Experience with Resection of the Pancreas in the Treatment of Chronic Relapsing Pancreatitis *

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FAILURE to obtain satisfactory results with most of the indirect and less radical surgical procedures advocated for the treatment of chronic relapsing pancreatitis led us to evaluate radical resection of the pancreas for treatment of this disease.

The modern era of radical resection of the pancreas was introduced by Whipple in 1935 [10] when he successfully performed a pancreatoduodenectomy in two stages for the removal of an ampullary carcinoma. In 1944, Priestly [6] was the first surgeon to extend surgery of the pancreas to include its total extirpation, while Claggett [9] in November of the same year was the first to perform successfully total pancreatectomy for chronic relapsing pancreatitis.

In 1946, Whipple [11] reported five cases of pancreatitis treated by radical resection of the pancreas. His series included three cases of pancreaticoduodenectomy and two cases of total pancreatectomy, thus bringing the number of reported cases of total pancreatectomy to 14 of which four had been performed for pancreatitis.

During the past decade, increasing familiarity with the technical problems related to pancreatic surgery has resulted in greater efforts to treat chronic relapsing pancreatitis by more direct operative procedures including resection of the pancreas. Caudal pancreatectomy with anastomosis of the remaining pancreas to a defunctionalized limb of jejunum, an operation first performed by us in February 1951 but abandoned because of poor results, has been utilized by a number of investigators with varying degrees of success. Pancreaticoduodenectomy has been given consideration by a limited number of workers. The most notable of these are Cattell and Warren who reported in 1953 a series of 13 similar procedures performed without a death. They concluded that pancreaticoduodenectomy was the surgical treatment of choice for chronic relapsing pancreatitis since it permitted removal of the common point of ductal obstruction in the head of the pancreas and allowed removal of a major portion of the involved gland. Total pancreatectomy has had only limited application because of the serious physiological problems associated with it. Only eight of the 33 total pancreatectomies reported in this country had, as their indication, chronic relapsing pancreatitis. Claggett,[9] Rhoads,[8] Zinninger,[12] Owens,[5] Chapman,[3] and Cattell [2] have each performed one total pancreatectomy while Whipple has done two for this disease.

The purpose of this paper is to present our experience with eight patients suffering from chronic relapsing pancreatitis treated by radical resection of the pancreas, and to compare this experience briefly with results obtained by the more conventional and indirect surgical approaches which we have used.

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TABLE I. *Indirect Surgical Procedures Utilized for Treatment of Pancreatitis*

Operations	Number of Operations	Results		
		Good	Poor	NFU
1. Sphincterotomy	12	0	9	3
2. Gastric procedures	8	0	7	1
3. Pancreatic duct ligation	5	1	4	0
4. Pancreatic cyst-enterostomy	5	1	2	2
5. Neurectomy	4	0	4	0
6. Choledochostomy	3	0	3	0
7. Caudal pancreatectomy and pancreaticojejunostomy	2	0	2	0
8. Choledochojejunostomy	1	0	0	1
9. Cholecystostomy	1	1	0	0
Total	41	3	31	7

TABLE II. *Results of Indirect Surgical Procedures Utilized for Treatment of Pancreatitis*

41 Operations Performed on 26 Patients		
Good Results	Poor Results	No Followup
3	16	7

TABLE III. *Chronic Relapsing Pancreatitis Treated by Pancreaticoduodenectomy*

Case	Duration of Symptoms	Length of Followup	Evaluation of Results
1. F. H.	4 months	5.5 years	Excellent
2. C. C.	2 weeks	5.5 years	Excellent
3. G. C.	1.5 years	2.0 years	Excellent
4. L. F.	9 months	1.5 years	Excellent
5. V. H.	2 years	1.3 years	Improved

TABLE IV. *Chronic Relapsing Pancreatitis Treated by Total Pancreatectomy*

Case	Duration of Symptoms	Length of Followup	Evaluation of Results
1. S. D.	3.5 years	1 year	Improved
2. L. R.	11 years	7 months	Excellent
3. J. G.	10 years	4 months	Dead

INDIRECT SURGICAL PROCEDURES

Our experience with most of the indirect operations employed in the treatment of chronic relapsing pancreatitis was unsatisfactory except when dealing with cases of primary biliary tract disease. These cases are not included in this discussion. Results with indirect surgical procedures utilized for the treatment of chronic relapsing pancreatitis during the past nine years are tabulated in Tables I and II. During this period 14 procedures were used 41 times in 26 patients for treatment of pancreatitis. Seven of these patients were lost to follow-up. Results obtained in the remaining 19 patients were considered satisfactory in two (cholecystostomy and cystgastrostomy), equivocal in one (pancreatic duct ligation), and unsatisfactory in the remaining 16. It is of interest that sphincterotomy, the procedure most frequently employed, accounted for only one satisfactory result. This case was not included in the tabulation of sphincterotomies utilized for the treatment of chronic relapsing pancreatitis since it was performed after the patient's first attack of this disease. It is conceivable that satisfactory results with this procedure might have occurred if we had used it earlier in the course of pancreatitis before irreversible architectural changes within the pancreas had intervened.

DIRECT SURGICAL PROCEDURES

The ineffectiveness of indirect surgical procedures which we used for treatment of chronic relapsing pancreatitis made it clear that, in our hands at least, these methods do not provide satisfactory therapy. This experience, as well as the superior results obtained in two cases of chronic relapsing pancreatitis treated by pancreaticoduodenectomy for the presumptive diagnosis of carcinoma, has prompted us to evaluate resection of the pancreas as an alternative form of treatment.

Important considerations in the selection of cases suitable for this form of therapy were recurrent attacks of abdominal pain associated with an elevated amylase con-

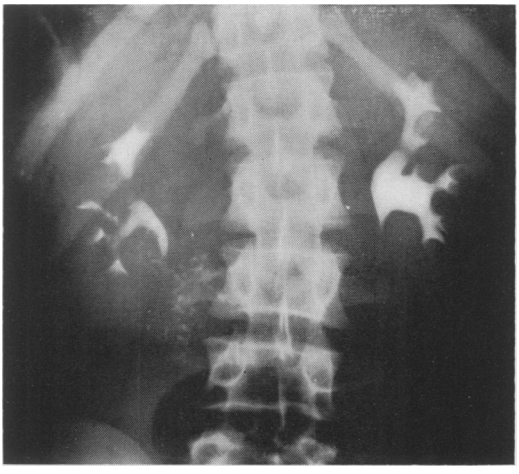

FIG. 1. Case 3. Calcifications were present in the head of the pancreas.

tent of the serum or urine and the increasing frequency of attacks with persistent abdominal pain between attacks. Factors suggestive of marked architectural changes within the pancreas which we considered important in the evaluation of a patient for pancreatectomy were (1) failure to obtain an elevated serum amylase with an attack of pain when formerly this had occurred, (2) evidence of calcification in the region of the pancreas on roentgenographic examination, (3) onset of diabetes, (4) weight loss, (5) an increase in the frequency and bulk of the stool as well as its fatty character, (6) failure to obtain a positive secretin test, and (7) gross appearance of the pancreas at laparotomy. Utilizing these criteria, the following eight patients were selected for resection; pancreaticoduodenectomy was performed in five (Table III) and total pancreatectomy in three (Table IV).

Pancreaticoduodenectomy: **Case 1.** F. H., a 52-year-old white man with a history of moderate alcoholism and a 30 pound weight loss, entered the hospital because of constant upper abdominal pain of 4 months' duration characterized by radiation to both flanks. For 1 month prior to entry the patient also complained of left chest pain and periodic attacks of chills and fever. A massive left pleural effusion initially served to confuse the diagnosis.

After a diagnosis of retroperitoneal tumor was made, the patient was explored on October 19, 1950. A diffuse enlargement and firmness of the entire pancreas was noted, but the head was particularly hard. Based on frozen sections of a biopsy of the head of the pancreas, the diagnosis of carcinoma of the pancreas was made and a pancreaticoduodenectomy was performed. Subsequent permanent sections were interpreted as "extensive, calcareous, cystic, chronic, scarifying pancreatitis with atypical ductal hyperplasia" rather than carcinoma.

During the 5½ years that have elapsed since operation, this patient has had no recurrence of pancreatic pain. Without the benefit of pancreatic replacement therapy, he has had 4 to 5 soft stools a day and has maintained a steady weight of 125 pounds, although his best preoperative weight was 155 pounds.

Case 2. C. C., a 63-year-old white man, was admitted to the hospital for painless jaundice and was explored for possible carcinoma of the pancreas on October 10, 1950. The head of the pancreas was notable for its hardness. On the basis of a diagnosis of carcinoma made from frozen sections of a pancreatic biopsy, a pancreaticoduodenectomy was performed. Subsequently, study of the permanent sections showed chronic pancreatitis rather than carcinoma of the pancreas. The immediate postoperative course was complicated by biliary and pancreatic fistulae which closed spontaneously.

The patient's history in the 5½ years after operation was uneventful and unassociated with any unusual abdominal complaints. His most recent weight was 190 pounds as compared with his preoperative weight of 135 pounds. In spite of the sporadic use of pancreatic extracts he has had only 1 to 3 soft but formed stools a day.

Comment. As a result of two patients operated upon for suspected carcinoma of the pancreas, we have had two long term follow-up studies of patients with chronic pancreatitis treated by pancreaticoduodenectomy. The absence of clinical evidence of pancreatitis and the excellent nutritional status maintained by these patients for 5½ years after operation demonstrated the satisfactory, long term results which may be obtained with this procedure. The tail of the pancreas, which represents approximately ¼ to ⅓ of the total pancreatic tissue, was implanted into the bowel in both patients and was sufficient to maintain normal exocrine and endocrine activity in each case.

Case 3. L. F., a 34-year-old negro man with a history of heavy drinking, was admitted for epigastric pain radiating to the left flank of 9 months' duration, jaundice of 2 weeks' duration, and a 45

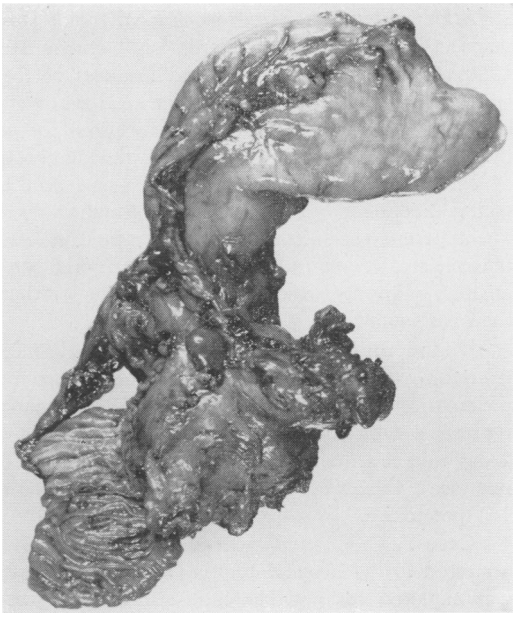

FIG. 2. Case 3. Although inflammation was present throughout the pancreas, the head was the portion principally involved. A pancreaticoduodenectomy was performed.

pound weight loss which had occurred during the present illness. Calcifications were seen in the area of the pancreas on roentgenographic examination (Fig. 1).

With a preoperative differential diagnosis of chronic relapsing pancreatitis or carcinoma of the pancreas, a laparotomy was performed on September 28, 1954. The pancreas was involved in a chronic inflammatory process throughout. The head was stony hard and was enlarged by a cystic mass approximately 6 cm. in diameter (Fig. 2). A pancreaticoduodenectomy was performed, and in spite of the involvement of the caudal portion of the pancreas it was retained and implanted into the jejunum.

The patient's postoperative course was uneventful; he has had no abdominal pain since operation; and he has returned to full employment as a painter. The patient took no pancreatic extract and continued to have approximately 7 soft stools a day. His last reported weight of 127 pounds equaled his preoperative weight but not that of his ideal weight of 150 pounds.

Comment. Although the results of this case were excellent during the 18 months since operation, a favorable prognosis could only be made with reservations for the tail of the pancreas was obviously involved in a chronic inflammatory process at the time of operation. For this reason the patient was observed carefully for possible recurrence of pancreatitis in the remaining portion of the gland. Although metabolic studies were not made, it appeared that the remaining islet tissue was sufficient to maintain the normal endocrine function of the pancreas, but that an insufficient amount of acinar tissue remained to provide the normal exocrine activity of the pancreas. Pancreatin was beneficial in alleviating this deficit but the low potency of this drug required a daily consumption of 15 to 20 grams for therapeutic effectiveness. Because of the cost, inconvenience, and gastric side effects many patients, such as this one, refused to take pancreatin in the amount necessary for satisfactory replacement therapy. The nutritional status of this patient may be further improved by the use of viokase, a pancreatic extract of greater potency than pancreatin, which we observed to be well tolerated and very effective.

Case 4. V. H., a 38-year-old white man with a history of chronic alcoholism, was first diagnosed as having pancreatitis in December 1952. He was treated conservatively until March 1954, at which time a sphincterotomy was done. No benefit was derived from this procedure, and on December 15, 1954, a pancreaticoduodenectomy was performed. The postoperative course was complicated by pericholecystitis which developed secondary to pancreatic drainage and which necessitated cholecystectomy.

During the 15 months since operation he has been hospitalized twice for left abdominal pain radiating to the left flank. Each of these attacks was mild and of short duration as compared with the attacks prior to resection of the pancreas. The serum amylase was not elevated with either of these attacks. His bowel pattern after operation varied widely from 1 or 2 soft, formed stools to 5 or 7 soft, fatty stools a day. His maximum postoperative weight of 138 pounds was 24 pounds below his preoperative weight.

Comment. This patient, like the previous one, was allowed to retain the caudal end of the pancreas in spite of the fact that pancreatitis was also present in this portion. It is of interest that during the first 15 months after operation he had only two mild attacks of abdominal pain as compared with five severe attacks during the same period preceding pancreaticoduodenectomy. Both postoperative attacks followed an alcoholic debauch, and the presumptive diganosis of each was pancreatitis of the remaining portion of the pancreas. In spite of the patient's apparent satisfactory nutritional status the caudal end of the pancreas, while adequate to prevent diabetes, was insufficient to maintain normal digestion and absorption. This suggests that the benefit derived from the retention of a small portion of the pancreas, even though it may be

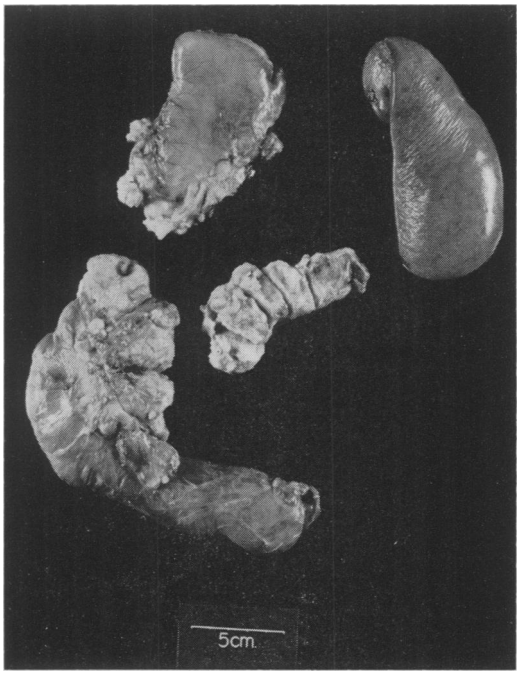

FIG. 3. Case 7. The marked degree of achitectural destruction of the pancreas predicted by the preoperative studies was verified at operation. Because of the marked degree of involvement, a total pancreatectomy was performed.

abnormal, is worth the risk of recurrent attacks of pancreatitis.

Case 5. G. C., a 41-year-old white man with an alcoholic history, was admitted because of constant epigastric discomfort and attacks of severe upper abdominal pain radiating to the back of 1½ years' duration. For 4 months prior to admission there was constant pain with acute exacerbations at monthly intervals. A markedly elevated serum amylase was present when tested during three attacks of severe abdominal pain. On physical examination there was evidence of a 15 to 20 pound weight loss and moderate tenderness in the epigastrium. A roentgenogram of the abdomen demonstrated diffuse areas of calcification in the region of the head of the pancreas.

The head and one-half of the body of the pancreas and the duodenum were resected on March 4, 1954. The distal end of the pancreas was anastomosed to the jejunum. The immediate postoperative course was uneventful except for taking small, daily doses of insulin sufficient to maintain the blood glucose level within a normal range.

During the two years since operation the patient has gained 16 pounds, his appetite has been good, and he has had regular and normal bowel movements. He stated that his general strength was "possibly less than could be desired" but he "passed" a physical examination for re-enlistment in the military service in November 1955 and was working regularly. A recent attack of mild abdominal discomfort was completely relieved by belladonna. He has not taken insulin since leaving the hosiptal.

Comment. This patient shows an excellent result from partial pancreatic resection which has been maintained over a two year period. Persistent abdominal pain and recurrent attacks of pancreatitis were completely relieved by removal of that portion of the pancreas in which gross architectural changes and calcification had occurred. The remaining portion of the pancreas, although somewhat fibrotic at the time of operation, has continued to produce adequate amounts of endocrine and exocrine secretions.

Total Pancreatectomy: **Case 6.** S. D., a 39-year-old white man who admitted excessive use of alcohol, entered the hospital because of a history of pancreatitis which dated from August 1951 and which was treated by dorsal sympathectomy and splanchnicectomy in September 1954 without benefit. On admission in December 1954 he was 30 pounds underweight and was having constant abdominal pain with intermittent exacerbations. The fasting blood sugar was 242 milligrams per cent and stools were grossly fatty. Although the patient was addicted to demerol, pancreatectomy was recommended because it was evident that the chronic pancreatitis precluded successful management of the narcotic addiction.

At laparotomy on March 1, 1955 total pancreatectomy was performed because of the severe degree of pancreatitis which involved the entire gland. The patient's postoperative requirement of insulin ranged from 30 to 40 units a day. His stools were large, loose, and fatty unless controlled by viokase. Although he did not have pain similar to that before operation, he complained of being "shakey" and of having crampy abdominal pain when narcotics were withdrawn. He admitted his dependency upon narcotics and registered with the Federal Bureau of Narcotics in order to insure their constant supply.

Comment. Although it was recognized before operation that the patient was addicted to narcotics we were equally confident that the pain of chronic relapsing pancreatitis was also present. Operation relieved this patient of his pancreatic pain and he returned to work; nevertheless, the results of pancreatectomy were not considered successful since his weight remained below normal, he required insulin to control his diabetes whereas this had not been necessary before operation, and he remained a narcotic addict. In spite of the questionable re-

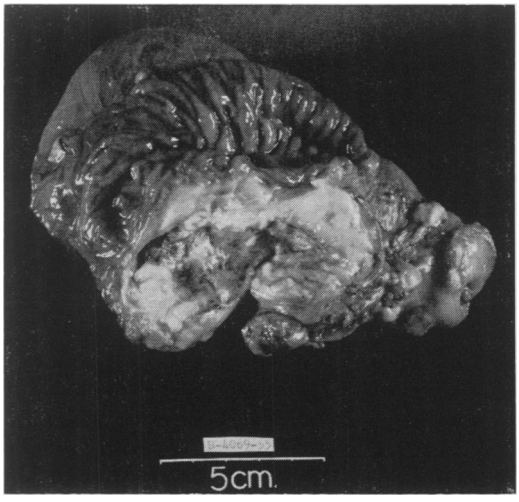

FIG. 4. Case 7. An enlarged view of the head of the pancreas depicts the degree of fibrosis and cystic degeneration that was present.

FIG. 5. Case 7. Photomicrograph of the pancreas demonstrating fibrosis, inflammation, ductal dilatation, and virtual absence of normal pancreatic tissue.

sult of pancreatectomy the patient was satisfied and appeared to be leading a more comfortable existence than before operation. In retrospect, treatment by resection was justified; and yet in view of the experience obtained by followup studies of those patients in whom a densely fibrotic caudal portion of the pancreas was retained, it was our opinion that pancreaticoduodenectomy would have been the procedure of choice.

Case 7. L. R., a 34-year-old white man who was a moderately heavy beer drinker, was admitted because of a 10 year history of intermittent upper abdominal pain which penetrated to the back and was associated with a 40 pound weight loss. The attacks occurred with such frequency and severity at the time of admission that there was no interval completely free of pain; he required 40 grains of codeine a week for relief. Studies revealed a diabetic glucose tolerance curve, bulky stools with a high fat content, and a negative response to secretin. Roentgenographic examination revealed calcium throughout the area occupied by the pancreas.

At laparotomy on September 20, 1955 the pancreas was hard throughout, but most marked in the head and body. The gland was densely adherent to surrounding tissues and its edges were obscured by the encapsulating chronic inflammatory process. A total pancreatectomy was performed; the marked degree of fibrosis, calcification, and cystic degeneration was best seen in the gross specimen (Figs. 3 & 4), while the marked destruction of pancreatic tissue and replacement by fibrosis and inflammation were more apparent in the photomicrograph (Fig. 5). Dissection of the specimen revealed no ductal communication between the gland and the gastrointestinal tract. The patient made an uneventful recovery except for abdominal crises associated with initial attempts to withdraw codeine. Eventually these efforts were successful, and the patient was permanently weaned from all narcotics. The diabetes was easily controlled by the administration of 30 to 40 units of insulin a day. With the daily intake of 6 Gm. of viokase the stools were large, well formed, and limited to two or three a day. The patient's appetite was ravenous, but it was noted that satiety was reached on a lower caloric intake if viokase was used regularly. The patient gained 12 pounds after operation and was fully employed.

Comment. Although no evaluation regarding the long term results in this case was possible seven months after operation, at that time the patient stated that he had "never felt so well in ten years" and was exceedingly well satisfied. From the nutritional and metabolic aspects, the handicap imposed by total pancreatectomy was not disabling. The marked architectural changes of the pancreas made it difficult to understand how any treatment other than resection could have produced a satisfactory result. Had treatment by resection been postponed for any appreciable time, this patient undoubtedly would have become a narcotic addict.

Case 8. J. G., a 36-year-old white man with a heavy alcoholic background, received a heavy blow to the left flank in 1944. A year later pancreatitis developed and, in October, 1953, a cholecystectomy and dilatation of the sphincter of Oddi was performed. The patient had very few symptoms for one year following this procedure, but by the time of admission in March 1955 daily left upper quadrant and left chest pain had increased to such intensity that regular doses of demerol were required. On examination there was a suggestion of a mass in the left upper quadrant, and the pain in this area was increased by abdominal palpation. The fat content of the stools was elevated, and weight loss was evident. The glucose tolerance curve was not abnormal, and no calcifications were seen in the area of the pancreas on roentgenographic examination.

On May 18, 1955, laparotomy revealed that generalized pancreatitis, most marked in the caudal portion of the gland, had eroded the spleen and resulted in a collection of approximately 500 ml. of blood in the left upper quadrant. The spleen and distal portion of the pancreas were excised, and the stump of the pancreas was over-sewn but not implanted into the small bowel. An abscess followed by a persistent pancreatic sinus tract complicated the postoperative course and resulted in the patient's nutritional deterioration and need for large doses of narcotics.

On October 27, 1955 the patient was re-explored, and a pancreaticoduodenectomy was performed, removing all of the remaining pancreas. Although the postoperative course was long and difficult he appeared to make a satisfactory recovery. At the time of discharge the patient was receiving 60 to 85 units of insulin a day, 6 Gm. of viokase a day, and, to the best of our knowledge, no narcotics.

Comment. After leaving the hospital the patient was lost to followup. Subsequently, information was obtained that he died 4 months after operation, presumably as a result of complications from diabetes.

The total pancreatectomy performed on this patient was done under extenuating circumstances which do not make the case comparable to the others reported in this series. If total pancreatectomy had been performed initially rather than as a secondary operation after removal of the tail of the gland had resulted in multiple complications and narcotic addiction, the result might have been different. The cause of this patient's death has not been verified. The possibility of a fatal hypoglycemia is likely, however, since unrecognized and therefore uncontrolled hypoglycemia represents the greatest danger to the life of the patient following this operative procedure.

DISCUSSION

Although the pathogenesis of pancreatitis is not clear, chronic relapsing pancreatitis appears to be a progression of acute pancreatitis differing in the important respect that resultant architectural changes within the pancreas, ductal hyperplasia, fibrosis, lithiasis, and cystic degeneration produce ductal obstruction which operates as the key to recurrent insults and the perpetuation of chronic relapsing pancreatitis. In cases of far advanced disease where the normal architecture of the pancreas has been destroyed, it appears unlikely that indirect surgical procedures will have more than a limited value in treatment. Failure to obtain reasonably consistent results in the treatment of this disease with any of the indirect or less radical direct surgical methods has led to an evaluation of pancreatic resection in a limited number of cases.

Radical resection of the pancreas for pancreatitis should not be undertaken lightly for the technical problems are far greater than those accompanying a similar procedure for malignancy. Resection was attempted by us in nine cases and completed in eight with no immediate deaths. There was one late death, four months after total pancreatectomy. In one patient the procedure was terminated because of injury to the portal vein. This patient recovered, and after a suitable interval resection may be attempted again. The intimacy of the tributaries of the portal vein to the pancreas and the dense inflammation surrounding these structures makes dissection of the pancreas from these vessels the point of greatest technical difficulty and will undoubtedly result in an occasional fatality. In spite of the hazzards associated with this type of therapy, the risk of this procedure is justifiable in carefully selected cases

where other procedures offer no possibility of curing the patient.

In addition to the technical aspects associated with radical resection, there are nutritional and metabolic problems associated with total pancreatectomy which must also be considered.

Diabetes has not occurred in any case of pancreaticoduodenectomy, but has presented a special problem in cases of total pancreatectomy. Diabetes in the latter cases was extremely labile during the immediate postoperative period with wide swings in the blood sugar level after relatively small doses of insulin or intravenous glucose. Although the total amount of insulin required was greatest during the first few days after operation, the extreme fluctuations that occurred in the diabetic control made it necessary to alter the management from hour to hour. The most difficult period in diabetic control of the depancreatized patient began with the oral intake of food. Estimation of the actual caloric intake during this period was impossible because of an inconstant appetite and poor digestion and absorption. The use of tube feeding during the period that oral nutrition was resumed was a valuable means of coping with this problem. After stabilization and the patient's oral intake was satisfactory, good diabetic control was not difficult. The average daily requirement of insulin for each of two patients ranged from 30 to 40 units, while the insulin requirement in the patient who died ranged from 60 to 85 units a day. The increased difficulty in the diabetic control of the latter undoubtedly was an important factor in the cause of death. The theoretical considerations for the excessive insulin requirement of this patient are beyond the scope of this paper.

Nutritional Defects. The postoperative nutritional status of the patients in this series was variable. One patient regained his ideal weight, five patients equaled their preoperative weight, while two patients were discharged below their preoperative weight. Following pancreaticoduodenectomy the patient's stools were formed but of increased bulk. Diarrhea was an exception although the balance of the gastrointestinal tract was easily upset by dietary indiscretions. The normality of the bowel pattern undoubtedly was influenced by the degree of involvement of the remaining portion of the pancreas.

Patients with total pancreatectomy, on the other hand, had mushy stools, the character of which could be greatly influenced by the use of pancreatic substitution therapy. For this purpose we utilized viokase rather than other preparations of pancreatin since the former was more effective. Raw pancreas is the starting substance for both viokase and other forms of pancreatin, however, the method of manufacture of these products is different. Viokase, effective in ⅓ the dosage of other brands of pancreatin that we have used, is void of the untoward gastric symptoms associated with pancreatin. For these reasons there was greater assurance that the patient would use adequate pancreatic replacement therapy when viokase rather than pancreatin was administered. The ravenous appetite complained of by the patients with total pancreatectomy was more readily satiated by the use of viokase. This effect was presumably the result of an increased absorption of food.

Liver Function. A totally depancreatectomized dog maintained on insulin alone develops a fatty liver, a decreased insulin requirement, hypolipemia, and abnormal liver functions. Although liver biopsies were not available in our patients, it was noteworthy that the insulin requirements did not diminish, hypolipemia did not develop, and no abnormalities of routine liver function studies were demonstrated. To this extent, therefore, it can be said that no evidence of fatty liver developed in our patients following total pancreatectomy. This

suggests that the alterations in lipid metabolism that have been observed in the dog following total pancreatectomy do not occur in the human subject after a similar procedure. This is further indicated by the work of Nardi [4] who demonstrated with radioactive phosphorus a normal phospholipid metabolism in a depancreatized patient; whereas Barker *et al.*[1] had previously reported an abnormal phospholipid metabolism in depancreatized dogs.

Degenerative Changes. Our patients have not been followed sufficiently long to know whether they are more susceptible to degenerative changes than those with spontaneous diabetes. Priestly [6] reported a total pancreatectomy performed for benign islet cell tumor in 1942, and a recent communication from him [7] indicated that this patient was alive and that degenerative changes characteristic of diabetes had not been observed thus far.

All of our cases of chronic relapsing pancreatitis treated by radical resection have not been followed sufficiently long to allow a final evaluation. The results obtained thus far, however, suggest that the method is promising and worthy of further study. To date there has been one death in eight cases, while in the remaining seven cases the results were good in five and improved in two. These results were far superior to any form of indirect surgical therapy employed by us in the treatment of chronic relapsing pancreatitis. We are in agreement with Cattell and Warren [2] who consider resection of the pancreas the current treatment of choice for far advanced case of chronic relapsing pancreatitis with ductal obstruction. For the best results from this form of therapy, it is important to select the patients before they have become involved in narcotic addiction. Further study may warrant extension of this form of therapy to cases of pancreatitis which appear unrelenting in their course before the degree of pancreatic destruction reaches the magnitude represented by the cases herein reported. Our data suggest that when treatment of pancreatitis by resection is contemplated, every consideration should be given to retaining the caudal end of the pancreas even though evidence of inflammation and fibrosis are present. The additional morbidity and mortality and the magnitude of the nutritional and metabolic defects created by total pancreatectomy justifies the risk of recurrent pancreatitis which results from retention of the tail of the pancreas following pancreaticoduodenectomy.

SUMMARY

Forty-one operations representing 14 indirect surgical maneuvers were employed as treatment for chronic relapsing pancreatitis in 26 cases. Results of the operative treatment of these patients were good in three cases, poor in 16, while the remaining seven were lost to followup.

The poor results obtained with the conventional surgical procedures utilized for the treatment of chronic relapsing pancreatitis led us to an evaluation of radical resection of the pancreas. Pancreaticoduodenectomy was performed on five patients and total pancreatectomy on three patients. There was no immediate mortality but one patient died four months after operation. Results in the remaining seven cases, after a period of followup study ranging from six months to five and a half years, were considered excellent in five cases and improved in two cases.

A comparison of results obtained with pancreatic resection and other surgical procedures employed by us for the treatment of chronic relapsing pancreatitis suggests that removal of the archietecturally destroyed pancreas with its distorted and obstructed ductal system is a more satisfactory surgical approach than indirect measures designed to influence the patho-physiology of the disease. The nutritional and metabolic changes associated with total pancreatectomy are so marked compared

with those following pancreaticoduodenectomy that the former procedure should not be performed unless the functional capacity of the entire gland has been severely involved in the destructive process.

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DISCUSSION.—DR. JOHN M. WAUGH, Rochester, Minnesota: Drs. Longmire, Jordan and Briggs have rightfully emphasized the value of resection in selected cases of relapsing pancreatitis. I brought some slides along, but I have decided to dispense with them because I was afraid Henry Harkins might measure them. (Laughter)

We have felt that the less radical procedures, such as sphincterotomy, and sphincterotomy has been done transduodenally, coupled with T tube drainage and cholecystectomy, even in the face of a normal-appearing and normal-feeling gallbladder, have been advisable, and we have also tried retrograde drainage of the tail of the pancreas. I used this latter procedure three times about two years ago, and two of those patients maintain that they have obtained benefit from it. The third is very questionable. However, these two less radical procedures have seemed to us to be advisable before undertaking the resection, because our early experience with total pancreatectomy was not entirely satisfactory.

We have had very poor results with the nerve severing procedures, both unilateral and bilateral. In general, we have used resection under the following circumstances:

First, when there is a localized abscess in the tail or adjacent body of the pancreas. This abscess can be very small—as small as 1 to 2 cm—and still give considerable pain. I resected one of these in 1942, thinking it was probably a very small carcinoma causing the pain, and when it was opened it was actually a small, well-encapsulated abscess. Dr. Priestley just recently removed a very similar one.

Second, there are large inflammatory masses that are due to resolving abscess or pseudocyst that will overlie the pancreas and will cause quite a bit of destruction of the pancreas, and I think it is better to remove that rather degenerating pancreatic tissue rather than leave it in the tail and adjacent body.

Third, there are cutaneous fistulae that result from both inflammation and trauma. Rather than do an anastomosis if that fistula arises in the tail or body, I would advise you to resect that portion of the pancreas and the portion distal to it.

Fourth, localized calcification in the head of the pancreas with severe pain, I feel, is a definite indication for resection if the less radical procedures fail. Certainly failure of the conservative procedures mentioned at the beginning would be an indication to think of resection.

As far as results are concerned, I have the impression that when we have used sphincterotomy and other procedures, we have not gone over those definitely because they are of too short duration, but I have the impression that sphincterotomy has not helped more than 60 to 65 per cent of our patients.

Dr. Longmire has well shown the advantages for proper fat digestion in leaving a portion of the pancreas even when it may appear quite fibrotic.