Results of Operations of the Whipple Type in Pancreaticoduodenal Carcinoma *

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CARCINOMA of the head of the pancreas and the lower end of the bile duct, including the papilla of Vater, has been an important cause of obstruction of the common duct and of death throughout much of the history of medicine. It remained for a former president of the American Surgical Association, Dr. Allen O. Whipple, to propose and carry out a radical surgical procedure for extirpation of these carcinomas. Dr. Whipple's original publication on this subject was in 1935, when he proposed a two-stage procedure which he soon gave up in favor of a one-stage attack.[5]

Many surgeons have endeavored to follow in Dr. Whipple's footsteps, and at the Hospital of the University of Pennsylvania, 14 surgeons have taken major responsibility for 38 such operations performed for carcinoma. A very large number of these procedures must have been carried out in the various hospitals over the country.

Mortality has been high. Long-term good results have been infrequent and the difficulty of establishing the diagnosis at the time of operation is often great. For these three reasons the responsibility of deciding upon a radical resection of the head of the pancreas, the duodenum and the lower end of the common duct has been a heavy one, and one which a good many surgeons have hesitated to take. Mortality statistics have begun to improve in some centers, so that there is hope that the risk of operation will progressively decline.

The question of what the operation holds in terms of long-term results is an important one, because the answer to it may largely determine how much use we should make of the Whipple operation and its variations in treating carcinomas in the region of the distal common duct. It is to this end that we have recently reviewed our experience at the Hospital of the University of Pennsylvania. This began to accumulate in 1941. Up until May 1, 1952, or five years ago, 21 Whipple operations were done in a total of 83 patients who were operated upon with a diagnosis of pancreaticoduodenal carcinoma (a resectability rate of 25 per cent). Only 17 of the 21 patients survived the first 30 days, but of this group we are able to report that six are still alive, and only two of these six have had known recurrence. To Dr. Zintel goes credit for four of these long-term survivors. Three of the four deaths occurred before the first 30-day survivor in 1943.

The average survival time of those patients whose deaths were not directly associated with operation but did not survive the five-year period was 19 months. If we take the entire group including those who died from operation and those who are

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still living, the average survival time thus far is 33 months and is, of course, increasing month by month as the survivors grow older. If one discounts the operative deaths, the average survival time of those recovering from operation is over 40 months. We have sought in vain to establish a good control series of individuals with pancreaticoduodenal carcinoma who have been treated with side-tracking operations for palliation. Fifty of these procedures have been done in our hospital, but in 58 per cent of such cases, the diagnosis was not established histologically, nor was the nature of the disease established by autopsy. Thus, it has not been possible to develop an accurate control group.

The longest known survivor following a side-tracking procedure without resection of the tumor in a patient who had the diagnosis established is 42 months. The general pattern is, of course, much shorter, and McDermott and Bartlett,[3] reporting from the Massachusetts General Hospital in 1953, give a survival interval of nine months for cases not subjected to the Whipple procedure. In 24 such cases in our series which were followed, survival was also nine months. Our impression is that the average survival time of such cases probably lies between six and 12 months, but the justifiable reluctance of surgeons to biopsy the pancreas has made it difficult to assess the cases in a completely reliable manner. For instance, there are four patients without biopsy who are surviving from five to 13 years following a shunt, and showing no apparent signs of deterioration. These patients' histories are quite compatible with those of chronic pancreatitis and are reminiscent of two similar cases of Dr. Walter Lee's [2] who were still surviving at eight and 11 years respectively.

DISCUSSION

It has not been practical for clinicians to separate carcinomas of the head of the pancreas from those of the adjacent common duct. The typical projecting carcinoma of the papilla of Vater may, of course, be recognized clinically or even diagnosed by x-ray in advance, but these are exceptional. It, therefore, seems more helpful to consider the carcinomas of the papilla, the lower end of the bile duct, the head of the pancreas, and the adjacent duodenal wall as one group. Any of these can produce juandice and usually do. We have not included in our study carcinomas of the upper portion of the common duct or of the hepatic ducts, nor have we included those of the body and tail of the pancreas.

The cardinal symptom of the pancreaticoduodenal carcinomas is jaundice. Statistically, pain, weight loss and various other symptoms may be just as frequent, but it is jaundice which usually precipitates diagnostic and therapeutic action. This jaundice is usually progressive and not remittent except in the case of the ulcerating tumors of the papilla, which may at times have periods when the jaundice decreases. Because of the importance of jaundice in directing attention to this area and in establishing the need for operation, it is interesting to speculate that the prognosis may vary with the size of the tumor required to obstruct the common duct. Thus, the narrowest portion of the common duct is at the papilla, and presumably a very small growth in this area could be capable of obstructing the outflow of the common duct. Any tumor arising along the wall of the distal common duct would also have to grow a relatively small amount before it produced jaundice. Those arising in the head of the pancreas would have to grow even somewhat larger, depending upon the distance between the center of origin and the comon duct, and this is also true of the tumors of the adjacent duodenal wall. Carcinomas arising in the body or tail of the pancreas probably would kill the patient before they grew large enough to

obstruct the lower end of the common duct; and to our knowledge we have not been successful in recognizing any of these tumors early enough to obtain a five-year survival. Indeed, they are seldom recognized early enough to resect at all.

In view of the fact that both the liver and its bile ducts and the pancreas form as buds or outpouchings from the embryologic alimentary tract, one would not expect very different types of tumors to arise from these four tissues, and it may well be that it is the size more frequently than the character of the tumor which determines prognosis in the resected cases.

With the exception of the series reported by Dennis and Varco [1] a year ago, mortality has been generally high. Analysis of our fatal cases indicates that postoperative hemorrhage, apparently due to autodigestion of arterial walls, has been the most important single cause of death. The necessary factors for such a course of events would seem to be the extravasation of pancreatic juice, plus the duodenal juice required to activate it, into the peritoneal cavity. From this standpoint one may well raise the question of whether it would not be safer to remove the entire pancreas than to remove merely the head. Dr. Julian Johnson and Dr. Zintel have carried out this plan successfully. However, there has also been some mortality with total pancreatectomy.

The method should be used if further experience with it establishes its increased safety. On the other hand, if it does not prove safer than partial pancreatectomy, it has the disadvantage of rendering all such patients totally diabetic and of depriving them of the digestive ferments which the body and tail of the pancreas may eloborate.

Another method which was employed recently with a view to preventing autodigestion is shown in Figure 1. The tube draining the duct of Wirsung was led through the jejunal loop and then out through a purse string suture to the outside. By continuous suction on the tube, it was hoped to remove all of the pancreatic juice from the duct of Wirsung. The procedure worked out well and the patient had a rather smooth course. Further experience will obviously be required to evaluate it.

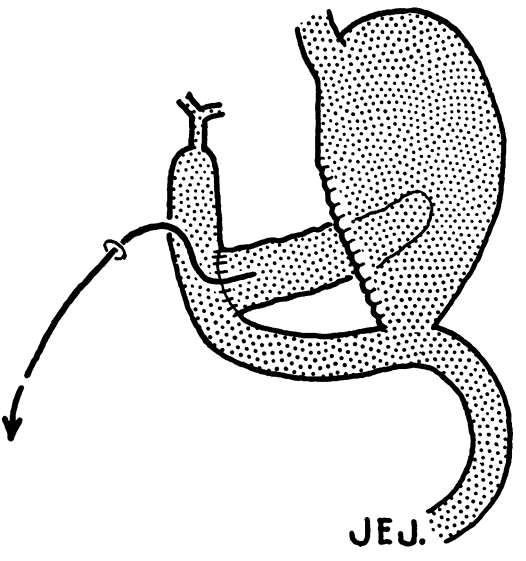

FIGURE 1

SUMMARY

A series of 38 Whipple operations for carcinoma is presented with a complete follow up study on 21 patients undergoing operation up to May 1, 1952.

TABLE I. *Whipple Operations for Pancreaticoduodenal Carcinoma (H.U.P.), 1941–1952*

Youngest patient	38
Oldest patient	69
Average age at operation	55
Women	8 (38%)
Men	13 (62%)

TABLE II. *Total Whipple Operations for Carcinoma up to 5/1/52 (H.U.P.): 100% Follow up*

Operative deaths	4 (19%)
Five-year survivors	6* (29%)

* Constitute 35 per cent of those patients who recovered from operation.

TABLE III. *Whipple Operations for Pancreaticoduodenal Carcinoma (H.U.P.) Five-Year Survivors*

Patient	Site of Tumor	Years of Survival	Condition	Surgeon
M. T.	Bile duct	Over 6	Has had recurrence	J. E. R.
G. P.	Bile duct	Over 6	Apparently free of tumor	H. A. Z.
B. D.	Ampulla of Vater	Over 7	Apparently free of tumor	H. A. Z.
D. C.	Ampulla of Vater	Over 5	Apparently free of tumor	J. E. R.
A. C.	Duodenum	Over 6	Has had recurrence	H. A. Z.
A. R.	Bile duct	Over 10	Apparently free of tumor	H. A. Z.

TABLE IV. *Whipple Operations for Pancreaticoduodenal Carcinoma (H.U.P.): All Patients Operated upon up to 5/1/52*

Primary Location	No. of Patients	No. Surviving 5 Years or More	Survivors
Head of pancreas	6	0	0%
Lower end of common bile duct	8	3	37%
Papilla of Vater	4	2	50%
Duodenal wall	3	1	33%
Total	21	6	29%

TABLE V. *Five-Year Survivors of Whipple Operations for Pancreaticoduodenal Carcinoma from the Literature*

Author and Year	Head	Ampulla and Papilla	Duodenum	Common Duct	Location Not Stated	Total
Orr, T. G.[4] (collected series) 1952	4	9				13
Dennis and Varco[1] (collected series in addition to Orr's) 1956	8	3	1		1	13
Rhoads, Zintel and Helwig 1957		2	1	3		6
Total	12	14	2	3	1	32

Table I shows the age and sex statistics. There were four operative deaths, a mortality of 19 per cent, but there were also six five-year survivors, a five-year survival rate of 29 per cent for the five-year series, and a rate of 35 per cent for those who survived the operative period (Table II). Table III shows the status of the survivors. Table IV analyzes the cases by site of origin, and in Table V this series is combined with the recent summary of reported cases by Dennis and Varco.

Only two of the long-term survivors are known to have disease. Others are working and leading active and useful lives. We believe this rate of 29 per cent is distinctly better than rates obtained in malignancy in some other areas of the alimentary tract,

such as the esophagus and the fundus of the stomach. The mean survival of 33 months compares with a survival of only nine months in those in which side-tracking procedures were done.

While 21 cases do not comprise a large series, we believe that radical pancreaticoduodenectomy is worthwhile for the more favorable cases of pancreaticoduodenal carcinoma, and that efforts should be focused on lowering the operative risk.

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DISCUSSION

DR. ZINTEL: I would like to comment on four aspects of this problem:

1. The early and late symptoms before operation,

2. The histologic diagnosis of the presence of a carcinoma;

3. The origin of the tumor with respect to the advisability of resection; and

4. Adequate exploration.

As in almost all cancerous lesions, it seems reasonable to expect that early diagnosis and early operation for carcinoma in the region of the head of the pancreas will produce a considerably better survival rate. Many of the patients which we have reported had marked delays before they were referred to us for definitive surgery. In some, the interval between severe symptoms and definitive operation was almost two years. Several had had previous operations, the most frequent of these being biliary tract operations.

In our first 25 patients subjected to pancreaticoduodenectomy, the incidence of the most common early symptoms—symptoms which cause the patient to either stop work or to consult his family doctor regularly were: pain, 48 per cent; jaundice, 40 per cent; weight loss, 24 per cent; indigestion, 24 per cent. The immediate preoperative symptoms were: pain, 72 per cent; jaundice, 88 per cent (intermittent in 13 per cent of these); and indigestion, 84 per cent.

In less than one-third of a group of 25 consecutive patients were we able to have a definite histologic diagnosis after exploring the abdomen and attempting to obtain a biopsy specimen of the mass. This means that frequently the operating surgeon must make a bold decision. In the past there have been some discussions at this meeting and others to the extent that pancreaticoduodenectomy should be performed for carcinoma of the duodenum or papilla, and of the common bile duct, but not for pancreatic ductal or acinar lesions, because the prognoses in the latter are so poor. Such discussions are academic, and not practical, in the light of our present-day methods of diagnosis.

Dr. Rhoads has mentioned the pathologist's dilemma, and I have commented on a part of the surgeon's dilemma. I would also like to remind you that the majority of the operable lesions arise in a mass of tissue about 4 centimeters in diameter and 2½ centimeters in thickness. In most of the patients that we have reported, from one to two hours have been spent in attempting to establish the nature of the mass, and in looking for evidences of tumor invasion and tumor spread to lymph nodes and to other tissues within the abdomen, before any essential structures were divided. Patients who have no hope of cure should not be subjected to an operation of this magnitude.

Four, or 33 per cent, of the 12 patients operated on by me have lived five to ten years after operation. I am inclined to believe that pancreaticoduodenectomy is a good operation. Thank you. (Applause)

DR. BAKER: Mr. President, members and guests, I am sure that most of us are critical of those extensive operations which demonstrate skill to the exclusion of mature surgical judgment. However, the Whipple resection for the cancer which is still localized in a good risk patient, should not be put in this category.

Because so few cases have properly qualified for this operation, and because so much emphasis has been placed, of late, on the paucity of five-