such as morphine or a barbiturate is ever allowed, atropine being the sole premedication.

Arguments against the use of any form of premature delivery are gaining strength and are based on the increased risk to life that prematurity forces on a child already holding reduced chances of survival. Recently, attempts are being made to allow cases to proceed without interference and to terminate in natural births. Barns and Morgans adopting this policy estimate that any added foetal loss by death in utero can be set against an improved neonatal survival rate. A much more extensive group of cases must be watched before their conclusions are justified and before the accepted method of early Caesarean section carrying certain improvement in foetal survival rates should be abandoned.

To come to the right decisions as to whether to terminate, the best time to choose, the right method to use, each case should be completely reviewed at 35 weeks, preferably in hospital.

It is abundantly clear from what has already been said that exceptional care must be afforded the infant, irrespective of the manner of its birth. Gentle handling, especially of the fragile head, during delivery and after, warmth and a clear airway are the fundamentals. Upper air passages must be cleared with a mucus catheter and gastric suction employed to avert inhalation of stomach contents. Incubation with oxygen is needed for three to five days, according to the maturity and response of the infant. No fluid is given in the first forty-eight hours during which oedema subsides and considerable weight loss results from spontaneous diuresis. Hypoglycaemia not being considered to contribute much to neonatal problems, glucose should not be given. If the infant does well to the third day it stands a good chance of survival. Later deaths are accounted for by congenital defects or by birth injuries.

In conclusion it must be emphasized that not all diabetic women are subject to these hazards. A small number escape and undergo a normal pregnancy, terminating naturally in the delivery of a healthy full-term child. One such experience is a good portent for continued uneventful childbearing. Unfortunately, no simple means has yet been devised to distinguish this fortunate group from the unfortunate majority who will be exposed to the more eventful course. Even were hormonal imbalance accepted as the critical factor in the evolution of abnormality, the estimations required for its detection are time consuming, difficult and expensive and could not be applied on any wide scale. It is better to regard all diabetic pregnancies as potentially abnormal unless assurance from a previously excellent obstetrical history is available.

\[\sqrt{C\text{ARCINOMA OF THE}}\]
\[\text{HEAD OF THE PANCREAS}\]

By Rodney Smith, M.S., F.R.C.S.

Surgeon, St. George’s Hospital, London

Cancer of the pancreas has not long been considered a possible, let alone a profitable, field for excisional surgery. Until about twenty years ago very few attempts had been made to perform more than a palliative operation, though a certain number of local, conservative resections had also been carried out and one radical pancreato-duodenectomy similar to the modern operation had been attempted, though without success, by Codivilla as early as 1898.

The middle 1930s saw a considerable revival of interest in this difficult branch of surgery, and the advent of vitamin K in 1935, which so greatly reduced the risk of operating upon a jaundiced patient, naturally had a good deal to do with the progress made. In this year (1935) Whipple and his associates described their two-stage procedure for the radical resection of a carcinoma of the ampullary region and a great deal of the credit for reviving interest in pancreaticectomy for cancer must be given to these authors. In 1937 Brunschwig successfully removed a carcinoma of the head of the pancreas using a similar two-stage procedure.

These islands and the Commonwealth did not lack surgeons of skill and high courage interested in the surgery of this region. Gordon-Taylor, James Walton and Illingworth are names that at once spring to mind, while Victor Hurley of Melbourne had a success with resection by the retro-duodenal route. No one who heard Gordon-Taylor about this time will forget his enthusiastic insistence that radical surgery must be attempted on all suitable cases. His papers in 1942 and 1943 referred to several successful cases of his own, though his technique in those days was less...
radical than the modern pancreateo-duodenectomy and he described Maingot's case, reported in 1941, as being the first truly radical resection in this country with success.

Today the operation of radical pancreateo-duodenectomy is still on trial, for although it has been performed successfully on many occasions since the war, on both sides of the Atlantic, the largest series by any one surgeon being published by Cattell in 1949, the number of cases in which survival for a lengthy period has followed is depressingly small.

We have had time now to digest the experiences of the post-war years and it is a suitable moment to take stock and analyse the present position in the treatment of these difficult tumours. Surgery has beyond doubt moved in the right direction in this problem, though there is room for discussion not only whether it has moved far enough but also whether it may have moved too far. In considering the problems of pancreatic cancer, the writer has felt that serious consideration must be given to the possibility that in certain cases radical surgery, although the tumour can be classified as just operable, offers such a slender chance of immediate survival combined with a high probability of early recurrence that a palliative procedure is preferable to attempted resection. Before deciding that the right course is to adopt an attitude of 'Come what may, this must be excised,' the surgeon should be very certain that this decision is taken not through a natural desire to pit his skill against a difficult technical problem, but because judgment and humanity together bring the conviction that this course is the best for the patient.

The focus of the problem has thus changed. It is no longer a question only of how to overcome the technical difficulties of operating upon an organ whose relations make radical surgery very complicated, but also of which cases to operate upon and how much to attempt.

It is not the intention of the writer to indulge in any description of operative technique, save in broad outline, but rather to indicate certain principles in clinical diagnosis and investigation which appear to have become established as a result of the increased general interest in these tumours, and to present a personal view upon the scope of surgery based upon experiences with 28 cases and analysis of relevant literature.

Clinical Manifestations and Diagnosis

It is well to consider carcinomas of the head of the pancreas and ampullary carcinomas together, for in both the symptom which usually brings the patient to his doctor is jaundice. Standard textbooks give the impression that this usually appears unheralded by other symptoms and, in particular, without pain, deepens progressively without remissions, and is accompanied by a palpable enlargement of the gall-bladder. In fact, this description is often misleading. In most cases of carcinoma of the head of the pancreas pain is a prominent symptom and usually precedes the onset of jaundice. It may be severe and is variously described as burning, aching or boring, is generally constant and unaffected by food, situated in the mid-epigastrum or just to the right of the mid-line, sometimes referred through to the back. Pain is less frequently a symptom of an ampullary growth and when present is usually not severe, but some pain is complained of in about half of these cases.

The jaundice is usually progressive, but remissions do sometimes occur, possibly as a result of sloughing of the centre of soft tumour blocking the exit of the common bile duct. With the jaundice occurs nausea and occasionally vomiting, a dirty tongue and offensive breath, bradycardia, loss of appetite and often lassitude and asthenia. Loss of weight is common. Acholic stools and bile in the urine are simply demonstrated. Steatorrhoea, associated with obstruction of the pancreatic duct, is an infrequent feature.

Examination of the abdomen usually reveals enlargement of the liver, which has a firm rounded edge, not tender unless some degree of cholangitis is present. In late cases hepatic metastases may be obvious. Below the edge of the liver the fundus of a dilated gall-bladder may be felt, constituting the well-known sign of Courvoisier, not always present, one should remember.

An ampullary growth is never, a growth of the head of the pancreas hardly ever, itself identified by palpation of the abdomen, but very occasionally in a thin patient a carcinoma of the head of the pancreas can be felt as an ill-defined epigastric mass. If a retro-peritoneal mass is felt, it is much more likely to consist of lymph glands enlarged by metastatic deposits of growth.

Other evidence of metastasis should be sought, such as ascites, which may be caused by generalized malignant involvement of the peritoneum or by obstruction of the portal vein, and deposits of growth in the pouch of Douglas or in supracavicular lymph glands.

Investigations

Examination of the Stools. Absence of bile pigments may be accompanied by an excess of unsplit fat and undigested meat fibres, but this is a very inconstant finding. The stools should also be examined for occult blood. If performed properly, every stool passed for several days being examined, this must be regarded as an important investiga-
tion, for occult blood is present in most cases of ampullary carcinoma and absent in most cases of biliary obstruction by a gall-stone.

*Examination of Duodenal Aspirate.* If a tube is passed into the duodenum under radiological control, the fluid aspirated can be centrifuged and the deposit and liquid examined for red blood cells and mucus, malignant cells, bile and pancreatic ferments. In theory this is a valuable investigation. In practice useful information is seldom obtained.

*Radiological Examination.* Examination with a barium meal confirms the presence of a carcinoma in a percentage of cases bearing a close relationship to the skill and experience of the radiologist and his interest in this particular field. Expansion of the duodenal curve is seen if a large tumour in the head of the pancreas is present, or there may be compression or distortion of the duodenal wall. Invasion may be demonstrated by a study of the mucosal relief patterns of the duodenum and the pyloric portion of the stomach. A combination of invasion and oedema at the ampulla may produce a typical filling defect resembling a 'reversed 3.' Evidence of invasion is necessary before a certain diagnosis can be made, for although expansion and compression of the duodenum is strongly suggestive, lesions other than a carcinoma of the pancreas can give this appearance, notably lymphatic glands of the pancreatic group enlarged by secondary metastasis from a gastro-intestinal carcinoma or by Hodgkin's disease. Obstruction of the duodenum by an ampullary growth is occasionally seen but is uncommon.

*Gastric analysis* is not of value as an aid to diagnosis, but the demonstration of hyperchlorhydria has some bearing upon the technique of the operation.

*Tests of Liver Function.* These are of importance in helping to distinguish an obstructive from an hepatogenous jaundice. Many tests have some value. The writer has come to place considerable reliance upon two in particular. A normal thymol turbidity test, indicating a negligible shift in the albumin: globulin ratio, combined with a markedly elevated serum alkaline phosphatase nearly always indicates an obstructive jaundice.

**Treatment**

The necessity for laparotomy is clear in most cases, even though it may not be certain that a carcinoma is the cause of the biliary obstruction.

*Pre-operative Treatment.* This is mainly a matter of common sense. It should include the identification and treatment of anaemia or hypoproteinaemia, the administration of a diet rich in protein and glucose, low in fat, and vitamin K either orally with bile salts or by injection. An X-ray of the chest should exclude pulmonary metastasis. Penicillin may be employed to bring under control an associated cholangitis, though the best treatment for this is the speedy relief of biliary obstruction. Preparation for blood transfusion during the operation should be made.

*Laparotomy* may be performed through a para- or median, transverse or inverted T incision. The dilated common bile duct is noted, and its freedom from calculus obstruction confirmed. The gall-bladder is nearly always found to be similarly dilated. Evidence of metastasis is sought. The head of the pancreas is carefully examined, and this cannot be efficiently done until it is mobilized by incision of the peritoneum to the right of the duodenal convexity so that the head can be lifted forwards and palpated between finger and thumb.

From this examination it may be clear that the head of the pancreas contains a growth, or it may be anything but clear, the pancreas being apparently normal. A third possibility is to find a hard indurated pancreas, clearly the site of chronic inflammation but very possibly the site also of a small impalpable carcinoma. It cannot be emphasized too strongly that if in a case of obstructive jaundice the common bile duct is found to be dilated and free from calculus, but the pancreas feels normal or to be the site of inflammation only, the examination must not end here. It is only too likely that a small ampullary carcinoma is the cause of the obstruction, and in order properly to display and examine this region the duodenum should be opened and the medial wall palpated, with a probe passed down the common bile duct to the site of obstruction. If, then, a lesion obstructing the lower end of the common bile duct is to be subjected to biopsy, *transduodenal* biopsy should be performed, cutting right down to the probe in the common bile duct from the duodenal lumen. This will obtain a piece of tissue from the actual site of obstruction and will not lead to an external pancreatic fistula. The reverse is, of course, the case if a surface biopsy of the pancreas is performed.

**Operative procedures available,** assuming a carcinoma of the head of the pancreas or ampulla is identified. These include:

1. **Radical Pancreato-Duodenectomy.** This operation involves the block removal of the head and neck of the pancreas, and occasionally body and tail as well, if total pancreatectomy is performed, the whole of the duodenum, a variable amount of the stomach and the lower end of the common bile duct. The divided common bile duct and stomach are then anastomosed to the jejunum and the severed pancreatic duct is either tied off or implanted into the jejunum or stomach. For various reasons it is less safe to tie off the
Fig. 1.—Ampullary carcinoma. Typical 'reversed 3' appearance shown by Barium meal.
Reproduced by courtesy of Dr. Kemp Harper of St. Bartholomew's Hospital.

Fig. 2.—Radical pancreateo-duodenectomy. Extent of the resection.
(Figs. 2, 3, 5 and 6, reproduced by kind permission of the Medica Press).

Fig. 3.—One-stage radical pancreateo-duodenectomy. After resection and before reconstruction.

Fig. 4.—One-stage radical pancreateo-duodenectomy. The reconstruction.
FIG. 5.—Cholecyst-jejunostomy and entero-anastomosis, can also be performed as Stage 1 of a two-stage radical pancreato-duodenectomy.

FIG. 6.—Two-stage radical pancreato-duodenectomy. Stage 2.

FIG. 7.—Specimen removed by radical pancreato-duodenectomy.
common bile duct and use the gall-bladder for the biliary-intestinal anastomosis, but if this variety of reconstruction is preferred, the stump of the common bile duct should be invaginated and oversewn like the duodenal stump in performing a gastrectomy. The operation may be done in one or two stages, as illustrated in Figs. 2-6.

(2) Conservative Resection. Local Excision of the Tumour. This may be done by trans-duodenal or retro-duodenal approach, or cylindrical duodenal resection may be performed.

(3) Biliary Short-Circuit. Anastomosis of the dilated biliary system to the stomach or small intestine.

(4) External Biliary Drainage.

Results of These Operations

(1) Radical Pancreateo-Duodenectomy. The clear-cut figures quoted by Cattell in 1949 illustrate well the scope of the radical operation. He analysed the cases of 165 patients undergoing exploratory laparotomy at the Lahey Clinic between the years 1942 and 1948. It was found possible to perform a radical pancreateo-duodenectomy in 56 of these, divided as follows: 20 ampullary carcinomas, 30 carcinomas of the head of the pancreas, 4 carcinomas of the duodenum, and 2 carcinomas of the common bile duct.

The operative mortality was 14.3 per cent., distributed between the two major groups, thus:

One death in 20 resections for ampullary carcinoma (5 per cent.), and five deaths in 30 resections for carcinoma of the head of the pancreas (16.7 per cent.).

The long-term results of these operations was as follows:

Ampullary growths: 12 available for 5-year follow-up (three alive and well, nine dead—three of these lived for 3 years or more). Thus 25 per cent. of patients survived for 5 years or more.

Carcinoma of the head of the pancreas: 25 patients available for study (18 had already died). The average length of survival of these was 11 months and the longest period of survival was 19 months. Seven patients were still alive, having survived: one for 3 years 7 months, one for 2 years 3 months, one for 1 year 3 months, and three for less than 1 year.

The difference in the immediate and remote prognosis between carcinomas of the head of the pancreas and ampullary carcinomas in this series is striking, the operative risk being three times as great in the former and the chances of surviving 3 years being in the order of one-twelfth as good. No other series of cases of this size is available for study, but many have commented upon this difference in prognosis.

The writer has explored the abdomen of 28 patients for primary malignant obstructive jaundice, with the results shown below.

(2) Conservative Resection. Trans-duodenal resection of a small ampullary growth, provided it is skilfully performed, undoubtedly carries a smaller immediate risk to life than the radical operation, and although it seems probable that the long-term prognosis is less good, this is by no means certain. At all events, prolonged survival has quite often followed this limited operation, as shown by the pioneer work of Gordon-Taylor, Illingworth, James Walton and Victoria Hurley.

(3) Biliary Short-Circuit. This does not greatly increase the length of survival, but relieves jaundice and resultant pruritus and usually brings about a very considerable temporary improvement in condition. Operative technique must aim at minimizing the chances of gastric or intestinal reflux into the bile passages, which may lead to ascending cholangitis.

(4) External Biliary Drainage. Cholecystostomy has little to commend it. It is probably true, but by no means certain, that the immediate risk to life is less than that of biliary-intestinal anasto-
mosis. It is also probably true that the later risk of ascending cholangitis is less. It will certainly allow the jaundice to clear and symptoms such as pruritus to disappear, but the writer cannot feel that any operation which leaves the patient with an external fistula through which pours his entire biliary output can be called truly palliative, a word implying that the physical condition of the patient is made more comfortable.

The Choice of Operation. In the opinion of the writer the results of the radical operation have proved disappointing. The operation clearly has its place, but its scope is not as great as early optimistic reports suggested. The following is a personal view upon the choice of operation:

(1) *An ampullary carcinoma is found.* If the growth is mobile and there is no sign of metastasis, radical pancreato-duodenectomy should be performed, unless the patient is over 70 or considered too ill or too feeble to withstand an operation of this magnitude, even if performed in two stages. In such a case trans-duodenal resection is to be preferred. If the patient is a fit subject but doubts exist of the malignant nature of the obstruction, trans-duodenal biopsy and cholecyst-jejunostomy should be performed, and if the histological report confirms a carcinoma the radical operation is completed as a two-stage procedure. Apart from this indication it is preferable to carry out the radical operation in one stage.

(2) *Carcinoma of the head of the pancreas is found without metastases.* The duodenum and head of pancreas are mobilized and local operability assessed. If the growth is fixed to the portal vein or superior mesenteric vessels, radical surgery should be abandoned, even though brief survival has followed resection and end-to-end anastomosis of the portal vein and even resection and ligation. Radical pancreato-duodenectomy should only be performed if the preliminary mobilization opens up peri-pancreatic planes free from oedema or fixity. The radical operation performed for growths which have already given evidence of extension, directly or via lymphatics, outside the strict confines of the gland itself carries a high risk to life and such a poor chance of freedom from early recurrence that a palliative short-circuit should be preferred. The risks of ascending cholangitis are probably minimized by employing a choledocho-jejunostomy, using either a Roux type of anastomosis or an anastomosis of the gall-bladder to the apex of a jejunal loop with an entero-anastomosis of the afferent and efferent loops (Fig. 5).

Total pancreatectomy carries a very high immediate mortality and offers a minimal chance of long survival. It should be reserved for those cases in which this complete integrity of the peri-

pancreatic cellular planes is present, but the malignant process involves all or practically all the pancreas. As may be imagined, this is an infrequent finding.

(3) *If metastases are present,* either with an ampullary or pancreatic carcinoma, again palliative cholecyst-jejunostomy should be performed, relieving jaundice and improving the general condition of the patient, even though adding little to the period of survival. Occasionally the gall-bladder has already been removed, or is diseased, or the malignant process has involved the junction of the common bile duct and cystic duct, allowing no bile to enter the gall-bladder. In such a case an anastomosis not of the gall-bladder but the common bile duct to the jejunum must be performed.

(4) *External biliary drainage,* cholecystostomy, should never be contemplated.

(5) *Duodenal obstruction,* a late and infrequent complication, may call for gastro-jejunostomy.

Post-Operative Treatment

Once more this is largely a matter of common sense. Blood transfusion during and after the radical operation should be accompanied by other measures to minimize shock and followed by careful attention to fluid and electrolytic needs during the next few days.

Among the post-operative complications to be watched for and treated are:

(1) Pulmonary complications, particularly atelectasis.

(2) Acute dilatation of the stomach.

(3) Paralytic ileus, with or without

(4) Peritonitis, usually a result of leakage of pancreatic juice or bile.

(5) Sub-phrenic abscess.

(6) Biliary or pancreatic fistula.

(7) Acute pancreatitis, the danger of which, after pancreatic surgery, is more theoretical than practical.

Space does not permit any detailed discussion of the treatment of these and the more rare complications, though in the management of these difficult cases it is certain that without careful attention to detail in the post-operative period the surgeon may well fail to reap the reward of early diagnosis and a successfully performed resection.

BIBLIOGRAPHY


due either to the necessarily small calibre of the tube in relation to thick intestinal contents sometimes encountered, to further distention occurring in the bowel above the level of the end of the tube, as suggested by the increased aspirate which may be obtained on withdrawing the tube to a higher level or to the arrest of the tube above an angulated distented loop of bowel. This additional factor of mechanical superimposed upon functional obstruction, caused by angulation of distended bowel is very important and arises in all cases in which distension becomes severe. Multiple points of obstruction are produced and attempted surgical relief is never indicated as these angulations rapidly become reduced once normal peristaltic activity is resumed. Obstruction by adhesions at a single site certainly occurs following peritonitis, but it is seldom seen in the early post-operative period. At one time it was considered that, in some cases, obstruction might be due to a localized loop of small intestine becoming paralyzed by immersion in a collection of pus in the pelvis (the ileus duplex of Sampson Handley), but it seems doubtful if this is ever really so although the relief of obstruction which may follow the drainage of an intraperitoneal abscess tends to support it. It may be, in fact, that the intestine has become angulated and oedematous by becoming involved in the formation of the wall of the abscess and that this is relieved when the pus has been evacuated.

Prolonged inhalation of oxygen in high concentrations has been advocated in an attempt to reduce distention by displacing the nitrogen in the bowel. It is very difficult to judge clinically of its efficacy, but this does not seem to be very great, certainly not sufficient to justify the additional discomfort and manipulation that it entails.

Stimulation of the bowel by various methods has also been advised on many occasions in the treatment of paralytic ileus, but as far as that complicating peritonitis is concerned it is contraindicated. There is no convincing evidence that enemas can induce reflex peristalsis in the small intestine and they may, in fact, add to distention by being retained and fail to relieve even large bowel ileus when this is present. Cholinergic drugs may cause contraction of the bowel but this contraction does not seem to be of the co-ordinated propulsive type necessary for the forward trans-

mission of the intestinal contents. They may, in fact, stimulate further secretion from the bowel wall and where the mechanical obstructive element has supervened there are other possible dangers.

Certain other factors which have already been dealt with, such as the control of infection and of the water, electrolyte and protein balance of the body will have a direct effect on improving the circulation of the bowel wall and maintaining it in such a condition that its normal function may return. They constitute an essential part of treatment.

**Provision of Rest and Relief of Pain**

The importance of ensuring adequate rest in the form of sleep and relief of pain and anxiety in general peritonitis has already been mentioned, and this is even more true when paralytic ileus has ensued. Many conflicting accounts have been given of the effects of morphine on the motility of the alimentary tract. Even if it were proved conclusively, however, that it had inhibitory effects on the intestinal muscle, its enormously valuable general effects would continue to justify its use.

**Conclusion**

Improvement in the prognosis of general peritonitis has been very marked in recent years. The most important factors responsible are the introduction of the antibiotics, the fuller understanding of the fluid, electrolyte and protein balances of the body, the use of gastrointestinal decompression and the earlier diagnosis and treatment of the acute abdomen. More powerful antibiotics with an increased range of activity may become available in the future, but in the absence of the most careful pre- and post-operative management, attention to general surgical principles and to the details of surgical technique, it is doubtful if the outlook in this condition can be further improved to any great extent.

**BIBLIOGRAPHY**


LIVINGSTONE, E. M. (1912), 'A Clinical Study of Abdominal Cavity and Peritoneum' (Hoeber's Surgical Monographs No. 1), New York: Paul B. Hoeber, Inc.

---

**CORRECTION**

We must apologise for the Printer’s error which appears on p. 583 of the November issue, this acknowledgment should read (Figs. 2, 3, 5 and 6 reproduced by kind permission of The Medical Press).