

2. The infection may be blood-borne; or it may enter through abrasions, minute scratches or blisters; occasionally through a hair follicle.

3. It is most apt to occur in the presence of severe trauma, and in cases in which the skin is unusually dirty, and the general resistance of the patient unusually low.

4. Preventive treatment consists in a very thorough cleansing of the skin, and an aseptic treatment of superficial scratches and of blebs. Once infection is established, thorough drainage and the Carrel method are indicated.

5. Prognosis is usually good, though duration is usually long.

DISCUSSION.

DR. COTTON: I remember a case of Dr. Monk's also a case with severe gas-bacillus sepsis. There was a little scrape of the skin on the anterior surface of the thigh, but it was not a compound fracture. He finally got well. I have seen two or three other cases.

DR. W. J. MIXTER: I am reminded by Dr. Blake's paper of a case of fracture of the skull at the Massachusetts General Hospital; a child with a simple fracture of the skull who died of meningitis with a pure culture of influenza bacillus. The child fell from a chair two weeks before entrance to the hospital. Diagnosis of meningitis made by lumbar puncture. A medico-legal autopsy was done by Dr. McGrath. There was no fracture of the base, whatever, but pus from the line of fracture at the vertex also showed influenza bacilli.

DR. SCUDDER: I recall one case that was so striking it is worth while mentioning it in connection with Dr. Blake's paper. The case was that of a woman, a young adult, who received a T-fracture into the knee joint, a T-fracture of the lower end of the femur. The patient was an apparently healthy woman. It was decided to do an open reduction of the fracture. Upon making an incision to reach the fragments, pus and blood were evacuated from the swollen tissues about the joint and from the joint itself. Of course, under these conditions no plastic operation was done upon the bone. The wound was drained and the whole leg was properly immobilized. The patient did poorly, continued to be septic, showed evidences of pyemia, and an amputation of the thigh was done. The patient subsequently died.

Here was a case with no apparent abrasion of the skin, and there was no evidence of infection previous to the receipt of the injury. The infection must have been through the blood stream. Dr. Blake has very properly, it seems to me, called attention to this possible serious complication associated with apparently simple closed fractures. The subject is one of great importance, and I record this case as a recent personal experience.

DR. BLAKE (closing): Three cases have been described by Drs. Lund, Cotton and Mixter. Two of these were found to be infected at the time of late operation (boneplating), or at autopsy; there were no gross signs of infection before this time. It is possible, therefore, that some cases of delayed union are complicated by what might be called a "silent" infection.

The writer has seen one case of closed fracture of the humerus, in which the skin of the entire arm became much inflamed; the arm looked like a raw ham, but deep infection did not occur. After two weeks, and while still in the ward, the man developed a bronchopneumonia and died in thirty hours. This pneumonia was probably of septic origin, superficial sepsis of the arm being the starting-point.

SOME RECENT EXPERIENCES IN GASTRIC AND DUODENAL SURGERY.

BY JOHN T. BOTTOMLEY, M.D., BOSTON.

THE fact that a relatively large and, for me, an unusual number of cases of gastric and duodenal surgery happened to come under my observation in January of this year, and that some of them, either in clinical history or in operative result, were not without interest, has led me to offer a brief report before this society and to hope that it will draw out an expression of opinion from the members on certain questions in this particular field that are still to be regarded as unsettled.

These brief remarks have to do with a total of fifteen cases, eight of which showed chronic ulcer of the duodenum; one, chronic ulcer of the duodenum with a subacute perforation; three, chronic ulcer of the stomach (two of which were "hour-glass" stomachs); one, co-existent gastric and duodenal ulcers, and two, cancer of the stomach. In the treatment of these conditions gastroenterostomy with infolding* of the ulcer was done eight times, gastroenterostomy with suture of perforation once, gastroenterostomy alone, once, "sleeve" resection of stomach and pyloric portion of the stomach, once, and exploratory abdominal section, once.

There were two deaths, and to these particular attention is asked because they followed the less radical and less grave surgical procedure and were due to causes which to me, at least, were very unusual in this field.

The first fatality occurred in a case of chronic ulcer of the duodenum for which posterior gastroenterostomy with infolding of the ulcer had been done.

The patient, a thin, worked-out, neurotic woman, thirty-eight years old, had been bothered for three years with persistent, so-called "dyspepsia." Her clinical history was not characteristic, and the diagnosis of ulcer of the duodenum was made only after roentgenological examination. At operation a chronic ulcer on the superior border of the duodenum and marked enteroptosis were found. Though this ulcer could have been excised easily, the patient's high pulse rate impelled me simply to infold the ulcer and that portion of the duodenum between it and the pylorus, and to do a posterior gastroenterostomy. This was very easily and quickly accomplished. The following day, though there was

* This procedure is extended until the pylorus is blocked at least temporarily.

considerable vomiting, the pulse rate was only 72; apparently little attention was paid to the vomiting because that symptom had played a very prominent part in her pre-operative history. The vomiting continued, however, and on the fourth day the pulse rate began to increase. Consulted by telephone, I advised gastric lavage and the withholding of all liquids by mouth; the patient refused to have the stomach tube passed, and demanded drinks. I saw her on the sixth day. External inspection of the abdomen showed immediately a low placed, greatly dilated stomach; the abdomen otherwise was absolutely flat. We could not persuade the patient to submit to treatment of any kind; she refused even to change her position in bed. The vomiting continued, her heart gradually weakened, and she died on the eighth day.

Her death was unquestionably due to the dilated stomach. There is little doubt in my mind that the fatal issue would have been avoided, had the woman submitted to gastric lavage. Whether the dilatation was secondary to obstruction below the anastomosis or was of the unexplainable variety that may follow any abdominal section I do not know. I am inclined to the opinion that it was of the latter variety because the death came so long after operation. High obstruction in the small intestine is rapidly fatal. Whatever the cause of the dilatation may have been, it is my first experience with it in gastric surgery.

The second fatal case was, likewise, one of chronic duodenal ulcer in a man of fifty-seven. His clinical history, going back eight to ten years, was entirely indefinite. His chief complaint had been colicky pain in the region of the umbilicus, entirely unaffected by the ingestion of food or the exhibition of alkalies. A very capable general practitioner, under whose care he had been, was inclined to believe that we were dealing with a progressive intestinal obstruction. The roentgenologist would not risk a diagnosis. My brief talk with the patient did not lead me to think of duodenal ulcer, but convinced me that he had some abdominal condition that demanded surgical investigation. An abdominal section disclosed a large chronic ulcer on the superior border of the duodenum, about $\frac{3}{4}$ in. from the pylorus. The duodenum was much deformed. The ulcer, with the surrounding infiltration, was as large as a silver quarter, and directly behind it, in the pancreas, was a considerable area of infiltration which made me suspect that there might be a chronic perforating ulcer of the posterior wall. The usual infolding with a posterior gastroenterostomy was done. The patient did perfectly well for seven days, and during that time ran a flat temperature with a pulse of about 60. On the eighth day he suddenly showed a very considerable rise of temperature (102°) and had some pain near the right costal border, with some vomiting; the temperature, however, fell rapidly, and in forty-eight hours was normal again, and thus continued for three days, the pulse holding about 60. On the thirteenth day the temperature rose rapidly to 104° , with a corresponding rise of pulse and severe pain and tenderness at the right costal border. The local physician opened and drained a right subphrenic abscess. There had been no escape of contents of the stomach or duodenum, and there was no dem-

onstrable connection between the field of operation and the abscess. Death occurred on the fourteenth day.

I am sorry that I was unable to do the second operation because I might possibly have enlightened myself on the cause of the infection. I have never seen another case of subphrenic abscess following an operation for unperforated ulcer of the duodenum. It is possible here that the infection may have been through the lymphatics or through the blood current (embolic) but I am puzzled to explain the run of absolutely normal temperature for a week, the sudden rise, the return to normal for three days and then the last and fatal rise. The case is one which certainly invites discussion.

The other patients, thirteen in number, had perfectly smooth convalescences; none suffered less than the three upon whom I felt obliged to do relatively severe operations (in two, "sleeve" resection of the stomach for chronic ulcer lying somewhat to the left of the Hartmann-Mikulicz line, and in one, resection of the pyloric end of the stomach and a portion of the duodenum for distinctly separate ulcers of both stomach and duodenum).

Brief references to a few points of technic may not be amiss here. The gastroenterostomies were all done with fine chronic catgut; at the most four interrupted, supporting sutures of linen were placed along the anastomotic line, sometimes only three and occasionally none. Four-row gastroenterostomies were the rule; five-row, the exception. In two cases, because of very thick abdominal walls, I could not get a satisfactory application of clamps to the stomach and in those instances I used the five-row method.

In doing "sleeve" resections the application of a right angle clamp placed on the lesser curvature above the proximal stomach clamp is a great aid in laying a secure suture line. It prevents too marked a slipping of the cut edges of the lesser curvature from between the jaws of the ordinary straight clamp. The difficulty of doing a rather high "sleeve" resection is also much lessened by freeing all adhesions about the ulcer before cutting the gastrohepatic omentum. Many of these ulcers high on the lesser curvature are pulled upward and particularly backward in the direction of the posterior wall by adhesions. A thorough freeing of the ulcer makes it far more easy of access.

The question of excising every duodenal ulcer and of securing a permanent blocking of the pylorus is still debatable, I believe. Excellent results from simpler methods are reported from clinics doing much duodeno-gastric surgery. In patients below par and in fat people I am careful to do as little as I conscientiously can. My experience in trying to do too radical work in fat patients is not very assuring. In patients who have had severe hemorrhage from duodenal ulcers, excision of the ulcer with permanent blocking of the pylorus should be the operation

of choice but it is not always possible to do this with reasonable safety. Then ligation of all visible vessels entering the indurated area and as complete an infolding as possible should be done. I have known a patient with chronic duodenal ulcer to die of hemorrhage ten years after a posterior gastroenterostomy.

Because in certain of my cases hernia has followed incision in the median line in the epigastric region (and such hernias are decidedly unpleasant and difficult of cure), my routine approach to the peritoneal cavity in gastro-duodenal cases is behind the belly of the left or right rectus muscle, the muscle fibres being retracted outward.

In the thirteen cases of chronic ulcer in these series, the appendix and gall-bladder were carefully examined for pathologic changes. In one case only did the appendix show what I was willing to consider inflammatory changes. In none was the gall-bladder macroscopically affected.

Flint's recent publication of his observations in the healing of gastrointestinal anastomosis warrants the continuance of the practice of keeping our patients on a low diet for at least two weeks after operation. His work shows that the healing of the mucous surfaces is only rarely complete before that time.

The occasional difficulty of distinguishing between a benign and a malignant gastric growth at operation is well illustrated by one case of this series. One of the patients showed an "hour-glass" stomach of moderate degree. This patient had undergone an exploratory abdominal section in Glasgow eight years previously and had been told that she had an inoperable cancer of the stomach.

DISCUSSION.

DR. PORTER: Hypertrophy of pylorus in adult. Pylorotomy. J. S. M., age 55, entered the Massachusetts General Hospital February 9, 1917. A perfectly well man until eight years ago. Indigestion for two years was followed by complete relief until two years ago when he suffered from acid stomach, occasionally vomiting without pain. Three months ago he had three fairly severe hemorrhages from the stomach within two hours; was confined to bed for three weeks. Thereafter developed nausea and a loss of forty pounds in weight. Test meal 200 c.c.; free hydrochloric acid 0.18; total acid 0.23. X-ray by Dr. Ariel George showed gall-bladder negative; stomach greatly dilated with prominent filling defect of pylorus and first portion of duodenum. Large six-hour residue.

Diagnosis. Obstructive lesion of the pylorus. Evident suggestion of chronic indurated ulcer; though we cannot exclude malignant disease. Diagnosis by Dr. Scudder and myself—chronic ulcer of pylorus; operation indicated.

Operation, February 11, 1917. Stomach normal; upper part of duodenum and pylorus bound to liver and gall-bladder by adhesions. Sphincter and adjacent pylorus much thickened like a doughnut. Through pylorus finger-tips meet. No red stippling; no frosting; no scar; no glands. This induration extended to the posterior part of the duodenum adjacent to the pylorus.

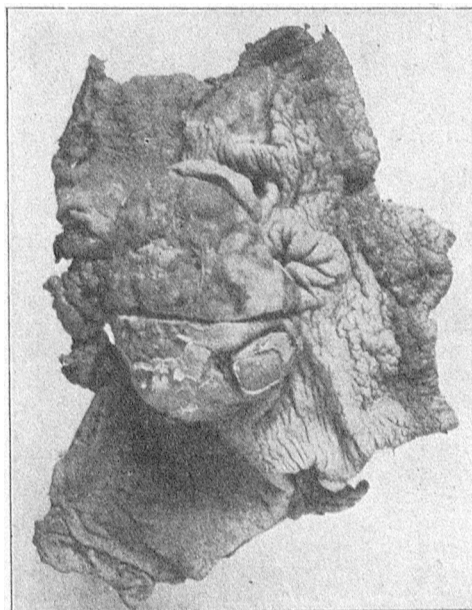
This seemed to be a case of hypertrophy of the

pylorus or possibly a malignant lymphoma, for ulcer and cancer seemed to be excluded on the above evidence. In view of the symptoms and the age of the man (55) I did a pylorotomy and a posterior gastroenterostomy. Symptomless convalescence, and discharged March 3.

Pathological Diagnosis. The pylorus shows a local nodular thickening of its posterior wall measuring $1\frac{1}{2}$ cm. at its thickest portion. On section the mucosa is pale and smooth. There are two shot-like small lymph nodes with a large prominent blood vessel in the great omentum.

Microscopical examination shows a normal mucosa with normal but greatly thickened and muscular wall. Some of the sections pass through the duodenum as evidenced by the presence of Brunner's glands. Sections of the lymph nodes show a normal lymph adenoid tissue. Sections of the large blood vessels above mentioned show considerable thickening of the intima.

Hypertrophy of the Pylorus. There may have been an old pyloric ulceration which gave rise to the bleeding with subsequent spasm and hypertrophy. This case suggests in the adult a hypertrophic pyloric stenosis of infants.

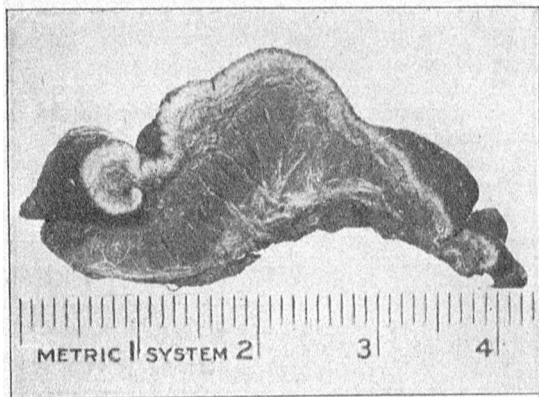


Note in the photograph the tumor growing from the gastric mucosa, projecting into the duodenum, and contrast the different appearance of the duodenal with the gastric mucous membrane. Stereoscopic photograph.

"Malignant Lymphoma Stomach." E. B., age 52, entered the Massachusetts General Hospital June 12, 1916. A perfectly healthy man until five months ago when he began to have pain in the epigastrium, radiating to sternum, without relation to meals. It was not at first severe, but has recently increased, coming on three or four times until night. He never vomits but raises a great deal of gas. Pain is sometimes relieved by food, sometimes not. He has lost twenty pounds. Abdominal examination negative; Wassermann test negative; test meal 75 c.c.; free hydrochloric acid absent; total acidity 0.7. X-ray shows a high stomach with sluggish peristalsis and irregular filling defect of antrum. There is no stasis.

Operation under Ether. Large mass involving antrum and media; few glands; liver negative. (Ow-

ing to the excellent condition of this patient and the apparent diagnosis of cancer, a difficult partial gastrectomy was done after a transverse incision had been made at the lower rib margin to give better access to the stomach. This was followed by an anterior gastroenterostomy. Three days after operation there was consolidation of the left lower lobe with fever and increased respiration. The pneumonia was clearing up when on the 20th the wound broke open, and intestines were found covering the abdomen, with fibrin and pus adherent. In spite of replacement, under ether, death occurred on the following day.



Section through nodular thickening. Note tremendously thickened muscularis with normal mucosa.

Pathological Examination. Pyloric portion of the stomach measuring 13 cm. along the lesser curvature. Pylorus easily admits the index finger. On opening the stomach there is an irregular, roughly circular tumor mass measuring 7 cm. in its greatest diameter, having a superficial ulcerated surface with raised edges. This mass is situated on the posterior wall and extends across the lesser curvature on to the anterior wall. Posteriorly the line of excision lies very close to the tumor mass. While distal it is separated from the edge of the tumor by almost the entire length of the pylorus. On the posterior peritoneal surface the growth projects in the form of several discrete nodules. The stomach wall is much thickened. There are a few slightly enlarged soft lymph-nodes in the omentum.

Microscopical Examination. All sections from this tumor mass show a submucosa infiltrated with a richly cellular tumor made up of undifferentiated cells with very little stroma, containing numerous thin-walled blood vessels. These cells run into the mucosa to some extent but do not infiltrate the muscular coat as much. The mucous membrane shows areas of superficial ulceration where the tumor cells infiltrate it. Sections of the lymph nodes show a normal lymph adenoid tissue. Malignant lymphoma.

"Fibro-sarcoma stomach." H. H., age 48, entered the Massachusetts General Hospital Oct. 22, 1913. A previously healthy man with the exception of occasional gas and vomiting at rare intervals for twenty-eight years. Three months ago he began to complain of continual oppression in the pit of his stomach with some eructation and vomiting. The vomitus was sour, and after a month contained food eaten two days previously. There was no pain; he lost twenty-five pounds; Wassermann test was negative; haemoglobin 80%; fasting contents 65 c. c.; guaiac plus; no free hydrochloric

acid; x-ray showed obstruction at pylorus with stasis well marked. The shadow was crescentic and convex at the pylorus, as if a rounded tumor occupied this position.

Diagnosis at the time—gastric ulcer.

Operation, Oct. 23, 1913. A median epigastric incision under local anaesthesia showed a tumor, apparently polypoid, within the pylorus and projecting for one-half of its mass into the duodenum. Tumor was the size of a plum; growth was clearly neither ulcer nor cancer; there was no stippling; no frosting; no scar on surface; no enlarged glands. Posterior gastroenterostomy.

Nov. 19, 1913, under gas and ether, a pylorotomy was done, removing the first portion of the duodenum, which was sutured in layers and drained. Convalescence uneventful.

Pathological Examination. Portion of stomach and duodenum section shows the pyloric opening filled with a plum-sized tumor mass adherent to the greater curvature; surface ulcerated; reddened; section smooth and attached to the mucosa by a broad base. A few soft lymph nodes.

Microscopical examination showed a very cellular growth with a fibrous tissue and occasionally very large cells. It is covered by a little, thin mucous membrane. At the base there is an infiltration of the growth between the bundles of muscular tissue. Fibro-sarcoma.

At the end of a year the patient had gained forty pounds, and yesterday, March 5, 1917, by telephone he reported that he was never better in his life.

DR. BROOKS: In some cases I do as little as possible. About five weeks ago I saw a case in which the abdomen was absolutely rigid and the patient was in tremendous pain. The only history I could get was that for some time previous the patient had been troubled with pain low down on the right side. Upon opening the abdomen the appendix was found to be perfectly normal. The abdomen was filled with fluid. An exploration showed that there was a perforated duodenal ulcer. The patient's general condition was so poor that I simply put a plug of omentum into the perforation and held it there with a cigarette wick. The patient made an uninterrupted recovery. The question now arises: How soon should one think of any operative procedure such as a gastroenterostomy? I feel confident that if I had tried to enfold the ulcer in this case, the result might have been different.

DR. HARTWELL: (Showed specimens: 2) This specimen shows a distinct nodular thickening on the posterior surface of the pylorus. You can see that it is half again as thick as the normal organ. There was no scar, no change in the gastric wall as evidence of any previous ulcer.

The second specimen is a lymphosarcoma, the common type of sarcoma of the stomach or intestine. It doesn't usually produce any stenosis of the viscera; merely a diffuse thickening of the stomach wall. Here the posterior wall of the stomach is greatly thickened by the growth.

DR. LUND: I have had quite a number of these cases lately and two fatalities: both in cases in which the condition was very serious and the operation comparatively simple. One woman had had hemorrhages for years. She was under the care of a doctor who said to her, "You shall never be operated upon until it is absolutely necessary." Finally

it became absolutely necessary after an acute hemorrhage. I found the duodenum adherent to the abdominal wall and in attempting to find the bleeder, there was an escape of gas as I was separating the duodenum, and I sewed up the hole. She continued to have a temperature and died in nine days. This gas came from a subdiaphragmatic abscess that I had gotten into; there was more gas than pus in it.

The second was a chronic ulcer which had penetrated into the pancreas, the stomach was enormously dilated, and the patient very weak. He had a high temperature for about a week after the operation and died.

A third case is interesting as showing that a very large cancer may not reveal itself to the x-ray examination if it is situated on the posterior surface of the stomach, for the stomach, being filled out with bismuth, may entirely hide it when it is viewed antero-posteriorly. The man went to a hospital clinic, where they made a diagnosis of duodenal ulcer. He was out in the country, and one day vomited a lot of blood; I don't know just how much, but it covered the snow for some distance. I operated on account of this great hemorrhage and found a very extensive cancer. The cancer was on the pancreas, rather shaped like a teacup, and I could feel the rim of the teacup in the stomach. The adhesions to the stomach were such that it was impossible to do anything more than an exploratory operation.

GASTRO-JEJUNOSTOMY UNDER LOCAL ANESTHESIA IN THE TWO-STAGE OPERATION IN GASTRIC SURGERY.

BY DAVID CHILVER, M.D., BOSTON.

[From the General Surgical Service of the Peter Bent Brigham Hospital.]

IN certain surgical conditions the performance of the indicated operation in two stages rather than in one finds increasing favor, and it is recognized that the effort to attain the ideal operative result by a single, rather than by two or even three procedures, may result in unnecessary disaster. As examples, may be mentioned the surgery of prostatic obstruction, of rectal carcinoma, and of intracranial tumors. But from the point of view of the patient, the repetition of a general anesthesia presents serious disadvantages; its necessity is faced with dread and apprehension, and too often in a patient discouraged by the prospect and already physically reduced, it is not well borne. It thus happens that, wherever possible, one or the other of the two stages is carried out under some form of local anesthesia; thus the preliminary suprapubic cystotomy is performed under local infiltration anesthesia, and the completion of the extirpation of rectal carcinoma by the perineal or sacral route is done under spinal anesthesia.

Certain surgical lesions of the stomach, or indeed of other organs, associated with or compli-

cated by pyloric obstruction, furnish an ideal field for the two-stage operation, the first stage consisting of relief of the obstruction by gastro-jejunostomy under local infiltration anesthesia. These patients may be reduced to a very extreme degree of asthenia and exhaustion by the practical starvation, so that a radical operation for the extirpation of the obstructing neoplasm, or even the giving of a general anesthetic for a palliative gastro-jejunostomy cannot be thought of. Frequently a wholly erroneous impression of the hopelessness of any attempt at a radical procedure is given by these cases. During the last two and one-half years the writer has carried out this preliminary procedure in ten cases, with one death, a mortality of 10%, or, adding Case No. 11, in which a transgastric cauterization and suture of a chronic perforating ulcer of the posterior wall of the stomach was carried out without gastroenterostomy, eleven cases, with a mortality of 9%. It should be emphasized that no selection of cases was made with regard to the operative risk, for during this period every case of pyloric obstruction which came under his observation and consented to the proposed procedure was operated on, in the conviction that unless the patient were *in extremis* the probability of remarkable relief to a distressing and indeed unbearable condition, at the price of a minimum of pain or discomfort, thoroughly justified the risk. The character of some of these cases as operative risks may be inferred from the following brief data: Cases 1, 4, and 5 (all adults) were so reduced that they weighed 79 lbs., 78 lbs., and 79 lbs., respectively; Case 6 was complicated by chronic nephritis with recent acute exacerbation and a phthalein output of 20% in two hours; Case 7 by syphilis, aneurysm of the arch of the aorta, aortic insufficiency and chronic nephritis; Case 9 by advanced prostatic obstruction, requiring constant drainage and prostatectomy one month later; Case 11 by chronic gout, emphysema, a chronic cardiac condition partly decompensated, chronic nephritis, a phthalein output of 12% and 15% in two hours (two determinations) and a chronic obstructing prostate. None of these cases would have been accepted by the writer for operation under a general anesthetic; yet the change wrought by the operation is well illustrated by Case 1, weighing 79 lbs., in whom at the preliminary gastro-jejunostomy a pyloric carcinoma was found, which was judged to be inoperable. Ten months later, having gained twenty-five pounds and having had no symptoms whatever, she insisted on an attempt at the radical removal of the mass, which now she plainly felt in the epigastrium. This was consented to on the ground that the necessarily incomplete exploration under novocaine might have been deceptive. At operation under ether, on Aug. 5, 1915, the inoperability of the tumor was confirmed. Not satisfied, after the expiration of another ten months, she was again explored by another surgeon, to whom her good