Review of general surgery 1977

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Introduction

This year the emphasis is on the interaction of different disciplines on Surgery. The search for more accurate 'non-invasive' investigations of abdominal disease has led to interesting advances in the use of ultrasound and computerized axial tomography, rivalled only by the developments in sophisticated radiology. As more and more drugs come on the market, the surgeon encounters more and more strange surgical syndromes entering into his differential diagnosis and often requiring operative intervention. Antibiotics in surgical practice continue to require careful assessment in order to enjoy their benefits and avoid their disadvantages. In gastroenterology, some important aspects of peptic ulceration and of Crohn's disease are discussed. No apology need be made for once again riding the author's hobby horse of wound healing – perhaps the public will be relieved to realize that surgeons are taking a keen interest in the safe healing of surgical wounds! As usual, the review ends with a selection of interesting publications which appeared in 1977.

Abdominal investigations

For decades, clinicians have had only a relatively limited range of special investigations available to them in the diagnosis of abdominal symptoms. We have rested heavily on the various radiological contrast studies available for the alimentary canal, the biliary system and the urinary tract. Investigations of liver, spleen, pancreas, the pelvic organs and the retroperitoneum has depended to a large extent on displacement of contrast-filled viscera, supplemented in some cases by arteriography, with its accompanying risks. The last few years have seen an explosion in technology and this includes the use of ultrasound, computerized axial tomography, the development of sophisticated new radiological techniques, and the production of an amazing range of fibre-optic endoscopic instruments.

Vicary (1977) presents a useful progress report on the value of ultrasound in gastroenterology. This depends upon the principle that sound is reflected when it passes across two tissues of unequal acoustic density. Fluid reflects virtually no sound, whereas gas

totally disperses the sound waves. Thus, an organ situated behind a gas-filled structure is virtually 'invisible', so that the pancreas, for example, may be completely 'hidden' behind the colon. Fat disperses the ultrasound and therefore obese patients are unsuitable for this technique. Ultrasound is particularly valuable in the diagnosis of liver cysts and abscesses, for the detection of intra-abdominal abscesses and for demonstrating a distended gall bladder and biliary ducts (in which gall stones may also be clearly visualized). Thus, in a study of 26 patients with jaundice, Vicary and his colleagues (1977) had 24 technically good ultrasound scans and were able to make a correct diagnosis in 23 cases, 9 having extra-hepatic obstructions and 14 being shown to have non-surgical jaundice. However, a pancreatic mass was visualized in only 2 of their 6 cases of carcinoma of the pancreas. In contrast, pseudocysts of the pancreas, being fluid-filled, are well visualized, so that Arnaud and his colleagues (1977) found that ultrasound was able to confirm the diagnosis in 14 cases and gave useful information about their size, their site and whether or not the cysts were multiple.

Unfortunately, the diagnosis of primary or secondary liver tumours is not a simple matter using ultrasound (Vicary, 1977). In practice, the difference in acoustic properties between two solids such as the normal liver and a tumour is extremely small and only the most modern machines with grey-scaling have the capacity for detecting these small differences. When there is a mass in the region of the gall bladder, ultrasound may be useful in deciding whether or not the diagnosis is one of acute cholecystitis. Berger and his colleagues (1977) describe 3 patients who mimicked acute cholecystitis with a palpable mass in the right upper quadrant but where ultrasound demonstrated the mass to be separate from the gall bladder. These patients proved to have, respectively, a hepatic fungal abscess, a pyogenic abscess in a previous abdominal scar, and a carcinoma of the gall bladder invading the liver. In this last case fine needle biopsy confirmed the diagnosis, the needle being guided into the mass using ultrasound. As the technique becomes more sophisticated,

its range of application continues to enlarge. Webb, Berger and Sherlock (1977a, b) were able to demonstrate the normal portal vein by grey-scale ultrasound whereas an incompletely thrombosed or recanalizing vein is seen as being irregular and reduced in diameter. A thrombosed vein is not detected. Twenty patients with extra-hepatic portal obstruction (confirmed by angiography) were correctly diagnosed by this technique and no errors were made in a further 17 patients with liver disease and 20 age-matched controls. These authors conclude that the grey-scale ultrasound is a rapid, cheap (£10 per patient), reliable and, above all, a non-invasive method of diagnosing obstruction of the extra-hepatic portal system and it is also of value in following the natural history of the thrombosis.

The diagnosis of a deeply placed intra-abdominal or pelvic abscess may be particularly difficult on clinical grounds. Wolson (1977) describes 5 cases of pelvic and deeply placed wound abscesses following appendectomy, all of which had the diagnosis confirmed by ultrasound. In this context, the use of scanning following an injection of ^{67}Ga citrate may be of value; this radioactive material is taken up by the abscess wall and may be seen as an area of increased density. Caffee, Watts and Mena (1977) describe the use of this scanning technique in 50 patients with suspected intra-abdominal abscess. Thirty-six of these had post-operative fever, 8 had pyrexia with abdominal signs, 3 had evidence of pelvic inflammation and one had sub-acute bacterial endocarditis with abdominal pain. One patient was scanned on 2 occasions and, of the 51 scans, 19 were interpreted as abnormal. It was subsequently determined that 12 of these were correct but there were 7 false positives. Of 32 normal scans, 2 were false negatives. The false positives may be due to persistent activity in the large bowel, since this material accumulates in the wall and lumen of the gut. There is also accumulation of gallium in any superficial wound infection and in 2 cases the positive scan was due to haematoma rather than pus. The authors believe that gallium scanning is a valuable tool in the diagnosis of intra-abdominal abscess in spite of these false positive results.

Computerized axial tomography has revolutionized neuroradiological diagnosis and its use in abdominal investigation is now being intensively investigated. Cooperman and his colleagues (1977), at the Cleveland Clinic, have performed 1000 abdominal computerized tomographies since November 1974. They find it useful for the delineation of liver, pancreas, kidney and the retro-peritoneal tissues. Dilated ducts can be shown within the liver but, although the dilated gall bladder can be outlined, it is rather rare for stones to be able to be demonstrated within it. Another valuable adjunct is

to use this technique for percutaneous guided needle puncture to enable accurate tissue biopsy to be obtained. Morris and his colleagues (1977) have used computerized tomography to investigate 54 patients with various liver diseases and in 38 the technique was found to be diagnostically useful. For example, in 11 patients with extra-hepatic obstructive jaundice, 10 had their dilated intra-hepatic ducts shown. Gall stones were visualized in 3 out of 5 patients. Hepatic tumours were demonstrated in 4 patients with secondaries but not in 2 further patients with primary liver tumours. Although the scan was abnormal in 21 out of 22 patients with cirrhosis, the abnormalities were not always diagnostic. Hepatic density was abnormally reduced in 3 patients with fatty infiltration of the liver but in 7 other patients with a variety of parenchymal liver diseases, including hepatitis, no abnormalities were detected. These authors conclude that this non-invasive technique is of considerable value in the diagnosis of obstructive jaundice and can differentiate extra- from intra-hepatic causes as well as demonstrating pancreatic carcinoma and common duct stones. It is of value in the diagnosis of hepatic infiltrations with iron or fat and provides helpful information in cirrhosis and metastatic deposits, but it is of less value in the diagnosis of non-fibrotic parenchymal liver diseases.

Turning now to more 'invasive' methods, percutaneous cholangiography has been employed for the last 40 years but until recently normal calibre bile ducts were not usually demonstrated, so that the technique was only of value in demonstrating extra-hepatic obstruction. Using this method there is a risk of biliary peritonitis if a dilated duct is punctured and laparotomy therefore must follow in a few hours. In 1974, Okuda described an improved technique in which a much slimmer needle (0.5 mm in diameter, 25 gauge) was used, and showed that this allowed the demonstration of both dilated and undilated ducts together with a greatly reduced complication rate. Hinde, Smith and Craven (1977) give an interesting account of their experience with the Okuda needle in 42 consecutive patients with a clinical diagnosis of obstructive jaundice. The needle is inserted under local anaesthetic and, once inserted, normal respiration is permitted. Hypaque is injected while simultaneously withdrawing the needle under fluoroscopic monitoring until a bile duct is outlined, and successful entry into a duct results in a slow flow of contrast towards the porta hepatis. Up to 5 attempts may be required to enter a duct. In their 42 cases, successful injection was obtained in 41. In every instance the examination separated intra- from extra-hepatic obstruction and accurately defined the level of the block. In 3 patients with carcinoma of the pancreas it is interesting that gall stones were an

incidental finding and it is important to remember that the presence of stones does not exclude associated carcinoma. In this series, there were no significant complications; vitamin K injections were given where necessary to reduce the prothrombin time to the normal range and gentamicin was prescribed for 24 hr before the investigation. Benjamin and his colleagues (1977) carried out this technique in 35 patients, 19 of whom were jaundiced and others presented complex biliary surgical problems. The biliary tract was successfully outlined in all with dilated intra-hepatic ducts (17 cases) and in 14 of the 18 patients with non-dilated intra-hepatic ducts. In no case was immediate surgical intervention required and in 19 patients who underwent subsequent surgery, there was no evidence of significant biliary collection or haemorrhage. However, in 3 patients the investigation was followed by pyrexia and one of these died of septic shock. Burcharth and his colleagues (1977), from Copenhagen, describe a sophisticated technique in which a polyethylene catheter is inserted into the biliary tree. A guide wire is then passed along the catheter with a slightly curved tip, is advanced into the common bile duct itself and the catheter then advanced over it. In 115 patients with obstructive jaundice, successful catheterization of the common bile duct was performed in 113 cases. In a further 45 patients the diagnosis of obstruction was eliminated (26 because normal ducts were shown and 19 because the duct could not be cannulated). However, this larger catheter was associated with a greater risk of complications. Three of the patients had bile leaks and 2 bled, all 5 requiring urgent surgery. An advantage of the technique, however, is that the catheter can be left *in situ* to allow biliary drainage to be carried out.

The development of fibre-optic endoscopy, based on the fundamental work of Professor Harold Hopkins of the Department of Physics at the University of Reading, has opened up a whole new world of direct inspection of the body cavities. The ingenuity of the instrument maker combined with the imagination of the endoscopist now enables much of the alimentary tract and its adnexae, the pelvic organs (including the contained fetus) and indeed every other cavity in the body, even the inside of the skull, to be studied, biopsied, photographed and televised. Brilliantly devised instruments enable adhesions, sphincters and ducts to be divided, foreign bodies and polyps to be removed and many other procedures, once requiring major open surgery, can now be performed with safety in what has often become an out-patient basis. The broad sweep of this new technology can be appreciated by glancing through the very large volume on this subject edited by Berci (1976). Cotton (1977) gives a valuable progress report on endoscopic cannulation of the

papilla of Vater. In experienced hands complications occur in two to three per cent of examinations and there is a mortality of 0.1 to 0.2%. Complications are considerably more frequent with an inexperienced team. The two main hazards are sepsis and pancreatitis and Cotton has had 7 episodes of the latter in over 1000 examinations; all occurred in patients already suffering from recurrent pancreatitis and 3 of these had pseudocysts. Sepsis occurs almost exclusively in patients with poor drainage of the pancreatic and biliary systems. Cotton uses prophylactic gentamicin and ampicillin in any patient with pre-existing cholangitis, and immediately after endoscopic retrograde cholangio-pancreatography (ERCP) when duct stasis is demonstrated. The most effective prevention and treatment of sepsis is prompt surgical decompression. Using this instrument, it is now possible to carry out an endoscopic papillotomy of the papilla of Vater and to remove common bile duct stones, and to date it is said that some 1100 such procedures have been performed with an 89% success rate (Classen and Ossenberg, 1977).

Turning to the other end of the alimentary tract, the fibre-optic colonoscope enables an experienced operator to study the whole of the large bowel as far as the caecum in something like 95% of examinations. The examination nearly always follows a careful barium enema study and may be used to examine an abnormal or equivocal area of colon demonstrated radiologically. It may be used when bowel symptoms such as rectal bleeding or diarrhoea present no abnormal clinical or radiological findings. Colonoscopy may be used to keep a careful observation on a colonic anastomosis to pick up early evidence of local tumour recurrence and finally polyps may be removed with the diathermy snare without having to submit the patient to open surgery (Leading Article, 1977a; Williams, 1977). As with every new technique, it is always wise to temper enthusiasm with caution. Abrams (1977) questions the frequent description of colonoscopy as being 'simple, rapid, thorough, reliable, inexpensive and safe'. It is, in fact, the most difficult of the alimentary endoscopies and it has been suggested that a minimum of 200 examinations should be performed before polypectomy is attempted, although the side-viewing telescope does enable the trainee to watch and to study the expert at work. The examination is often extremely time consuming, it is not always possible to examine the whole colon, and this is particularly so if there are fixed loops or bends, previous surgery, or diverticular disease. Abrams estimates that the 3000 colonoscope units in the USA represent a total initial expenditure of about 75 million dollars and the average life of the instrument is only about 200 examinations. Reports of up to 5% incidence of perforation and haemorrhage

following polypectomy are recorded and the true complication rate for colonoscopy is unknown.

Faced by this explosion of new diagnostic techniques, the clinician would do well to read the useful review by Kreel and Meire (1977). It is most important that these investigations should be used intelligently to obtain information relevant to the patient's management and it is not enough to undertake an examination in the vague hope of showing an abnormality. Generally, a step-wise but methodical approach is preferable and should proceed from the least invasive, the simplest and the cheapest to the invasive, complicated and more costly methods. It goes without saying that careful history and examination may give the most valuable information in the vast majority of cases! Moreover, it must be remembered that a space-occupying lesion may appear the same on isotope scanning, ultrasound or computerized tomography; the last two may show whether it is solid or cystic. If it is solid, only histology will usually be sufficiently specific for tissue diagnosis and scanning procedures as yet cannot be used as a substitute for histological examination.

In spite of all the sophistication of modern investigative methods, it may still be necessary for the perplexed and puzzled physician to ask a surgical colleague to perform a diagnostic laparotomy in cases of pyrexia of undetermined origin and undiagnosed abdominal pain. Reviewing recent reports, Rothman, Schwartz and Adams (1977) have found that a positive diagnosis was made at laparotomy for PUO in 57–82% of cases. In their own series of 24 patients, all of whom having already undergone the most extensive investigations, the operative findings were positive in no fewer than 21 (87%). The most common diagnosis was an inflammatory process (13 patients), including hepatic granuloma, hepatitis, liver abscess, tuberculous peritonitis and renal inflammatory disease. Malignancy accounted for the fever in 7 patients (including 3 with disseminated carcinomatosis) while the final patient was found to have a primary volvulus of the omentum. In only 3 patients had the diagnostic laparotomy failed to identify any lesion but 2 of these lost their fever after operation! In their same study, 27 patients with persisting abdominal pain, undiagnosed in spite of intensive investigations, had diagnostic laparotomies with positive findings in 22 (82%); a malignant lesion being found in 13 (most often cancer of the pancreas, which was present in 8 patients). Chronic pancreatitis was diagnosed in 4, and 4 others had a variety of pathologies discovered. Five of the patients had negative laparotomies and 2 lost their symptoms after surgery.

Undoubtedly many patients with chronic abdominal pain with entirely negative investigations have psychogenic pain and the clinician must be prepared

to diagnose this when he has positive evidence of neurosis in the absence of definite clinical or laboratory findings of organic disease. Sometimes he will be wrong, and there is always the possibility that a neurotic patient will develop an organic lesion (Leading Article, 1977b). Gomez and Dally (1977), in an important contribution from Westminster Hospital, stress that psychiatric assessment has a place among the investigations of non-acute abdominal pain and certainly it should not be considered simply as a 'last resort'. Ninety-six patients complaining of recurrent or persistent abdominal pain were examined psychiatrically after their initial physical investigation. Only 15 patients had organic disorders that could be responsible for their symptoms. In the remainder, psychiatric factors were considered primarily responsible for their symptoms; 31 were depressed, 21 had chronic tension, in 17 hysterical mechanisms were prominent and 12 were found to be previously unrecognized alcoholics. It is interesting that over 50% responded favourably to psychiatric management. It is also interesting that Wilson and his colleagues (1977), in an analysis of over 1000 patients admitted to the General Infirmary at Leeds with acute abdominal pain, found that some 45% had non-specific abdominal pain, and this by far led the list, the second being acute appendicitis which accounted for only 15.6%. It is a matter for conjecture to estimate how many even acute abdominal pains are psychogenic in origin.

Iatrogenic surgical diseases

No sooner have surgeons succeeded in conquering one disease than it seems that the physicians and the pharmacologists manage to produce another one for them. Indeed, it behoves the practising surgeon to keep a careful eye on the lists of complications which may result from the ever-expanding numbers of new drugs. The association between methysergide, used in the treatment of migraine, and the development of retroperitoneal fibrosis is now well recognized over the past dozen years. A detailed review of this condition by Koep and Zuiderma (1977) details no less than 481 patients whose reports have been previously published and adds a further 10 cases. In this series, 12.4% of the patients had been on methysergide. The importance of early identification of this association is because the process usually regresses after the drug has been withdrawn.

Even well tried drugs in common use may occasionally be responsible for surgical problems. Reynier and his colleagues (1977) report 2 examples of intra-mural haematoma, one of the duodeno-jejunal junction and one at the ileo-caecal region, in patients on anticoagulant therapy, both of which required intestinal resection, and present a review of the extensive previous publications in this field.

Nakashima and Howard (1977) review the English, German and Japanese language publications on drug-induced acute pancreatitis. They analyse 112 cases of which 51 resulted from steroid or ACTH therapy, 24 due to chemotherapy (tetracycline and rifampicin), 16 due to diuretics, 6 oestrogen-induced, 3 due to clonidine and phenformin, 2 patients on warfarin, 2 due to hypercalcaemia secondary to calcium infusion, and one case each due to salicylate, asparaginase and D-propoxyphene. The clinician faced with a patient with acute pancreatitis needs, therefore, to enquire about drugs (Leading Article, 1977a). Tresadern, Rickwood and Spitz (1977), recording the first example of potassium chloride-induced stricture of the small intestine in a child, point out that enteric-coated preparations of potassium chloride are still marketed and that new examples of intestinal stricture continue to be reported. Experimental and clinical studies have shown that these strictures result from the rapid release of potassium chloride when the enteric coat disintegrates in the alkaline medium of the small intestine.

Three years ago, Brown and his colleagues (1974) gave the first description of the development of sclerosing peritonitis in a patient receiving the β -adrenergic blocking drug, practolol. Jackson (1977) notes that 60 further cases are now known to the Committee on Safety of Medicine and reports 6 patients with sclerosing peritonitis dealt with over an 18-month period at St Thomas' Hospital. All these had previously undergone unsuccessful attempts at surgical treatment in other hospitals. In this extraordinary condition, the entire small intestine is surrounded by a membrane of fibrous material, which causes shortening and angulation of the bowel and which, in turn, may result in sub-acute intestinal obstruction. The membrane may also extend over the large intestine, stomach and liver but does not normally cause compression of these organs. The diagnosis should be considered in patients who present with symptoms and signs of sub-acute intestinal obstruction and who give a history of having taken practolol, even though one case so diagnosed was found to have a duodenal ulcer and no evidence of sclerosing peritonitis (Thompson and Jackson, 1977). The patient may still be on the drug or may have stopped therapy several months previously. There is often a palpable mobile mass within the abdomen, apparently arising out of the pelvis. At operation, the small intestine will be found matted together, shortened and encased in a white fibrous membrane which represents the mobile mass so often palpable before operation. It is necessary to strip away completely the fibrous membrane that surrounds the bowel, thus exposing the normal serosa of the intestine from duodenum to terminal ileum.

Fortunately, a plane of cleavage exists between the membrane and the underlying intestine which is avascular and which enables the surgeon to dissect and strip the membrane from the bowel wall. Eltringham and his colleagues (1977) report a further 9 patients from Bristol. They point out that the onset of symptoms in their patients was delayed for up to 8 months and stressed that further cases will almost certainly present for some time to come. Barium examination of the small bowel was carried out in 5 of the patients and showed dilatation of the whole length of the small bowel, more marked in the duodenum than jejunum, which in turn was more dilated than the ileum. Delayed transit of barium was a constant finding and loss of mobility of the small bowel loops to external palpation was present. Following successful removal of the thickened peritoneal sheath, the subsequent progress of the patients has been entirely satisfactory with a period of follow-up to date of a maximum of 20 months.

In addition to their other side effects, there are a number of surgical complications associated with oral contraceptives. Mesenteric venous thrombosis was first reported in 1963 and mesenteric arterial thrombosis 5 years later. Hoyle and his colleagues (1977) report 3 examples of this condition (2 involving the superior mesenteric artery and one implicating the superior mesenteric vein) in young women taking oral contraceptives and progestational agents. All 3 patients were also smokers and of blood group A. They produce a useful review of the 18 previously reported cases and note a 50% mortality in this condition.

It is now known that women on oral contraceptives may develop liver tumours ever since the association was reported by Baum and her colleagues (1973), who first drew attention to an apparently increased frequency of highly vascular benign tumours of the liver in women on the pill. Foster and Berman (1977) point out that liver cell adenomas were previously extremely rare but their incidence and recognition has risen in association with the introduction of the pill. In a survey of 55 reported cases, they note that only 3 occurred in males (all, interestingly enough, in children up to the age of 10). In the 52 females, 4 occurred in children, 3 in women over the age of 50 and the rest occurred in the 20 to 49 age group. Central registries have now been set up to document the frequency of this tumour. Christopherson and Mays (1977) have published their findings in the first 100 cases reported over the last 4 years at the University of Louisville, Kentucky. Most of these tumours were histologically benign, showing either the characteristics of benign hepatic adenoma or of focal nodular hyperplasia. However, there were 13 examples of primary hepatocellular carcinoma, which suggests that the benign lesions may become

malignant. Almost all these tumours are highly vascular and abdominal pain, due to haemorrhage into the tumour, or rupture with haemoperitoneum, is the most common mode of presentation. Fortunately, most of these pill-associated tumours have been solitary and amenable to surgical resection but some have been multifocal. However, diminution in size of the tumour has been demonstrated on serial scanning after the pill has been stopped. Bein and Goldsmith (1977) report a patient who underwent 2 successive resections for a bleeding liver adenoma, in 1972 and again in 1975. A residual nodule of tumour was left behind at the second operation but this decreased in size by 25% on angiography after 8 months without the pill. These authors state that 'any patient taking oral contraceptives who presents with right upper quadrant pain, haemoperitoneum and vascular collapse must be considered to be bleeding from a hepatic tumour until proved otherwise'. We still cannot properly assess just how frequent benign liver tumours are in women taking oral contraceptives, and we have to balance the latter's efficacy and social convenience against their risks (Leading Article, 1977b). In a survey on nearly 150,000 women-years of oral contraceptive use and 2 population studies including 6 million individuals, Vessey and his colleagues (1977) could find only one case of primary hepatic neoplasm.

Not all benign liver tumours can be blamed on the pill. Foster (1977), in a study of 102 cases submitted to tumour resection, found that 63 were small nodular tumours, histologically resembling cirrhotic nodular regeneration, which might occur in children and pregnant women, which do not rupture or bleed and are probably unrelated to contraceptive tablets. Thirty-nine were purely epithelial, usually in menstruating women, often showing haemorrhage and rupture, and often pill-associated. The remainder were rare tumours in children, usually of mesenchymal origin.

Certainly there is still need for further research. Guzman and his colleagues (1977) reviewed 40 cases of benign hepato-cellular tumours of the liver occurring over a 26-year period in Minneapolis. Haemangiomas were excluded. There were 18 examples of focal nodular hyperplasia, 10 adenomas, 11 bile duct adenomas and one example of a mesenchymal hamartoma. The female to male ratio was 8 : 1 and the mean age was 43 years. They were unable to establish a definite causal relationship between the use of steroids and these benign tumours but could not rule out that oral contraceptives or other steroids might have a contributory influence on the initiation of these tumours or on tumour size. They do concede, however, that since 1973 a total of 112 benign liver tumours have been reported of whom no less than 82% have been on oral contraceptives

and 27% had presented with intraperitoneal bleeding.

Hayes, Lamki and Hunter (1977) report a fatal case of intraperitoneal haemorrhage due to rupture of a hepatic-cell adenoma that presented 5 days after Caesarean section and 13 months after stopping oral contraceptives. They note that the association of this tumour with pregnancy has been noted only in a few cases and this is not evidence of a causal link. However it is possible that pregnancy could influence the outcome of an adenoma already present in the liver. By stimulating active cellular growth, pregnancy might predispose to haemorrhage and rupture of a tumour that might otherwise have remained symptomless and regressed once oral contraceptive hormones were stopped.

Antibiotics in surgery

There is little doubt that antibiotics have become the modern panacea and are being used in what can only be described as an indiscriminate manner both in hospital and in general medical practice. Lawson and Macdonald (1977) monitored a total of 1717 patients admitted to 4 selected medical wards in 2 Glasgow teaching hospitals. Antibacterial therapy was given to 28% of the patients, usually for the treatment of respiratory or urinary tract infections. The agents most frequently prescribed were ampicillin, co-trimoxazole and tetracyclines. No less than 11% of the recipients experienced one or more adverse effects of therapy. Whereas 80% of the patients receiving anti-bacterial therapy for urinary tract infections had bacteriological evidence of an infection, no less than 66% of patients treated for respiratory tract problems had no bacteriological evidence to support this form of treatment. The authors point out that the Scots are, in fact, rather parsimonious in their use of antibiotics compared with the Americans, since a study in Boston showed that 42% of comparable patients received antibiotic therapy.

Indiscriminate prescription of antibiotics is not only wasteful of money and productive of insensitive strains but may be positively dangerous to the patient. Read and Cove-Smith (1977) note that 16% of adults and 20% of children treated with ampicillin develop diarrhoea. They report a fatal case of pseudomembranous enterocolitis in a patient on this drug and quote 3 previous case reports. This particular especially serious complication is most commonly reported following clindamycin.

Yet infection remains one of the severe hazards of surgery. Polk and Shields (1977) remind us that Gram-negative septicaemia was the commonest cause of acute renal failure in Vietnam (now that hypovolaemia is effectively treated, nephrotoxic

drugs are avoided and mismatched blood transfusions are rare). They stress that multiple organ failure (renal, pulmonary and hepatic) in post-operative or traumatized patients may be due to otherwise occult intra-abdominal abscesses. In many of these serious infections, antibiotics are a valuable adjunct to a surgical therapy. A good example of this is in the treatment of gas gangrene; Darke, King and Slack (1977) present an important review of 88 cases treated over a 10-year period at Whipps Cross Hospital. As well as debridement combined with hyperbaric oxygen treatment (surgery being delayed until after the first hyperbaric session) penicillin is given as a routine, except in those patients who are penicillin sensitive, in which case lincomycin or erythromycin is employed. Broad-spectrum antibiotics may be used if there is an associated Gram-negative infection. At the other end of the scale, however, in the treatment of acute superficial abscesses in the Casualty Department, Macfie and Harvey (1977), in a prospective clinical trial, found that neither antibiotics nor primary suture of the wound gave any advantage with regard to healing time as compared with the well tried old-fashioned technique of simple incision and drainage. The role of antibiotics in established infection in surgical patients is perfectly rational; they should be used whenever there is evidence of spreading infection (e.g. cellulitis, peritonitis, septicaemia) and the choice of antibiotic should be made wherever possible by checking the sensitivity of the infecting organism. Where there is localized pus, today as in the days of our surgical ancestors, there is no substitute for drainage and little if anything to be gained by adjuvant antibiotic treatment.

Turning now to the use of antibiotics in prophylaxis, surgeons at the beginning of the antibiotic era naturally hoped that merely giving patients routine antibiotics at the time of surgery would abolish infection from their wards; they were soon to be seriously disappointed. Even today, after several decades of experience, many surgeons are confused about whether or not antibiotics have any part to play in the prophylaxis of surgical wound infection. One factor that has contributed to their puzzlement is the enormous number of papers that have been published advocating and refuting the value of such therapy but which prove to have, on careful scrutiny, very little scientific value. Chodak and Plaut (1977), for example, have reviewed 131 articles on clinical trials with systemic antibiotic prophylaxis published between 1960 and 1976. They found that only 24 of these were well designed and thus scientifically acceptable. Their overall conclusions in this review were that there was evidence of decreased infection with antibiotic prophylaxis in hysterectomy, Caesarean section, hip surgery, biliary surgery and micro-

neurosurgery but not in laparotomies or in groin operations.

Recent years have seen a much greater attempt made at putting prophylactic antibiotic therapy on a more rational basis. Abdominal surgeons have learned that after gastro-intestinal surgery, wound infections are nearly always caused by intestinal organisms being released and disseminated into the incision during the operation. Wound sepsis is thus very low in abdominal operations where the bowel is not open, for example, repair of a hiatus hernia, and here infection will be seen in perhaps one or two per cent of cases. At the other end of the scale are those patients where the abdominal cavity is already soiled owing to perforation of a viscus (including the acutely inflamed and gangrenous appendix) where a sepsis rate of perhaps one case in 3 may be expected. Lying between these two extremes are the potentially contaminated operations where the gastro-intestinal or biliary tract are opened and where there is potential inoculation of the wound from bowel organisms. In this group infection may be in the region of 10%.

An interesting correlation between bacterial counts and wound infection in gastric surgery is the study by Gatehouse and his colleagues (1977). The mean count of organisms/ml of gastric juice was found to be 0×10^0 in normal subjects, 1×10^1 in patients with duodenal ulcer, 5×10^2 in gastric ulcer patients and 1.3×10^5 in gastric cancer cases. Wound infection occurred in 15% of patients operated on for duodenal ulcer, 29% for gastric ulcer and an alarming 54% for gastric carcinoma.

Keighley (1977a) presents an excellent review on prevention of wound sepsis in gastro-intestinal surgery. In theory, at least, wound sepsis may be minimized by the following methods:

Avoiding intestinal contamination of the incision by meticulous operative technique, the use of topical antibiotics, reducing the bowel organisms in colonic surgery by mechanical cleansing and oral antimicrobials and by using systemic antibiotics for high risk cases. Individuals who are particularly at risk include patients undergoing oesophageal surgery for obstruction, those with achlorhydria or pyloric stenosis having gastric surgery, all patients with acute intestinal obstruction, elderly jaundiced patients with stones or strictures requiring exploration of the bile ducts and all patients having operations on the colon or rectum. Although systemic prophylactic antibiotics will minimize wound sepsis, the complications of their use should limit their employment to the high-risk patients. Keighley advises a single dose of penicillin and gentamicin for the high-risk patients undergoing oesophageal, gastric or biliary operations, neomycin and metronidazole for patients undergoing elective colon

surgery and lincomycin and gentamicin for patients with acute intestinal obstruction or inflammatory bowel disease where pre-operative bowel preparation is unsatisfactory or unsafe. In biliary surgery, Keighley (1977b) suggests the useful idea of an immediate smear of bile obtained at the time of operation. If Gram-negative organisms are seen, gentamicin is prescribed but Gram-positive organisms are an indication for using ampicillin. In an extended trial of this technique, McLeish and his colleagues (1977) compared 119 patients where antibiotics were given as a result of Gram-staining of bile in the theatre compared with a 101 patients receiving no antibiotics during biliary surgery. The wound sepsis rate fell from 22% in the control group to 7% in those receiving antibiotics if required as a result of immediate examination of the bile. Positive bile cultures were obtained in approximately one-third of the cases in each group.

Topical antibiotic therapy has been shown in many recent trials to reduce the risk of wound infection following contaminated or potentially contaminated surgery. Pollock, Leaper and Evans (1977), as a result of very extensive trials, advocate 1 g of cephaloridine dissolved in 2 ml of water as the most effective topical agent. In this context, there has been a return to the use of local antiseptic agents in contaminated wounds as a substitute for antibiotics and trials have shown the effectiveness of povidone iodine as a topical applicant (Gilmore, 1977; Gilmore, Reid and Strokon, 1977).

Anaerobic organisms

Now that anaerobic organisms can be identified more easily and are seen to constitute the greater proportion of the intestinal flora, their importance in the causation of post-operative sepsis after gastro-intestinal surgery is becoming evident and there is considerable interest in the use of metronidazole (Flagyl) both in prophylaxis and therapy. Taylor and Cawdery (1977) compared the rate of postoperative wound infection in a prospective trial of patients undergoing colonic surgery. One group received phthalylsulphathiazole for 4 days before surgery, the second group received metronidazole in addition to this. Both groups had identical mechanical preparation for 4 days pre-operatively, using low residue diet, magnesium sulphate and bowel wash-outs. Seventeen out of 31 patients in the first group had postoperative infection (10 with *Bacteroides*) compared with only 4 out of 34 in those who received metronidazole in addition. All 4 of these infections occurred in the perineum following abdomino-perineal excision of the rectum and none grew *Bacteroides* on culture. Willis and his colleagues (1977) report a double-blind randomized trial on 46 patients undergoing elective colonic surgery. Twenty-

seven patients received prophylactic metronidazole and 19 received placebo. Anaerobic infections did not develop in any of the metronidazole-treated patients, but occurred in 11 of the 19 controls who were subsequently successfully treated with metronidazole. In these infected patients, the clinical and bacteriological response to metronidazole was dramatic with rapid disappearance of anaerobic bacteria from pathological discharges, a fall in temperature and pulse rate within 24 hr and clear evidence of resolution of any cellulitis.

Metronidazole has the great advantage of freedom from side effects compared with the very real dangers in some of the modern antibiotics. Feathers and his colleagues (1977) compared the prophylactic value of gentamicin combined with either lincomycin or metronidazole in patients undergoing colorectal surgery. In a control group of 25 patients there was a sepsis rate of 48% with one death attributable to sepsis compared with a sepsis rate of 4% in the treated group. The combination of gentamicin and lincomycin was effective against sepsis but pseudomembranous colitis developed in 2 of the 14 patients treated with this combination of drugs. The results with metronidazole in a further 14 patients were equally good but there were no toxic side effects.

Duodenal ulceration

The past 30 years have seen a search by surgeons for less and less destructive operations in the surgical management of duodenal ulceration. The radical partial gastrectomy with gastro-jejunal anastomosis was replaced by total vagotomy combined with some sort of drainage procedure. Selective denervation of the stomach, with preservation of the vagal supply of the rest of the gut, was then introduced, again, combined with some sort of gastric drainage operation. In recent years, more and more interest has been taken in the operation of highly selective, or parietal cell, vagotomy. In this operation, selective division of the innervation of the acid secreting portion of the stomach is carried out, and the vagal innervation of the antrum carefully preserved. By this means, the stomach's intrinsic emptying mechanism is saved so that a concomitant drainage operation (pyloroplasty or gastrojejunostomy) can be avoided. Many centres report a much lower incidence of dumping and diarrhoea, but there is no doubt that the operation is technically more difficult, and that technical failure completely to denervate the acid secreting part of the stomach is likely to be followed by recurrence of the ulcer. Jaffe (1977) well summarizes the situation when he writes that 'although parietal cell vagotomy is an extremely promising development in the management of peptic ulcer disease, it is not one which should be undertaken occasionally by surgeons with no

experience of the procedure. PCV is not a technically demanding operation but it is one that has proved difficult to learn without substantial assistance'. This is reflected by published figures which show good results when the operation is performed by highly experienced gastric surgeons. Thus, de Miguel (1977) reports 6 recurrences in 93 patients, 3 of whom responded to medical treatment and 3 required partial gastrectomy; Hollender and his colleagues had only one stomal ulcer in 72 patients followed-up for more than 6 months and Jensen and Amdrup (1977), in 60 patients observed from 5 to 7 years, had to re-operate on one patient for recurrent duodenal ulcer and had 2 more patients treated medically. Picaud and his colleagues (1977), in France, followed-up 92 of 100 patients submitted to this operation (performed without mortality) for from 6 months to 5 years. Although 87% achieved excellent or good results (Visick grades I and II), 4 patients developed recurrence of their ulcers (4.4%). In contrast, Holst-Christensen and his colleagues (1977) note a 12% recurrence in 211 patients followed-up from one to 4 years. Solhaug, Bjerkeset and Halvorsen (1977) record a 6.5% ulcer recurrence rate and an 18% total therapeutic failure in 76 patients followed-up from one to 3 years after this operation. They note, interestingly enough, that this was an early period of introduction of the operation into their hospital in Bergen and represented a small individual experience of each surgeon engaged in performing the procedure. The importance of the technical aspect of this operation is borne out by a study by Kronborg, Jorgensen and Holst-Christensen (1977). They note a disastrous 24% recurrence rate when only the lower 2 cm of the oesophagus was skeletonized in performing proximal gastric vagotomy. Extending the oesophageal clearance from 4 up to 7 cm resulted in a drop of the recurrence rate to 8%.

One of the pioneers of highly selective vagotomy, Holle, of Munich, has always insisted on adding pyloroplasty to the vagotomy procedure. He now reports (Holle, 1977) on his enormous experience of over 1100 cases of highly selective vagotomy with pyloroplasty carried out between 1964 and 1973. His results are most impressive, with a mortality of 0.6%, a recurrence rate of 0.7% and good functional results in very nearly 90% of his patients. Against this must be placed the results of a prospective trial comparing highly selective (or proximal gastric) vagotomy alone or combined with pyloroplasty reported by Wastell and his colleagues (1977). A consecutive series of 100 men with uncomplicated duodenal ulcer were entered into the study, 52 having the vagotomy alone and 48 being combined with pyloroplasty. The surgery was carried out between 1970 and the beginning of 1974. Three patients developed recurrent ulceration after vagotomy

alone, and 7 after vagotomy combined with pyloroplasty. Dumping was both more common and more severe when pyloroplasty was added and an overall satisfactory result was achieved in 92% after proximal gastric vagotomy alone and 81% when this was combined with vagotomy. This study concludes that combining pyloroplasty with vagotomy has no appreciable advantages. Amdrup, Andersen and Jensen (1977), who have done much to pioneer highly selective vagotomy in Denmark, point out that the operation has only been in general clinical use some 7 years, techniques are still improving, and that it will be several years before the long-term results of the operation, particularly with respect to recurrence, can be assessed.

The problem of recurrence after previous surgery for peptic ulceration is considerable and it is estimated that about 1700 cases could be expected annually in the United Kingdom. We still need information about the efficacy of H_2 receptor antagonists on the healing of recurrent ulcers but at present it is true to say that the majority of patients with recurrent disease after gastric surgery have subsequent operative treatment. Even this may not prevent further ulceration; Fromm (1977) quotes figures of between 7.5 and 23.9% for this complication. Hede and his colleagues (1977), from Liverpool, discuss this important problem. They consider that trans-thoracic re-vagotomy should be carried out unless investigations indicate either gastric outlet obstruction, or the need for additional antrectomy or where acid studies show that complete vagotomy has been performed, where again antrectomy is indicated. In a series of 20 patients operated on over a 5-year period (3 following a gastrectomy and the rest after vagotomy and drainage) half were treated by trans-thoracic vagotomy and the remainder had abdominal vagotomy together with antrectomy, or antrectomy alone. All cases were converted to good results following re-operation. Taylor, Pearson and Torrance (1977), from Manchester, review their 59 patients with recurrent ulceration following incomplete vagotomy. It was interesting that only 5 of these developed their symptoms 4 years or more after the original operation. Eighteen underwent a second vagotomy via the abdominal route and the other 41 had a second trans-abdominal vagotomy, 10 combined with antrectomy. Interestingly enough, in this series the best results followed abdominal re-vagotomy.

Diarrhoea is a troublesome symptom that may follow vagotomy and drainage. Continuous diarrhoea, which produces considerable upset in working and social life, occurs in about 1% of patients. Conventional treatment is disappointing. There is considerable interest in the use of cholestyramine, which preferentially binds dihydroxy bile acids, in

the treatment of this condition. Allan, Gerskowitch and Russell (1973) have shown that patients with severe continuous post-vagotomy diarrhoea excrete excessive amounts of bile salts in the faeces and the cathartic action of these bile salts on the colon may be a major factor in causing the diarrhoea. Continuous post-vagotomy diarrhoea may therefore be similar to that which follows ileal resection or severe Crohn's disease of the terminal ileum. Allan and Russell (1977) report a double blind control trial on the effectiveness of cholestyramine in treating severe continuous post-vagotomy diarrhoea and found a considerable improvement compared with a placebo. There were no significant side effects or changes in laboratory values in the treated group. Duncombe, Bolin and Davis (1977) detail a double-blind trial on 20 patients with persistent diarrhoea following vagotomy and drainage and noted a significant improvement in frequency, urgency and consistency of stool as well as episodic diarrhoea. Faecal bile acid secretion was significantly higher in the post-vagotomy group when compared with normal controls and their findings confirm the effectiveness of this drug as well as supporting the concept of a bile acid mediated aetiology in this condition. The cause of the diarrhoea, however, remains controversial. It may be due to division of the hepatic vagal branches or it may be that it is the drainage procedure itself, rather than the vagotomy, which allows rapid passage of bile salts into the small intestine.

It goes without saying that all but the most enthusiastic vagotomists look forward to the time when effective medical treatment of duodenal ulcer will become a reality. There is naturally immense interest in the development of specific H_2 receptor blocking agents. These have been shown, in many trials, to induce rapid ulcer healing compared with placebos (Gray *et al.*, 1977a) but there is the problem of relapse when the drug is discontinued and, indeed, even some evidence of 'rebound' ulcer activity on cessation of the drug. Much work still needs to be done on the regimes of drug therapy, particularly with regard to maintenance dosage (Leading Article, 1977). Thompson and his colleagues (1977), using the original drug metiamide, showed that nocturnal maintenance dose given after ulcer healing for a period of up to one year produced a relapse rate of 2 in 8 patients on therapy compared with 6 out of 8 in the control group. Using the more recent drug, cimetidine, Gray and his colleagues (1977b) report a double-blind trial using 400 mg of the 'drug as a bedtime dose after healing had been achieved. In 57 patients, followed-up for an average period of 20 weeks, there were 21 relapses; 17 of these were in the placebo group and 4 in the cimetidine-treated group. A smaller 6-months trial by Blackwood, Maudgal and Northfield (1977) showed

a relapse in 2 out of 7 of the cimetidine-treated patients compared with all 7 of the controls. Obviously a considerably longer trial period is required of this fascinating pharmacological breakthrough.

Crohn's disease

Although originally regarded as an affection of the terminal ileum, it is now well known that Crohn's disease can affect the gastro-intestinal tract from the mouth to the anus. A recent interesting report from the Lahey Clinic (Nugent, Richmond and Park, 1977) reviews their experience of 36 patients with duodenal involvement, most of whom had obvious disease elsewhere in the gastro-intestinal tract although 3 had the lesion confined to the duodenum. These patients usually present with upper abdominal pain and features of duodenal obstruction, and interestingly enough 15 of 18 patients subjected to a simple bypass procedure were free of symptoms with an average follow up of over 6 years. Other smaller series also report similar satisfactory results for bypass surgery (Leading Article, 1977). In recent years, metastatic Crohn's disease has been recognized as cutaneous lesions occurring remote from the gastro-intestinal tract and separated from it by normal skin. Disease of the groins, male genitalia, sub-mammary region and post-auricular area have been reported, that is to say, where skin surfaces are in close apposition and tend to be moist. Hamilton and his colleagues (1977) now report the first example of metastatic vulval lesions in a patient with Crohn's disease of the colon and distal ileum. Biopsy of the small reddened nodules with surrounding erythema on the vulva showed typical numerous giant cell granulomas. There is increasing acceptance of the concept that Crohn's disease does, in fact, represent a diffuse lesion of the gastro-intestinal tract and support to this is given by Dunne, Cooke and Allan (1977). These workers carried out proximal jejunal biopsies in 20 patients with Crohn's disease of distal ileum or of the large bowel, 14 patients with ulcerative colitis and 14 healthy volunteers who acted as controls. Although the dissecting microscopy and histological appearances of the biopsies were normal except for 2 of the Crohn's cases, which showed minor changes, morphometry showed a reduction of jejunal mucosal surface area and an increase in mucosal volume in the patients with Crohn's disease compared with the other 2 groups. The mucosal enzyme studies demonstrated that patients with Crohn's disease had a significant reduction in brush-border enzymes (disaccharidase) but no change in cytoplasmic enzyme activity (dipeptidases). They suggest that there is either specific damage to the microvilli or some other abnormality such as impairment of enzyme synthesis as a diffuse lesion in the Crohn's disease patients.

Crohn's disease has well been termed the 'disease of fistulae' and internal fistula may complicate anything from 25 to 40% of cases in different reported series. Fistula into the duodenum is unusual but Wilk, Fazio and Turnbull (1977) report 9 such cases in their series of 1600 patients with Crohn's disease treated at the Cleveland Clinic over a 10-year period. Four of these had disease of the terminal ileum and 5 had ileo-colitis. Interestingly enough, all were male patients. The same group (Fazio *et al.*, 1977) report 36 patients with ileo-sigmoid fistulae, all of whom were treated by segmental resection of the sigmoid together with resection of the ileo-caecal area. A covering loop ileostomy was performed when there was pelvic sepsis or obstruction and there were no deaths and no anastomotic leaks in this series.

Although fistulae into the vagina are well recognized, and indeed have been reported from 5% to 14% of large bowel disease, Stoddard and Irvin (1977) record the first example of recto-uterine fistulation in Crohn's disease. This rarity is probably because of the thickness of the uterine wall. Their patient was a girl of 23 years with Crohn's disease of terminal ileum and sigmoid colon. The terminal ileum had been resected and sigmoid colectomy performed but subsequently she developed a faecalulent vaginal discharge and a gastrografen enema showed a stricture of the pelvic colon with a fistula between the upper rectum and uterus. Another unusual complication of Crohn's disease is free perforation. Croft (1977) reports a case of double perforation of the small bowel treated successfully by an emergency right hemicolectomy. About a 100 cases have previously been reported and there is no definite association with previous or current steroid therapy.

There is, of course, an undoubted correlation between ulcerative colitis and a considerably increased risk of the development of carcinoma of the large bowel, particularly in longstanding cases of total colitis. There is now increasing evidence of an association between adenocarcinoma of the small intestine and Crohn's disease. Hoffman and his colleagues (1977) report two personal cases with 49 additional examples which have been published since 1957 and compare these with 272 cases of small bowel adenocarcinoma in the National Cancer Institute series. They confined their review only to those patients with small bowel tumours. They note that the mean age of the Crohn's group is 46 years compared with 64 in the non-Crohn's series. In those patients with carcinoma associated with Crohn's disease, 76% had the growth situated in the ileum compared with only 27% in the non-Crohn's group and they estimate on a population basis that there is undoubtedly a higher risk of developing adenocarcinoma in patients with Crohn's disease compared with normal subjects. They also note that diagnosis is

more difficult in patients with Crohn's disease because of the previous intestinal symptoms masking the development of symptoms. Thirteen of the patients with Crohn's disease developed the carcinoma in a bypassed loop of intestine but these authors were not convinced that the bypass operation was necessarily correlated with the tendency to develop malignant change.

Westaby, Everett and Dick (1977) report a female patient aged 49 years who developed inoperable carcinoma of the distal jejunum after a 25-year history of Crohn's disease. Of particular interest was that she had been treated with the immunosuppressive drug azathioprine for 7 years before the appearance of the tumour. It is well recognized now that immunosuppressed patients are at increased risk of spontaneous tumour formation – perhaps as a result of an impaired surveillance mechanism against spontaneously arising malignant cells, or as consequence of reduced resistance to oncogenic viruses or possibly because these agents are themselves carcinogenic. It will be of interest to note if similar cases are reported in the future.

Lee, Smith and Seal (1977) report a patient who underwent resection of an undoubted segment of Crohn's disease of the jejunum. Three years later a further resection of recurrent Crohn's disease was performed and 4 years after the initial resection the patient developed an inoperable lymphosarcoma involving small intestine. These authors note that 4 previous examples of reticulum cell sarcoma, one of carcinoid, one of enteroblastoma and 3 previous examples of lymphoma have been reported in association with Crohn's disease.

Surgeons advise resection in Crohn's disease usually in those patients with obstruction or fistulation, well recognizing that there is a high risk of recurrence after resection. Stone and his colleagues (1977), from the Lahey Clinic present a follow-up of 76 patients operated upon between 1956 and 1965 at their institution and undergoing their first operation for resection of Crohn's disease affecting only the small intestine. Fifty-one of these patients (69%) recurred between 6 months to 12 years after the initial resection. Of these 51 patients, 28 required further operative treatment.

A number of recent papers have considered prognosis following resection of Crohn's disease of the large bowel with preservation of the rectum and ileo-rectal anastomosis. Here too the prognosis must be guarded. Flint and his colleagues (1977) from New York report on 37 cases following this procedure. There were 3 postoperative leaks, all of whom died but no leakage occurred in those patients who had a loop ileostomy above the anastomosis. Of 29 patients followed-up for more than a year, 12 developed recurrences in the rectum or the ileum and

7 of these had to have the anastomosis taken down. This recurrence rate of 41% is about the same as published reports of recurrences following total removal of rectum and colon with a permanent ileostomy but these authors point out that even if recurrence occurs, only about 50% of the patients will need further surgery. Watts and Hughes (1977) review a larger series of 81 patients in a mixed group of ulcerative colitis and Crohn's disease. Twelve of these were failures and required ileostomy, another 5 were unsatisfactory but 64 gave satisfactory results. Most surgical series will be fairly limited with regard to experience of large bowel Crohn's disease; Jones, Munroe and Ewen (1977), reporting on 36 patients undergoing total colectomy with ileo-rectal anastomosis, note that only 4 of these were examples of Crohn's disease of the large bowel.

There seems little doubt that fundamental progress in the prevention or treatment of Crohn's disease is only likely to be achieved when its cause (or possibly its causes) is discovered. Already it has become recognized that many cases of acute terminal ileitis, once thought to be part of the same disease process, are likely to be due to infection with *Yersinia enterocolitica*. Doraiswamy and his colleagues (1977) report an interesting example of this in a 13-year-old boy operated on as an emergency with acute terminal ileitis whose stool specimen grew this organism and who also demonstrated a rising *Yersinia* antibody titre. If there is the possibility of yersiniosis, the specimen must be incubated at 30°C for an extended time or special media used.

In recent years, efforts have been made to demonstrate the presence of a transmissible factor in chronic Crohn's disease. Studies have shown that the inoculation of mouse foot pads with a homogenate prepared from Crohn's intestine has given sarcoid-like granulomata and injection of this material into the terminal ileum of rabbits has also produced microscopic features of Crohn's disease. However, negative findings with similar methods have also been reported. Donnelly, Delaney and Healy (1977) have now shown that the injection of rabbit's ileum with homogenates of both normal and Crohn's affected human bowel tissue gave Crohn's-like changes in nearly 50% of their animals after 6 months; but 12 months after injection, the rabbit bowel had reverted to normal. The addition of ampicillin to the homogenates prevented the appearance of these Crohn's-like changes. These results are interpreted by the authors as providing evidence for a transmissible factor present in both normal and Crohn's affected bowel in the aetiology of this mysterious condition.

Simonowitz and his colleagues (1977) injected homogenates of the terminal ileum from patients with Crohn's disease, ulcerative colitis and normal

controls into rabbit colons. Those injected with the Crohn's material developed thickening with prominent mucosal folds, mucosal tags and macrophage infiltration, but not the typical histological features of Crohn's disease. Three out of 8 of the rabbits injected with Crohn's material also developed enlarged regional lymph nodes. Whether these changes represented the effects of a transmissible agent or a non-specific reaction to a product of Crohn's inflammation was not determined but these workers are now attempting to see if the changes can be produced by repeated passage of the homogenate material.

A striking abnormality in Crohn's disease is a failure of neutrophils to migrate in normal numbers to an area of acute inflammation. This may delay removal of bacteria or ingested protein from the bowel and could be the aetiology of the typical granuloma formation in this disease. The mucosal ulceration would then still further reduce the normal intestinal defence barrier to bowel contents. Segal, Levi and Loewi (1977) treated 8 patients with uncomplicated active Crohn's disease by means of an elemental diet to induce remission (either by removal of ingested protein or by change of bowel bacteria), and then gave levamisole, which is a non-specific immunostimulant. They report that all remained in remission while on this drug for 3 to 12 months. Two patients developed drug-induced arthritis, which resolved spontaneously, but no significant other effects were noted. However, Wesdorp and his colleagues (1977), from Amsterdam, treated 11 Crohn's patients with levamisole and compared them with 10 patients treated with a placebo over a 3-month period. Only 2 of the levamisole group (and one in the placebo group) improved clinically and biochemically during the study period. Obviously further studies are required in this interesting new approach to therapy in what to date has been a therapeutically frustrating disease to surgeon, physician and patient.

Wound healing

The subject of wound healing is one of such immense importance to the surgeon that no excuse is needed for reviewing this topic for a second year running. To the abdominal surgeon, wound healing is of particular interest in 2 respects. Firstly, in the safe healing of the laparotomy wound, without either early disruption or late herniation, and secondly, in the sound union of anastomoses in the alimentary canal, failure of which would result at best in fistula formation and at worst in overwhelming peritonitis and death.

The number of possible factors affecting healing are legion, both locally at the wound site (blood supply, infection, tension etc) and general (vitamin C

deficiency, jaundice, uraemia and so on). We have pointed out (Ellis, 1977) the difficulty in the clinical study of these factors because it is uncommon for any one to exist in isolation. For example, a patient may undergo laparotomy for carcinoma of the pancreas. He may well be elderly, intensely jaundiced, anaemic, protein depleted and, of course, he is suffering from what is often advanced malignant disease. Immediately after his operation he may put additional stress on his wound by going into postoperative ileus as well as developing a severe pulmonary collapse, aggravating his chronic smoker's cough, and perhaps he may by now have been placed on cytotoxic drugs. What factor or factors do we blame if his abdominal wound bursts? And what part, if any, does the choice of incision, of suture material, skill and seniority of the operator or technique of closure play in this disaster?

Since the beginnings of abdominal surgery, surgeons have naturally argued about the merits of different techniques of wound closure but only in recent years have they submitted their ideas to the discipline of controlled clinical trials. These have shown, for example, the very high failure rate that can be expected if reliance is placed entirely on absorbable catgut sutures (Goligher, 1976). Many standard surgical textbooks stress the importance of suture of the peritoneum in the closure of abdominal incisions yet, in our own clinical trial, we have found that the incidence of burst abdomen and of incisional hernia in a series of patients whose laparotomy wounds have been sutured with and without peritoneal closure showed no significant difference. In 162 patients undergoing two-layer closure (catgut to the peritoneum and nylon to the sheath) there were 4 burst abdomens and 7 wound hernias (a total of 6.8% wound failures). In 164 one-layer closures, where the peritoneal suture line was omitted, there were 5 burst abdomens and 7 hernias (7.3% wound failures). Thus closure of the peritoneum as a separate layer as so widely advised and practised, appears to play no significant part in the healing of the laparotomy wound (Ellis and Heddle, 1977). There is now much evidence that mass closure of all layers of the abdominal wall apart from the skin, using unabsorbable sutures (nylon or steel wire) which incorporate wide bites of tissue either side of the line of incision, greatly reduces the incidence of wound breakdown, and this is certainly our own recent experience. With this technique, a burst abdomen rate of 1% or less and a 5% incidence of incisional hernia can be achieved (Irvin *et al.*, 1977; Leaper, Pollock and Evans, 1977). In support of this technique, Leaper and his colleagues (1977), in cadaver experiments, showed that the suture-holding capacity of the anterior rectus sheath alone was 2.25 kg, whereas the sutured full thickness wound has a

strength of 4.36 kg. In further experiments, the suture-holding capacity of stitches placed 0.5 cm from the cut edge was 3.9 kg whereas sutures placed 1 cm from the cut edge tore through at 7.16 kg.

Turning now to factors responsible for failure of healing, Irvin and his colleagues (1977), in a prospective trial of 200 abdominal wound closures, found that 7 of their 11 cases of dehiscence or herniation occurred in infected wounds, wound infection being associated with a ten-fold increase in the incidence of these complications. There were too few cases of wound failure in this study to permit a statistical evaluation of other factors but incisional hernias and wound infections were encountered rather more often in obese patients and in patients with malignant disease. Eight jaundiced patients were included in the study and one developed an incisional hernia. Pollet (1977) has studied herniation through appendectomy wounds and found that these, too, were associated with wound infection as well as with obesity of the patient. Leaper and his colleagues (1977), in a study of 357 major laparotomies, found that severe chest complications correlated with wound failure and that 8 out of 18 incisional hernias occurred in patients with deep wound sepsis. In our own study (Ellis and Heddle, 1977), only jaundice reached statistical significance in the aetiology of wound failure. There were 3 burst abdomens and 4 incisional hernias in 21 patients operated upon in the presence of jaundice (33.3% failures) compared with a 5.2% failure rate in the 305 non-jaundiced patients. Although obesity, chest infection, postoperative distension and postoperative wound infection all had an increased percentage of failure compared with patients in which these factors were absent, they did not reach statistical significance.

The seriousness of burst abdomen, even apart from the fright and discomfort to the patient and necessity for an emergency operation, is demonstrated by a study by White, Cook and Ward (1977). An analysis of 123 patients with abdominal wound dehiscence showed a 24% mortality and, of the 93 survivors, 18 (19%) subsequently developed an incisional hernia.

Most surgeons believe that local wound infection must impair wound healing and clinical experience (as quoted above) certainly seems to support this. The experimental studies reported by Enquist and his collaborators (Raju *et al.*, 1977; Tenorio *et al.*, 1976), although showing that wounds infected with *Staphylococcus aureus* healed significantly more slowly than did uninfected wounds, this was not the case when Gram-negative bacteria were employed. They studied the tensile strength and histological appearances of standard laparotomy wounds in the rat inoculated with pure and mixed cultures of Gram-negative bacteria and *Streptococcus faecalis*. To their surprise, the tensile strength of the wounds in the

infected animals were significantly increased. Since there was no increase in collagen, these authors explained the stronger wound in the presence of infection as being the result of the exaggerated inflammatory response with production of superabundant granulation tissue. It is interesting that in our own studies, published some years ago, (DeHaan, Ellis and Wilks, 1974) we demonstrated that although a muscle abscess produced by *Pseudomonas*, or a sterile turpentine abscess or a transient *Pseudomonas* bacteraemia had marked inhibitory effects on the early healing of skin, muscle, stomach and peritoneal wounds, direct infection of these wounds, even though local pus was produced, did not show any impairment of healing. It may well be that infection in these cases produces a systemic rather than local effect on healing tissues.

Miscellaneous

Foreign bodies

The 8 external orifices of the human body seem to attract strange foreign bodies just as honey does to bees. For size and variety of objects, pride and place goes to the rectum and there are a number of circumstances which may result in their ectopic presence. Firstly, there are the iatrogenic group, including thermometers, enema tips and catheters as well as inspissated masses of barium left behind after radiological examination. Next is the therapeutic group, a large variety of blunt objects to relieve pruritus and prolapsing piles. Criminal assault is an occasional cause and finally a wide variety of objects may be introduced into the rectum for sexual gratification, including battery-driven vaginal vibrators (Leading Article, 1977a). McDonald and Rosenthal (1977) had to remove a baseball impacted in the rectum by laparotomy in a man aged 49 placed there by his partner because 'he was oversexed'.

Most reports of rectal foreign bodies are anecdotal but Eftaiha, Hambrick and Abcarian (1977) review a 5-year experience of the removal of 31 colorectal foreign bodies in 30 patients. It is interesting that all 30 were male. Low-lying foreign bodies were removed trans-anally and, if sharp, were delivered through a proctoscope with care not to create further mucosal laceration. Large rounded objects were removed with the help of forceps when there was no risk of breaking the foreign body but glass containers required special care to avoid fracture. The suction effect created by the upward direction of the mouth of the container was ingeniously released by the use of a couple of Foley catheters passed around the container and extended into the lumen of the bowel above the foreign object. After inflating the balloons of the catheters, air was injected and application of traction to the catheters also helped in removal of the object. For high-lying foreign bodies, the patient is

placed in the lithotomy position, the object located through the sigmoidoscope and manipulated, if possible, by abdominal palpation into the rectal ampulla but in three patients open operation was necessary.

Turning to the other end of the alimentary canal, phytobezoars, which are concretions in the stomach made up of plant fibre, are unusual but may particularly occur following gastric surgery. Lee, Holloway and Nicholson (1977) give an interesting account of the medical dissolution of these foreign bodies using cellulase in five patients, all of whom had had a previous partial gastrectomy. This enzyme breaks up the cementing structure of the phytobezoar, allowing the solid mass to disintegrate to fine debris. All 5 cases were relieved of their foreign bodies after 3 days of enzyme treatment.

Crush syndrome

The earliest descriptions of the crush syndrome followed the Sicilian earthquake of 1908 but it was first defined as a clinical entity in air raid casualties in London during the Blitz. Following a compression injury of several hours' duration, usually to a limb, the patients developed hypotension and acute renal failure. Dark brown or granular casts were seen in the urine and at post-mortem examination the renal tubules contained a brown pigment and showed degenerative changes. Fortunately, the condition is unusual in peacetime but Brown and Nicholls (1977) give a detailed account of two patients suffering from the syndrome as a result of being trapped for several hours during the Moorgate tube train disaster. In spite of the most sophisticated modern treatment both patients died, one at 26 days and the other after 14 weeks. In spite of intensive research, pathogenesis remains the subject of debate. Among the possibilities are that the renal damage results from the myoglobin released from crushed muscle, the liberation of some unidentified nephrotoxin from the damaged tissues, selective renal vasoconstriction, hypotension, or possibly a combination of any of these circumstances. Much of the difficulty facing the investigator is the fact that no satisfactory animal experimental model exists for the crush syndrome.

The major threat to life is uncontrollable sepsis, which was the cause of death of both the Moorgate victims. Impaired host resistance is characteristic of both injured patients and those with renal failure; this requires further intensive study.

Perhaps the most difficult decision is that of the indications for amputation of the crushed limb (Leading Article, 1977b). When gross swelling, lack of movement and anaesthesia make it apparent that most of the soft tissues are dead there should be no further delay; fasciotomy and limited excision are ineffective in such cases.

Palliation for inoperable carcinoma of the oesophagus

The prognosis in obstructing neoplasms at or near the cardia is poor. Many patients present with obvious distant metastases, or their gross debility and advanced age preclude radical surgery. Atkinson and Ferguson (1977) report a useful contribution from the physicians in this surgical subject, which is to carry out intubation of the obstruction via the fiberoptic endoscope. The stricture is first dilated by means of Eder-Puestow dilators, following which a Celestin plastic tube is inserted over a guide wire by means of a rammer. This procedure was carried out in 13 patients with one death – the remainder were able to swallow satisfactorily and discharge from hospital was often possible within 3 days. These results are certainly superior to those reported using palliative intubation at laparotomy with gastrotomy and pull-through of the tube.

References

Abdominal investigations

- ABRAMS, J.S. (1977) A hard look at colonoscopy. *American Journal of Surgery*, **133**, 111.
- ARNAUD, J.P., APRAHAMIAN, M., MACLER, J., RENAUD, R. & ADLOFF, M. (1977) L'échographie dans le diagnostic des pseudokystes du pancréas. *Annales de chirurgie*, **31**, 463.
- BENJAMIN, I.S., ALLISON, M.E.M., MOULE, B. & BLUMGART, L.H. (1977) ERCP and fine needle percutaneous transhepatic cholangiography in the diagnosis of biliary tract disease. *Gut*, **18**, 416.
- BERCI, G. (1976) *Endoscopy*. Appleton, Century Crofts, New York.
- BERGER, M., SMITH, E., HOLM, H.H. & MASCATELLO, V. (1977) Utility of ultrasound in the differential diagnosis of acute cholecystitis. *Archives of Surgery*, **112**, 273.
- BURCHARTH, F., CHRISTIANSEN, L., EFSSEN, F., NIELBO, N. & STAGE, P. (1977) Percutaneous transhepatic cholangiography in diagnostic evaluation of 160 jaundiced patients. *American Journal of Surgery*, **133**, 559.
- CAFFEE, H.H., WATTS, G. & MENA, I. (1977) Gallium 67 citrate scanning in the diagnosis of intra-abdominal abscess. *American Journal of Surgery*, **133**, 665.
- CLASSEN, M. & OSSENBERG, F.W. (1977) Progress report – non-surgical removal of C.B.D. stones. *Gut*, **18**, 760.
- COOPERMAN, A.M., HAAGA, J., ALFIDI, R., STEIGER, E. & HERMANN, R. (1977) Computed tomography: a valuable aid to the abdominal surgeon. *American Journal of Surgery*, **133**, 121.
- COTTON, P.B. (1977) Progress report ERCP. *Gut*, **18**, 316.
- GOMEZ, J. & DALLY, P. (1977) Psychologically mediated abdominal pain in surgical and medical out-patient clinics. *British Medical Journal*, **1**, 1451.
- HINDE, G. DEB., SMITH, P.M. & CRAVEN, J.L. (1977) Percutaneous cholangiography with the Okuda needle. *Gut*, **18**, 610.
- KREEL, L. & MEIRE, H.B. (1977) The diagnostic process: a comparison of scanning techniques. *British Medical Journal*, **2**, 809.
- LEADING ARTICLE (1977a) Colonoscopy. *British Medical Journal*, **1**, 1240.
- LEADING ARTICLE (1977b) Diagnostic laparotomy. *British Medical Journal*, **2**, 144.
- MORRIS, A.I., FAWCITT, R.A., MARSH, M.N. & ISHERWOOD, I. (1977) Value of whole body computerised axial tomography in the diagnosis of liver disease. *Gut*, **18**, 417.

- ROTHMAN, D.L., SCHWARTZ, S.I. & ADAMS, J.T. (1977) Diagnostic laparotomy for fever or abdominal pain of unknown origin. *American Journal of Surgery*, **133**, 273.
- VICARY, F.R. (1977) Progress report: ultrasound and gastroenterology. *Gut*, **18**, 386.
- VICARY, F.R., CUSICK, G., SHIRLEY, I.M. & BLACKWELL, R.J. (1977) Ultrasound and jaundice. *Gut*, **18**, 161.
- WEBB, L.J., BERGER, L.A. & SHERLOCK, S. (1977a) Diagnosis of extrahepatic portal obstruction by greyscale ultrasound. *Gut*, **18**, 417.
- WEBB, L.J., BERGER, L.A. & SHERLOCK, S. (1977b) Greyscale ultrasonography of portal vein. *Lancet*, **ii**, 675.
- WILLIAMS, C.B. (1977) Colonoscopy and colonoscopic polypectomy. In: *Recent Advances in Surgery* 9 (Ed. by Taylor, S.). Churchill Livingstone, Edinburgh.
- WILSON, D.H., WILSON, P.D., WALMSLEY, R.G., HORROCKS, J.C. & DE DOMBAL, F.T. (1977) Diagnosis of acute abdominal pain in the accident and emergency department. *British Journal of Surgery*, **64**, 250.
- WOLSON, A.H. (1977) Ultrasound diagnosis of pelvic and wound abscess after an appendectomy. *Surgery, Gynecology and Obstetrics*, **144**, 376.

Iatrogenic surgical diseases

- BAUM, J.K., HOLTZ, F., BOOKSTEIN, J.J. & KLEIN, E.W. (1973) Possible association between benign hepatomas and oral contraceptives. *Lancet*, **ii**, 926.
- BEIN, N.N. & GOLDSMITH, H.S. (1977) Recurrent massive haemorrhage from benign hepatic tumours secondary to oral contraceptives. *British Journal of Surgery*, **64**, 433.
- BROWN, P., BADDELEY, H., READ, A.E., DAVIES, J.D. & MCGARRY, J. (1974) Sclerosing peritonitis, an unusual reaction to a β -adrenergic blocking drug (practolol). *Lancet*, **ii**, 1477.
- CHRISTOPHERSON, W.M. & MAYS, E.T. (1977) Guest Editorials: Liver tumours and contraceptive steroids: experience of the first 100 registry patients. *Journal of the National Cancer Institute*, **58**, 167.
- ELTRINGHAM, W.K., ESPINER, H.J., WINDSOR, C.W.O., GRIFFITHS, D.A., DAVIES, J.D., BADDELEY, H., READ, A.E.A. & BLUNT, R.J. (1977) Sclerosing peritonitis due to practolol: a report on 9 cases and their surgical management. *British Journal of Surgery*, **64**, 229.
- FOSTER, J.H. (1977) Primary benign solid tumours of the liver. *American Journal of Surgery*, **133**, 536.
- FOSTER, J.H. & BERMAN, M.M. (1977) *Solid Liver Tumours*. W. B. Saunders Co., Philadelphia.
- GUZMAN, I.J., GOLD, J.H., ROSAI, J., SCHNEIDER, P.D., VARCO, R.L. & BUCHWALD, H. (1977) Benign hepatocellular tumors. *Surgery*, **82**, 495.
- HAYES, D., LAMKI, H. & HUNTER, I.W.E. (1977) Hepatic-cell adenoma presenting with intraperitoneal haemorrhage in the puerperium. *British Medical Journal*, **2**, 1394.
- HOYLE, M., KENNEDY, A., PRIOR, A.L. & THOMAS, G.E. (1977) Small bowel ischaemia and infarction in young women taking oral contraceptives and progestational agents. *British Journal of Surgery*, **64**, 533.
- JACKSON, B.T. (1977) Surgical treatment of sclerosing peritonitis due to practolol. *British Journal of Surgery*, **64**, 255.
- KOEP, L. & ZUIDERMA, G.D. (1977) The clinical significance of retroperitoneal fibrosis. *Surgery*, **81**, 250.
- LEADING ARTICLE (1977a) Iatrogenic pancreatitis. *British Medical Journal*, **2**, 1043.
- LEADING ARTICLE (1977b) Liver tumours and the pill. *British Medical Journal*, **2**, 345.
- NAKASHIMA, Y. & HOWARD, J.M. (1977) Drug-induced acute pancreatitis. *Surgery, Gynecology and Obstetrics*, **145**, 105.
- REYNIER, J., MERLAT, M., AUROUSSEAU, R., BERNARD, J.L., GROSSETTI, D., MONOD, R. & CHOLLIER, A. (1977) Hématomes intra-muraux du tube digestif sous traitement anticoagulant. *Annales de chirurgie*, **31**, 169.

- THOMPSON, R.P.H. & JACKSON, B.T. (1977) Sclerosing peritonitis due to practolol. *British Medical Journal*, **1**, 1393.
- TRESADERN, J., RICKWOOD, A.M.K. & SPITZ, L. (1977) Multiple small bowel strictures in a child and accidental potassium chloride ingestion. *British Medical Journal*, **2**, 1124.
- VESSEY, M.P., KAY, C.R., BALDWIN, J.A., CLARKE, J.A. & MACLEOD, I.B. (1977) Oral contraceptives and benign liver tumours. *British Medical Journal*, **1**, 1064.
- Antibiotics in surgery*
- CHODAK, G.W. & PLAUT, M.E. (1977) Use of systemic antibiotics for prophylaxis in surgery. A critical review. *Archives of Surgery*, **112**, 326.
- DARKE, S.G., KING, A.M. & SLACK, W.K. (1977) Gas gangrene and related infection: classification, clinical features and aetiology, management and mortality. A report of 88 cases. *British Journal of Surgery*, **64**, 104.
- FEATHERS, R.S., LEWIS, A.A.M., SAGOR, G.R., AMIRAK, I.D. & NOUNE, P. (1977) Prophylactic systemic antibiotics in colorectal surgery. *Lancet*, **ii**, 4.
- GATEHOUSE, D., DIMOCK, F., BURDON, D.W., ALEXANDER-WILLIAMS, J. & KEIGHLEY, M.R.B. (1977) Bacterial flora of the stomach in patients requiring gastric operations. *Gut*, **18**, 955.
- GILMORE, O.J.A. (1977) A reappraisal of the use of anti-septics in surgical practice. *Annals of the Royal College of Surgeons*, **59**, 93.
- GILMORE, O.J.A., REID, C. & STROKON, A. (1977) A study of the effect of povidone-iodine on wound healing. *Postgraduate Medical Journal*, **53**, 122.
- KEIGHLEY, M.R.B. (1977a) Prevention of wound sepsis in gastrointestinal surgery. *British Journal of Surgery*, **64**, 315.
- KEIGHLEY, M.R.B. (1977b) Micro-organisms in the bile: a preventable cause of sepsis after biliary surgery. *Annals of the Royal College of Surgeons*, **59**, 328.
- LAWSON, D.H. & MACDONALD, S. (1977) Antibacterial therapy in general medical wards. *Postgraduate Medical Journal*, **53**, 306.
- MCLISH, A.R., KEIGHLEY, M.R.B., BISHOP, H.M., BURDON, D.W., QUORAIISHI, A.H., DORRICOIT, N.J., OATES, G.D. & ALEXANDER-WILLIAMS, J. (1977) Selecting patients requiring antibiotics in biliary surgery by immediate Gram-staining of bile at operation. *Surgery*, **81**, 473.
- MACFIE, J. & HARVEY, J. (1977) The treatment of acute superficial abscesses: a prospective clinical trial. *British Journal of Surgery*, **64**, 264.
- POLK, H.C. & SHIELDS, C.L. (1977) Remote organ failure: a valid sign of occult intra-abdominal infection. *Surgery*, **81**, 310.
- POLLOCK, A.V., LEAPER, D.J. & EVANS, M. (1977) Single dose intra-incisional antibiotic prophylaxis of surgical wound sepsis: a controlled trial of cephaloridine and ampicillin. *British Journal of Surgery*, **64**, 322.
- READ, L. & COVE-SMITH, J.R. (1977) Pseudomembranous enterocolitis complicating ampicillin therapy. *Postgraduate Medical Journal*, **53**, 324.
- TAYLOR, S.A. & CAWDERY, H.M. (1977) The use of metronidazole in the preparation of the bowel for surgery. *Proceedings of the Royal Society of Medicine*, **70**, 481.
- WILLIS, A.T., FERGUSON, I.R., JONES, P.H., PHILLIPS, K.D., TEARLE, P.V., STIDDIAN, R.V., GRAHAM, D.F., HARLAND, D.H.C., HUGHES, D.F.R., KNIGHT, D., MEE, W.M., PASHBY, N., ROTHWELL-JACKSON, R.L., SACHDEVA, A.K., SUTCH, I., KILBEY, C. & EDWARDS, D. (1977) Metronidazole in prevention and treatment of *Bacteroides* infections in elective colonic surgery. *British Medical Journal*, **1**, 607.
- Duodenal ulceration*
- ALLAN, J.G., GERSKOWITCH, V.P. & RUSSELL, R.I. (1973) A study of the role of bile acids in the pathogenesis of post-vagotomy diarrhoea. *Gut*, **14**, 423.
- ALLAN, J.G. & RUSSELL, R.I. (1977) Cholestyramine in treatment of post-vagotomy diarrhoea - double-blind controlled trial. *British Medical Journal*, **1**, 674.
- AMDRUP, E., ANDERSEN, D. & JENSEN, H.E. (1977) Parietal cell (highly selective or proximal gastric) vagotomy for peptic ulcer disease. *World Journal of Surgery*, **1**, 19.
- BLACKWOOD, W.S., MAUDGAL, D.P. & NORTHFIELD, T.C. (1977) Prevention of relapse of duodenal ulcer by bedtime cimetidine, a double-blind clinical trial. *Gut*, **18**, 420.
- DE MIGUEL, J. (1977) Recurrence after proximal gastric vagotomy without drainage for duodenal ulcer: a 3-6 year follow-up. *British Journal of Surgery*, **64**, 473.
- DUNCOMBE, V.M., BOLIN, T.D. & DAVIS, A.C. (1977) Double-blind trial of cholestyramine in post-vagotomy diarrhoea. *Gut*, **18**, 531.
- FROMM, D. (1977) *Complications of Gastric Surgery*. John Wiley & Sons, New York.
- GRAY, G.R., MCKENZIE, I., SMITH, I.S., CREAN, G.P. & GILLESPIE, G. (1977a) Oral cimetidine in severe duodenal ulceration. A double-blind controlled trial. *Lancet*, **i**, 4.
- GRAY, G.R., SMITH, I.S., GILLESPIE, G. & MACKENZIE, I. (1977b) Maintenance cimetidine in the control of duodenal ulcer symptoms. *Gut*, **18**, 420.
- HEDE, J.E., TEMPLE, J.G. & MCFARLAND, J. (1977) The place of transthoracic vagotomy in the management of recurrent peptic ulceration. *British Journal of Surgery*, **64**, 332.
- HOLLE, F. (1977) Critique and summary on the clinic of SPV and pyloroplasty (1964-1974) *Chirurgia gastroenterologica*, **11**, 69.
- HOLLENDER, L.F., MARRIE, A., MEYER, C. & STARLINGER, M. (1977) La vagotomie supra-sélective dans l'ulcère duodénal. *Annales de chirurgie*, **31**, 241.
- HOLST-CHRISTENSEN, J., HANSEN, O.H., PEDERSON, T. & KRONBORG, O. (1977) Recurrent ulcer after proximal gastric vagotomy for duodenal and pre-pyloric ulcer. *British Journal of Surgery*, **64**, 42.
- JAFFE, B.M. (1977) Parietal cell vagotomy: surgical technique, gastric acid secretion, and recurrence. *Surgery*, **82**, 284.
- JENSEN, H.E. & AMDRUP, E. (1977) Five years after parietal cell vagotomy. *Chirurgia gastroenterologica*, **11**, 59.
- KRONBORG, O., JORGENSEN, P.M. & HOLST-CHRISTENSEN, J. (1977) Influence of different techniques of proximal gastric vagotomy upon risk of recurrent duodenal ulcer and gastric acid secretion. *Acta chirurgica scandinavica*, **143**, 53.
- LEADING ARTICLE (1977) Preventing recurrence of ulcers. *British Medical Journal*, **2**, 1440.
- PICAUD, R., BAKI, N., ANFOSSI, G., GUIDICELLI, C. & DALMAS, H. (1977) Résultat d'une série de 100 vagotomies ultra-sélectives pour ulcère duodénal. *Journal de chirurgie*, **114**, 267.
- SOLHAUG, J.H., BJERKESET, T. & HALVORSEN, J.F. (1977) Highly selective vagotomy in the treatment of duodenal ulcer in a teaching hospital. *Surgery*, **82**, 248.
- TAYLOR, T.V., PEARSON, K.W. & TORRANCE, B. (1977) Revagotomy for recurrent peptic ulceration. *British Journal of Surgery*, **64**, 477.
- THOMPSON, M.H., VENABLES, C.W., SMITH, P.A. & WALKER, W. (1977) Nocturnal metiamide treatment in the management of healed duodenal ulceration. *Gut*, **18**, 438.
- WASTELL, C., COLIN, J., WILSON, T., WALKER, E., GLEESON, J. & ZEEGEN, R. (1977) Prospectively randomised trial of proximal gastric vagotomy either with or without pyloroplasty in treatment of uncomplicated duodenal ulcer. *British Medical Journal*, **2**, 851.

Crohn's disease

- CROFT, R.J. (1977) Free perforation of the small bowel in Crohn's disease. *Postgraduate Medical Journal*, **53**, 344.
- DONNELLY, B.J., DELANEY, P.W. & HEALY, T.M. (1977) Evidence for a transmissible factor in Crohn's disease. *Gut*, **18**, 360.
- DORAISWAMY, N.V., CURRIE, A.B.M., GRAY, J., LYNTON-MOLL, C. & MAIR, N.S. (1977) Terminal ileitis: *Yersinia enterocolitica*, isolated from faeces. *British Medical Journal*, **2**, 23.
- DUNNE, W.T., COOKE, W.T. & ALLAN, R.N. (1977) Enzymatic and morphometric evidence for Crohn's disease as a diffuse lesion of the gastrointestinal tract. *Gut*, **18**, 290.
- FAZIO, V.W., WILK, P., TURNBULL, R.B. & JAGELMAN, D.G. (1977) The dilemma of Crohn's disease: ileosigmoidal fistula. *Diseases of the Colon and Rectum*, **20**, 381.
- FLINT, G., STRAUSS, R., PLATT, N. & WISE, N. (1977) Ileorectal anastomosis in patients with Crohn's disease of the colon. *Gut*, **18**, 236.
- HAMILTON, P.A., BROWN, P., DAVIES, J.D., SALMON, P.R. & CROW, K.D. (1977) Crohn's disease: an unusual cause of dyspareunia. *British Medical Journal*, **2**, 101.
- HOFFMAN, J.P., TAFT, D.A., WHEELIS, R.F. & WALKER, J.H. (1977) Adenocarcinoma in regional enteritis of the small intestine. *Archives of Surgery*, **112**, 606.
- JONES, P.F., MUNRO, A. & EWEN, S.W.B. (1977) Colectomy and ileo-rectal anastomosis for colitis. *British Journal of Surgery*, **64**, 615.
- LEADING ARTICLE (1977) Crohn's disease of the duodenum. *British Medical Journal*, **2**, 282.
- LEE, G.B., SMITH, P.M. & SEAL, R.M.E. (1977) Lymphosarcoma in Crohn's disease. Report of a case. *Diseases of the Colon and Rectum*, **20**, 351.
- NUGENT, F.W., RICHMOND, M. & PARK, S.K. (1977) Crohn's disease of duodenum. *Gut*, **18**, 115.
- SEGAL, A.W., LEVI, A.J. & LOEWI, G. (1977) Levamisole in the treatment of Crohn's disease. *Lancet*, **ii**, 382.
- SIMONOWITZ, D., BLOCK, G.E., RIDDELL, R.H., KRAFT, S.C. & KIRSNER, J.B. (1977) The production of an unusual tissue reaction in rabbit bowel injected with Crohn's disease homogenates. *Surgery*, **82**, 211.
- STODDARD, C.J. & IRVIN, T.T. (1977) Recto-uterine fistulation in Crohn's disease. *British Medical Journal*, **1**, 1574.
- STONE, W., VEIDENHEIMER, M.C., CORMAN, M.L. & COLLIER, J.A. (1977) The dilemma of Crohn's disease: long-term follow-up of Crohn's disease of the small intestine. *Diseases of the Colon and Rectum*, **20**, 372.
- WATTS, J.McK. & HUGHES, E.S.R. (1977) Ulcerative colitis and Crohn's disease: results after colectomy and ileorectal anastomosis. *British Journal of Surgery*, **64**, 77.
- WESDORP, E., SCHELLEKENS, P.T.A., WEENING, R., MEUWISSEN, S.G.M. & TYTGAT, G.N.J. (1977) Levamisole in Crohn's disease - a double blind controlled trial. *Gut*, **18**, 971.
- WESTABY, S., EVERETT, W.G. & DICK, A.P. (1977) Adenocarcinoma of the small bowel complicating Crohn's disease in a patient treated with azathioprine. *Clinical Oncology*, **3**, 377.
- WILK, P.J., FAZIO, W. & TURNBULL, R.B. (1977) The dilemma of Crohn's disease: ileoduodenal fistula complicating Crohn's disease. *Diseases of the Colon and Rectum*, **20**, 387.
- Wound healing*
- DEHAAN, B.B., ELLIS, H. & WILKS, M. (1974) The role of infection on wound healing. *Surgery, Gynecology and Obstetrics*, **138**, 693.
- ELLIS, H. (1977) Wound healing. *Annals of the Royal College of Surgeons*, **59**, 382.
- ELLIS, H. & HEDDLE, R. (1977) Does the peritoneum need to be closed at laparotomy? *British Journal of Surgery*, **64**, 733.
- GOLIGHER, J.C. (1976) Visceral and parietal sutures in abdominal surgery. *American Journal of Surgery*, **131**, 130.
- IRVIN, T.T., STODDARD, C.J., GREANEY, M.G. & DUTHIE, H.L. (1977) Abdominal wound healing: a prospective clinical study. *British Medical Journal*, **2**, 351.
- LEAPER, D.J., POLLOCK, A.V. & EVANS, M. (1977) Abdominal wound closure: a trial of nylon, polyglycolic acid and steel sutures. *British Journal of Surgery*, **64**, 603.
- POLLET, J. (1977) Appendectomy wounds do herniate. *Journal of the Royal College of Surgeons of Edinburgh*, **22**, 274.
- RAJU, D.R., JINDRAK, K., WEINER, M. & ENQUIST, I.F. (1977) A study of the critical bacterial inoculum to cause a stimulus to wound healing. *Surgery, Gynecology and Obstetrics*, **144**, 347.
- TENORIO, A., JINDRAK, K., WEINER, M., BELLA, E. & ENQUIST, I.F. (1976) Accelerated healing in infected wounds. *Surgery, Gynecology and Obstetrics*, **142**, 537.
- WHITE, H., COOK, J. & WARD, M. (1977) Abdominal wound dehiscence. A 10-year survey from a district general hospital. *Annals of the Royal College of Surgeons*, **59**, 337.
- Miscellaneous*
- ATKINSON, M. & FERGUSON, R. (1977) Fibreoptic endoscopic intubation of inoperable oesophago-gastric neoplasm. *British Medical Journal*, **1**, 266.
- BROWN, A.A. & NICHOLLS, R.J. (1977) Crush syndrome: a report of 2 cases and a review of the literature. *British Journal of Surgery*, **64**, 397.
- EFTAIHA, M., HAMBRICK, E. & ABCARIAN, H. (1977) Principles of management of colorectal foreign bodies. *Archives of Surgery*, **112**, 691.
- LEADING ARTICLE (1977a) Foreign bodies in the rectum. *British Medical Journal*, **2**, 656.
- LEADING ARTICLE (1977b) Crush injuries. *British Medical Journal*, **2**, 1244.
- LEE, S.P., HOLLOWAY, W.D. & NICHOLSON, G.I. (1977) The medical dissolution of phytobezoars using cellulase. *British Journal of Surgery*, **64**, 403.
- MCDONALD, P.T. & ROSENTHAL, D. (1977) An unusual foreign body in the rectum - a baseball. *Diseases of the Colon and Rectum*, **20**, 56.