

Bypass surgery for obesity

The medical management of gross obesity is almost always unsuccessful in the long term. For this reason intestinal bypass has become a popular treatment, especially in the USA. Only two large series^{1,2} have been reported in Britain. Baddeley³ recently published an excellent account of his results in 182 patients, using operations based on those of Payne and de Wind,⁴ in which 14 inches (35 cm) of proximal jejunum are anastomosed end-to-end to 4 inches (10 cm) of terminal ileum, or on Scott *et al*,⁵ who anastomose the jejunum end-to-end to the terminal ileum and implant the blind loop to the transverse colon or sigmoid. Gazet *et al*² have reported results using an even shorter bypass—4 inches (10 cm) of jejunum to 10 inches (25 cm) of ileum.

Whatever procedure is used, the operation leads to great weight loss, averaging 40 kg and mostly occurring in the first postoperative year. Generally after two years weight is no longer lost and may even be regained. Such good results are obtained in about 80% of patients, but in about 10% the weight loss is unsatisfactory, and in about 5% the bowel has to be restored to normal because the patient cannot adapt to the bypass. The mortality is about 5%, half occurring at the time of operation and half at a later date.

The immediate operative complication rate is high—as might be expected from the gross obesity. Wound infections with dehiscence, incisional herniae, pulmonary emboli, and chest infections are all common.

The delayed mortality is mostly due to uncontrolled diarrhoea and vomiting leading to potentially fatal electrolyte disturbances and metabolic failure. When associated with jaundice these deaths have been described as due to liver failure, but such a conclusion seems unjustified when, as is usual, necropsy shows only severe fatty change in the liver. It is more likely that cellular metabolism throughout the body is grossly disturbed in such patients, a picture much like that found in kwashiorkor.^{6,7} Patients in hot climates are exposed to the risk of renal stone formation due to hyperoxaluria. Bacterial contamination of the small bowel may lead to arthritis, vasculitis, and pseudo-obstruction of the colon. The syndrome can often be treated successfully with metronidazole, but on occasions it is so severe that the bypass must be reversed.

Weight loss after bypass is due to decreased food intake and not due to malabsorption.⁸ The likely explanation for this change in eating habit seems to be the delayed transit of food through the bypassed bowel.⁹ Why this occurs is not yet known, but it has the effect of distending the proximal bowel and decreasing appetite. However, should the patient ignore the sensation of fullness and continue to eat normally the inevitable result is vomiting, which if continued leads to the hazards described already. There is no slowing of transit time when fluid alone is taken. Too great an intake leads to diarrhoea and electrolyte depletion, and, while electrolytes can be replaced, once excessive amounts of water have been lost only intravenous replacement can be effective. Bypass, then, presents a challenge to the patient to adapt; and there are three possible outcomes. He may adjust rapidly to the inability to eat normal amounts, and the loss of weight will be only small; or he may not adjust at all, when continued vomiting will lead to death if the bowel is not reconstituted; or there may be a gradual adaptation and great loss of weight.

The results of most bypass series suggest that the third course is the usual one. Nevertheless, bypass should never be undertaken lightly. Follow-up is arduous and expensive, and

patients may have to take replacement therapy, such as folic acid or vitamin B₁₂, for the rest of their lives. At best the operation can produce a happier and slimmer patient, with no evidence of liver damage. But bypass surgery is far from an ideal answer to an all too common medical problem.

¹ Baddeley, R M, *Proceedings of the Royal Society of Medicine*, 1973, **66**, 1098.

² Gazet, J-C, *et al*, *British Medical Journal*, 1974, **4**, 311.

³ Baddeley, R M, *British Journal of Surgery*, 1976, **63**, 801.

⁴ Payne, J H, and De Wind, L T, *American Journal of Surgery*, 1969, **118**, 141.

⁵ Scott, H W, *et al*, *Annals of Surgery*, 1971, **174**, 560.

⁶ Moxley, R T Z, Pozefsky, T, and Lockwood, D H, *New England Journal of Medicine*, 1974, **290**, 921.

⁷ Patrick, J, unpublished (Tropical Metabolism Research Unit, University of the West Indies, Kingston, Jamaica).

⁸ Pilkington, T R E, *et al*, *British Medical Journal*, 1976, **1**, 1504.

⁹ Quaaed, F J, *et al*, *Scandinavian Journal of Gastroenterology*, 1971, **6**, 357.

Spontaneous rupture of the liver

Spontaneous rupture of a diseased liver is rare in Britain. Spontaneous rupture of the normal liver is even rarer. The most common hepatic disease which predisposes to rupture is a primary tumour. Though metastatic tumour of the liver is many times more common than primary tumour, rupture of secondary deposits is exceedingly rare. The tendency of primary tumours to rupture is related to their vascularity. Probably the damage occurs as tumour extension causes venous obstruction and bleeding into the growth. If the pressure rises sufficiently to cause rupture through the capsule of the liver then haemoperitoneum follows, and the combination of a high arterial inflow and a poor venous outflow means that haemorrhage tends to continue. In the same way benign vascular lesions of the liver may also rupture and present as haemoperitoneum. Recently there have been several reports of vascular tumours developing in women taking the contraceptive pill. These often present with haemoperitoneum, and in such cases the mortality rate has recently been quoted as 60%.¹

Primary tumours of the liver are rare in Britain, but are comparatively common in the Far East and South Africa. Not surprisingly, therefore, one of the biggest series of patients presenting with spontaneous rupture of hepatic tumours has been reported from Hong Kong. Forty-two patients who presented in this way were analysed in detail.² They accounted for 15% of all patients with primary hepatic tumours. Cases reported from Europe have been mostly sporadic; though recently five patients aged 59-77 years with spontaneous rupture have been described in Finland.³

The diagnosis of spontaneous rupture of hepatic tumour is all the more difficult in Europe because of its rarity. These patients nearly all present with a sudden onset of severe epigastric pain, which may be described as being bursting. Occasionally pain is referred to the shoulder tip. The patient may be shocked, with tenderness and rebound tenderness, which is usually confined to the upper abdomen; another possible finding is muscle rigidity. An epigastric mass is palpable in two-thirds of patients. Abdominal paracentesis may help the diagnosis by confirming the presence of free blood, and at least one patient has been taken to the operating theatre with a diagnosis of ruptured aortic aneurysm.

The management of these patients must start with resuscitation and blood transfusion followed by early exploration. If it is possible, resection of the tumour by hemihepatectomy seems the best and most logical treatment. In the series from Hong Kong resection was possible in 13 out of 42 patients. There were five postoperative deaths; of the eight survivors one was alive at 5½ years, three were alive and well at 6 months, and one patient died at 3½ years. If resection is not possible then ligation of the hepatic artery seems the best method of controlling bleeding. In addition it has the advantage that it may cause tumour regression and relieve pain due to capsular stretching in some patients. Packing is much less satisfactory, and suture of the lesion usually impossible. In benign lesions ligation of the hepatic artery or more conservative resections should be used whenever possible.

Spontaneous rupture of the normal liver is rare. Almost all of the reported incidences have occurred in pregnant women.⁴ The patient usually presents with severe epigastric or right upper quadrant pain in the third trimester of pregnancy. They may have had nausea or vomiting, and some have had hypertension and pre-eclampsia. The mechanism of the rupture is uncertain, but its site is usually the right lobe. In most patients a subcapsular haematoma seems to develop first, which then expands and finally ruptures through the capsule of the liver into the general peritoneal cavity. In most cases it seems that the patient is first admitted to hospital for observation with undiagnosed abdominal pain; her condition then deteriorates, with more severe pain and shock. Abdominal paracentesis helps in diagnosis. After resuscitation the abdomen should be explored, and bleeding can usually be controlled by suture or packing with haemostatic agents. Sometimes hepatic artery ligation is required. Resection does not seem to be necessary. The fetus usually dies unless early delivery is undertaken, so that if the hepatic bleeding can be controlled quickly then caesarean section is probably indicated.

¹ Davis, M, *et al*, *British Medical Journal*, 1975, **4**, 496.

² Ong, G B, and Taw, J L, *British Medical Journal*, 1972, **4**, 146.

³ Mokka, R, *et al*, *British Journal of Surgery*, 1976, **63**, 715.

⁴ Baumwol, M, and Park, W, *British Journal of Surgery*, 1976, **63**, 718.

Measuring blood flow

The past 25 years have witnessed considerable advances in the understanding of circulatory haemodynamics. Much of this change has come from improvement in methods of blood flow measurement, itself due to close collaboration between biomedical engineers and clinicians. So it was appropriate that the Institution of Electronic and Radio Engineers should choose the applications of electronics to medicine as the subject of their recent Golden Jubilee Conference.¹

A great deal of effort has been concentrated on noninvasive methods of blood flow measurement. In electrical impedance plethysmography measurements of the changing electrical impedance between electrodes placed around a limb (or even an organ) give an estimate of the blood flow. Of particular interest, and still the subject of much controversy, is the application of this technique to the thorax. As early as 1943 Nyboer² observed transthoracic impedance changes with both respiration and cardiac activity. This stimulated research, and the now standard four-electrode technique was proposed by Kubicek and his colleagues³ in 1966. The method is now used widely for monitoring respiratory rate and, after calibration for each patient, for monitoring tidal volume.⁴ It is not widely

used, however, for the measurement of the stroke volume of the heart, since this application is still the subject of contention. A second noninvasive method featured at the conference was that based on the use of Doppler-shifted ultrasound. In this technique a blood vessel is insonated from a transducer placed on the skin. Reflected sound from any tissue interface moving within the sound field can be analysed to give a quantitative estimate of the velocity of blood flow. Early work in this field was pioneered by Strandness⁵ and his colleagues, mainly in relation to peripheral arterial disease. The latest refinements lie in the analysis of the pulse wave shape and propagation time, making it possible to diagnose the site of an arterial stenosis without the need for angiography.^{6,7} Vascular laboratories in which these investigations may be made are becoming familiar in our hospitals,⁸ and it seems likely that patients will soon be selected for reconstructive arterial surgery on the basis of routine ultrasound investigations alone.⁹

The use of ultrasound holds no less promise in cardiology. Light and others have pioneered the measurement of aortic velocity measurements¹⁰ for the assessment of cardiac function. Though early experience with these instruments showed that quantitation was difficult and data presentation poor,¹¹ new techniques of processing the complex Doppler spectra are currently under development.^{12,13} These enable the investigator to obtain the instantaneous mean and peak velocities in the aorta together with the acceleration wave forms. Further work on the simultaneous measurement of vessel calibre¹⁴ should enable the stroke volume to be computed beat by beat. Full clinical evaluation of these latest techniques must, however, wait for the equipment to become commercially available.

¹ *Proceedings of the Conference on Application of Electronics in Medicine*, London, Institution of Electronic and Radio Engineers, 1976.

² Nyboer, J, Bagno, S, and Nims, L F, *National Research Council Canada Report No 149*. Ottawa, National Research Council Canada, 1943.

³ Kubicek, W G, *et al*, *Aerospace Medicine*, 1966, **37**, 1208.

⁴ Baker, L E, and Hill, D W, *British Journal of Anaesthesia*, 1969, **41**, 2.

⁵ Strandness, D E, and Bell, J W, *Surgery, Gynecology and Obstetrics with International Abstracts of Surgery*, 1964, **119**, 1237.

⁶ Gosling, R, King, D, and Woodcock, J P, in *Blood Flow Measurement*, ed C Roberts. 2nd edn. London, Sector, 1976.

⁷ Johnston, K W, and Kakkar, V V, in *Clinical Blood Flow Measurement*, ed J Woodcock. London, Sector, 1976.

⁸ *British Medical Journal*, 1976, **1**, 1165.

⁹ Roberts, C, *Medical Progress through Technology*, 1976, **4**, 3.

¹⁰ Light, L H, and Cross, G, *Journal of Physiology*, 1971, **217**, 5p.

¹¹ Light, L H, Cross, G, and Hansen, P, in *Clinical Blood Flow Measurement*, ed J Woodcock. London, Sector, 1976.

¹² Huntsman, L L, *et al*, *American Heart Journal*, 1975, **89**, 605.

¹³ Sainz, A, Roberts, V C, and Pinardi, G, *Ultrasonics*, 1976, **14**, 128.

¹⁴ Sainz, A, Roberts, V C, *Medical and Biological Engineering*, 1976, **14**, 245.

Changes in orthopaedics

In any specialty there are periods of rapid growth and periods of consolidation, but in orthopaedics growth seems to have been sustained for the last decade with no signs of a pause. Prosthetic joints are revolutionising the management of degenerative and inflammatory arthritis; new tools such as the arthroscope are leading to more accurate diagnosis; while the use of adjuvant chemotherapy has transformed the management of some forms of bone cancer.

Starting this week (p 1301) we are publishing a series of articles reviewing the current management of the common disorders, for the recent advances have practical importance for anyone whose patients have bone and joint disease—which means every clinician.