Rounds; Max Seham; Stations I and J.

10:30 - 12:00 Medicine Rounds; Thomas Lowry and Staff; Station D.

11:00 - Pediatric Seminar; Arnold Anderson; Classroom, Station I.

11:00 - Pediatric Rounds; Erling S. Platou; Station K.

12:15 - Pediatric Staff Meeting; Classroom, Station I.

1:30 - Visiting Pediatric Staff Case Presentation; Classroom, Station I.

Veterans Administration Hospital

8:30 - 10:00 Orthopedic X-ray Conference; E. T. Evans and Staff; Surgical Conference Room, Bldg. 43.

8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker.

9:00 - Gastro-Intestinal Rounds; Drs. Wilson, Zieve, Hay, Brakel, Nesbitt and O'Leary.

12:30 - Medical Journal Club; Doctors' Dining Room.

12:30 - X-ray Conference; J. Jorgens; Conference Room, Bldg. I.

1:30 - 3:00 Metabolic Disease Conference; Drs. Flink, Schultz and Brown.

7:00 - Lectures in Basic Science of Orthopedics, Conference Room, Bldg. I.

Thursday, March 11

Medical School and University Hospitals

9:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

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

12:00 - 1:00 Medical Journal Club; 116 Millard Hall.

12:30 - Physiological Chemistry Seminar; Conflicting Theories of Fat Absorption; Wendell Engelstad; 214 Millard Hall.

1:30 - 4:00 Cardiology X-ray Conference; Heart Hospital Theatre.

5:00 - 6:00 Radiology Seminar; Presentation of Cases from Heart Hospital; Joseph Asta; Eustis Amphitheater U. H.

Ancker Hospital

8:00 - 10:00 Medical Grand Rounds; Auditorium.

Minneapolis General Hospital

9:30 - Neurology Rounds; Heinz Bruhl; Station I.

10:00 - Pediatric Rounds; Spencer F. Brown; Station K.

10:00 - Psychiatry Grand Rounds; J. C. Michael and Staff; Station H.

11:30 - 12:30 Clinical Pathological Conference; John I. Coe; Classroom.

Thursday, March 11, (Cont.)

Minneapolis General Hospital (Cont.)

12:30 - 2:30 Dermatology Rounds and Clinic; Carl W. Laymon and Staff.

1:00 - Fracture - X-ray Conference; Drs. Zierold and Moe; Classroom.

1:00 - House Staff Conference; Station I.

Veterans Administration Hospital

8:00 - Surgery Grand Rounds; Conference Room, Bldg. I.

8:00 - Surgery Ward Rounds; Lyle Hay and Staff; Ward 11.

11:00 - Surgery-Roentgen Conference; J. Jorgens; Conference Room, Bldg. I.

1:30 - 4:30 Infectious Disease Conference and Rounds; Wesley W. Spink; Conference Room, Bldg. I.

Friday, March 12

Medical School and University Hospitals

8:00 - 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.

10:30 - 11:50 Medicine Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.

10:30 - 1:50 Otolarynogology Case Studies; L. R. Boies and Staff; Out-Patient Department, U. H.

11:00 - 12:00 Vascular Rounds; Davitt Felder and Staff Members from the Departments of Medicine, Surgery, Physical Medicine, and Dermatology; Eustis Amphitheater, U. H.

11:45 - 12:50 University of Minnesota Hospitals Staff Meeting; Blood Pressure Determinations; Donald S. P. Weatherhead; Powell Hall Amphitheater.

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

1:30 - 2:30 Dermatology Grand Rounds; Presentation of Cases from Grouped Hospitals (University, Ancker, General and Veterans) and Private Offices; H. E. Michelson and Staff; Eustis Amphitheater, U. H.

2:30 - 4:00 Dermatology Hospital Rounds; H. E. Michelson and Staff; Begin at Dermatology Histopathology Room, M-434, U. H.

3:00 - 4:00 Neuropathological Conference; F. Tichy; Todd Amphitheater, U. H.

3:30 - 4:30 Dermatology-Physiology Seminar; J. D. Krafchuk; 3rd Floor Conference Room, Heart Hospital.

4:00 - 5:00 124 Advanced Neurophysiology Lecture; Werner Koella and Ernst Gellhorn; 111 Owre Hall.

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

5:00 - Urology Seminar and X-ray Conference; Eustis Amphitheater, U. H.

Ancker Hospital

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

Friday, March 12, (Cont.)

Minneapolis General Hospital

9:30 - Pediatric Rounds; Wallace Lueck; Station J.

10:30 - Pediatric Surgery Conference Oswald Wyatt; Tague Chisholm; Station I, Classroom.

12:00 - Surgery-Pathology Conference; Dr. Zierold, Dr. Coe; Classroom.

1:00 - 3:00 Clinical-Medical Conference; Thomas Lowry; Classroom, Station M.

1:15 - Pediatric X-ray Conference; Oscar Lipschultz; Classroom, Main Bldg.

2:00 - Pediatric Rounds; Station I and J.

Veterans Administration Hospital

10:30 - 11:20 Medicine Grand Rounds; Conference Room, Bldg. I.

1:00 - Chest Pathology Follow-up Conference; E. T. Bell; Conference Room, Bldg. I.

2:00 - Clinicopathologic Conference; Conference Room, Bldg. I.

Saturday, March 13

Medical School and University Hospitals

7:45 - 8:50 Orthopedic X-ray Conference; W. H. Cole and Staff; M-109, U. H.

9:00 - 10:30 Pediatric Grand Rounds; Eustis Amphitheater, U. H.

9:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; Heart Hospital Amphitheater.

9:15 - 10:00 Surgery-Roentgenology Conference; L. G. Rigler, J. Friedman, Owen H. Wangensteen and Staff; Todd Amphitheater, U. H.

10:00 - 11:30 Surgery Conference; Todd Amphitheater, U. H.

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

Ancker Hospital

8:30 - 9:30 Surgery Conference; Auditorium.

Minneapolis General Hospital

8:00 - Urology Staff Conference; T. H. Sweetser; Main Classroom.

9:00 - Psychiatry Grand Rounds; R. W. Anderson; Station H.

11:00 - 12:00 Medical - X-ray Conference; O. Lipschultz, Thomas Lowry and Staff; Main Classroom.

Veterans Administration Hospital

8:00 - Proctology Rounds; W. C. Bernstein and Staff; Bldg. III.

8:30 - 11:15 Hematology Rounds; Drs. Hagen and Fifer.