

Cancer Development in Gastric Stump After Partial Gastrectomy for Peptic Ulcer *

KAARE LIAVAAG, M.D.

From the Surgical Department, Drammen Hospital, Drammen, Norway

IN recent years there has been discussion of whether or not partial gastrectomy leads to development of cancer in the remainder of the stomach.

Bauer, in 1951, reported 26 cases from the literature and the complication was looked upon as fortuitous. Later individual case reports have implied a causal relationship. The extent to which cancer is more prevalent in the stomach remnant in the rest of the population, must, however, be derived statistically. Several writers have attempted clarification by different methods, with contrary results.

Cotè *et al.*¹ of the Mayo Clinic found 17 cases of carcinoma in residual stomach from all material since 1904, and they concluded that this eventuality must be extremely rare. Denck,² of the University Clinic in Vienna, studied the problem on the basis of about 2,000 patients who had gastric resection. He tried to find the answer in the following way: He analyzed the causes of death among such patients who died during the observation period compared with the causes of death of the same age group in the Vienna population. He found the incidence of cancer in the stomach in the whole population was four times as frequent as among those whose stomach had been partially resected. To him, this is explained by the fact that in ordinary cancer records 25 per cent of the lesions are confined to the fundic and cardiac regions, and it is this 25 per cent which appear among those resected; the

other 75 per cent disappear when part of the stomach is removed.

On the other hand Kühlmayer *et al.*⁴ examined German records in a similar way and found a 10 per cent incidence of cancer among those whose stomach was partially resected, and 7.0 per cent for the rest of the population. They concluded it was most unlikely that the development of cancer had anything to do with the operation. On the whole no one has drawn hard conclusions from their data.

In Norway, Helsingør and Hillestad³ tried to find an explanation by investigating patient records from surgical Department A, Rikshospitalet, Oslo. They also took up the important question as to whether or not there is any difference between those operated upon for gastric ulcer and those operated upon for duodenal ulcer. Furthermore they drew attention to the fact that it is not percentage in itself that is deciding, but one must compare observed incidence with total expected incidence in the whole population. From this it follows that the observation period must be divided into ten-year segments with men and women separate. Using this method they found that cancer incidence among those whose stomach was partially resected for gastric ulcer was three times higher than expected, while in those operated upon for duodenal ulcer the figure was of the order expected. They concluded that the development of cancer in residual stomach had nothing to do with the operation itself.

In recent years at Dramman Hospital, we have seen a number of cancers in resid-

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TABLE 1. *Cancer of the Stomach, 1940-1960*

Total	934 cases
In residual stomach remnant	25 (2.6%)

TABLE 2. *Carcinoma in Residual Stomach*

	Men	Women	Total
Gastroenterostomy	7	4	11
Partial gastric resection	13	1	14
Totals	20	5	25

TABLE 3. *Carcinoma after Gastroenterostomy*

Age at operation	32 years
Cancer development	61 years
Time interval	29 years
Spread	9-43 years

TABLE 4. *Carcinoma after Partial Gastrectomy*

Age at operation	44 years
Cancer development	60 years
Time interval	16 years
Spread	5-26 years

ual stomachs; we gained the impression that this must be not uncommon. For that reason we examined our records to see whether or not this finding has any significance (Table 1).

The total cases of gastric cancer at Drammen Hospital during the years 1940 to 1960 was 934, of which 25 (2.6%) developed in stomachs previously operated upon.

When we analyze the data more closely

it is apparent, as shown in Table 2, that in 11 cases the cancer developed after gastroenterostomy and in 14 cases after partial gastrectomy. However, of these 14, three were operated upon elsewhere so that they were removed from our records. The first thing which struck us (Table 3, 4) was that the time interval between operation and the development of cancer was 29 years for those who had undergone a gastroenterostomy, while in those whose stomach had been partially resected the time interval was 16 years.

The immediate conclusion perhaps would be that resection had a greater cancerogenic effect than gastroenterostomy. If we examine the two groups a little more closely, however, we see that the average age of the gastroenterostomy patients was 32 years when operated upon; cancer occurred at 61 years of age, a time interval of 29 years.

In the group partially resected the average age at operation was 44 years; cancer occurred at 60 years, a time interval of 16 years.

When one finds in our records that 62 is the average age of patients with cancer of the stomach it is apparent that cancer develops at the usual cancer age independent of whether gastroenterostomy, partial gastrectomy or any other surgical treatment has been carried out.

It is therefore clear that age is the dominating factor and overshadows all others.

If partial gastrectomy introduced an additional carcinogenic effect, one might ex-

TABLE 5. *Treatment of Carcinoma of the Stomach Occurring after Operation for Ulcer*

	Previous Operation		Total
	Gastroenterostomy	Partial Gastrectomy	
No operation	2	1	3
Exploration only	2	4	6
Re-resection	4	6	10
Total gastrectomy	3	3	6

TABLE 6. *The Site of the Cancer of the Stomach Occurring after Operation for Ulcer*

	Previous Operation	
	Gastro- enterostomy	Partial Gastrectomy
In or at the anastomosis	3	5 = 8
No relation to the anastomosis	7	8 = 15
Site not stated	1	1 = 2

pect to find the same conditions as are found with development of cancer of the colon in patients with ulcerative colitis—that cancer develops about ten years earlier than in other patients.

Although it is not within the scope of this paper to discuss treatment of carcinoma in the residual stomach, Table 5 will show how the patients have been treated. It is claimed that the prognosis is very poor. As will be seen in Table 5, however, it has been possible in two-thirds of the cases to do either a re-resection or a total gastrectomy. Even if the prognosis is poor, it is by no means hopeless—one patient is living ten years after total gastrectomy.

Since most of the patients were operated upon, the cancer location can be stated in the majority. This is shown in Table 6. We see that in eight the cancer had a relation to the anastomosis, in 15 no relation to the anastomosis. In several, where the anastomosis was involved by cancer, the cancer enveloped the stomach to such an extent that it was impossible to see whether it started at or near the anastomosis.

Several authors claim that cancer starts in the anastomosis and that the cause is an underlying “anastomitis.” Our findings do not confirm that statement.

To throw some light on the matter from a statistical point of view we examined the records between 1932 and January 1, 1946 providing a minimum observation period of 15 years.

Tables 7 and 8 show our total material and the cases traced. As will be seen we have been able to trace 616 patients

(90.7%). Fifty-four of these died in the observation period from causes others than carcinoma of the stomach. The exact cause of death is known for 49 since they were treated at Drammen Hospital shortly before death or died there. Thus we have calculated on the basis of person-years of exposure the expected number of cases according to the same table used by Helsingen and Hillestad so as to obtain a comparison with their figures (Table 9). As

TABLE 7. *Partial Gastrectomy for Ulcer, 1932-1945*

	Men	Women	Total
Gastric Ulcer	225	54	279
Duodenal Ulcer	351	49	400
Total	576	103	679

TABLE 8. *Patients Treated after Partial Gastrectomy for Ulcer, 1932-1945*

	Men	Women
Gastric Ulcer	207 (92%)	47 (87%)
Duodenal Ulcer	320 (91%)	42 (85%)
Total: 616 cases (90.7%)		

TABLE 9. *Cancer Development after Partial Gastrectomy for Ulcer*

	Expected	Observed
Gastric ulcer, men	4.3296	5
Gastric ulcer, women	0.9932	0
Duodenal ulcer, men	3.7737	4
Duodenal ulcer, women	0.4937	0
Total	9.5902	9

seen in Table 9 we are unable to establish a statistical difference between expected and recorded cancer incidence neither in the total material nor in separate groups.

With regard to the chance of development of cancer of the stomach individuals have to be divided into four groups, as follows: 1) The most susceptible patients with pernicious anemia; 2) patients with gastric ulcer; 3) so-called normal individuals; and 4) those with duodenal ulcer among whom considerably less cancer is recorded than in the rest of the population.

In our hospital Rømcke and Sponland⁵ investigated 550 cases of cancer of the stomach with reference to previous history of ulcer disease, and compared this number with the expected ulcer frequency in our area. They found 20 cases against an expected 18, but the distribution was different from that expected in that 18 were gastric ulcers and two were duodenal rather than the expected seven and 11 ratio.

These findings led us to draw the following conclusions: in patients operated upon for gastric ulcer, the cancer incidence in residual stomach is reduced to an extent which approaches the incidence in the general population, but in the duodenal ulcer group cancer incidence increases to an extent that also approaches the rate for the general population. Both these displacements mean that we must look back to the operation itself. Our conclusion will be somewhat different from other authors.

Summary

1. 616 patients who have undergone partial gastrectomy for benign ulcer at least 15 years ago, have been followed as to development of cancer in the stump of the stomach.

2. No difference between recorded and expected incidence of cancers could be demonstrated in those originally operated upon for gastric or for duodenal ulcer.

3. This means that in the gastric ulcer group the incidence of cancer is reduced and in the duodenal ulcer group the incidence is increased to what would be expected without operation. Patients with gastric ulcer without operation have a higher incidence of cancer, and in patients with duodenal ulcer there is lesser incidence. Both these displacements are to be traced back to the operation itself.

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