to cannot be estimated. In the absence of exact diagnostic criteria, cases will vary from series to series, while those that get published may well include an abnormally high proportion of successes. Again, some cases appear to be benefited by steroid therapy, others by splenectomy. Since remission is usually a slow process it is often impossible to distinguish the results of therapy from the natural fluctuations of the disease. As Scott, Cartwright, and Wintrobe (1959) point out, even the excellent results attributed to splenectomy may well be largely accounted for by selection of the more chronic cases, which are inherently more likely to recover spontaneously.

In the light of these considerations it is impossible to assess the true rate of spontaneous remission at all accurately. The interested reader must perforce read in detail the reviews of Boon and Walton (1951), Heaton, Crosby, and Cohen (1957), Scott *et al.* (1959), and Israëls and Wilkinson (1961). It is not unlikely, however, that somewhat less than one-third of such cases as are commonly labelled aplastic anaemia may recover spontaneously.

Clearly the cases here reported represent no particular advance, and no firm conclusions can be reached. At the same time it is worth noting that in Case 9 the administration of a small dose of foetal haemopoietic cells was followed by lengthening of the intervals between transfusions, and that when the rate of haemoglobin decline had again accelerated, a second, larger, dose of foetal cells was followed by a more complete remission. It is not impossible that in this case, as in those reported by Boon and Walton (1951), Morrison and Samwick (1940), Dameshek, McFarland, and Granville (1960), and McFarland, Granville, Schwartz, Oliner, Misra, and Dameshek (1961), a temporary proliferation of foreign metabolically competent cells in the marrow is able to help the impaired cells to recover, or that a direct humoral factor is involved.

In this context the experimental work of Bernstein and Russell (1959) should be cited. They have shown that genetically anaemic mice may, without prior irradiation, be cured by transplantation of foetal liver cells from closely related animals. It can be proved that the donors are not quite isologous, since skin grafts are slowly rejected. The probability here is that the foreign cells are able to withstand a weak homograft reaction and so colonize the recipient marrow, although another mechanism such as transduction cannot be entirely excluded.

Meanwhile Diamond (1960) has revealed the therapeutic potency of androgens in many cases of aplasia, and it seems likely that this will take first place in future therapeutic efforts.

Summary

Fourteen cases representing different types of bone-marrow hypoplasia have been treated by injection of foetal haemopoietic cells. Out of four cases of chronic pancytopenia two have had remissions, the timing of which suggests that the foetal cells may possibly have been partly responsible, although chimerism was not detectable.

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SYNCHRONOUS COMBINED ABDOMINO-PERINEAL EXCISION OF RECTUM

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In the course of the evolution of any successful operative procedure certain steps can be traced: firstly, the tentative trials in the hands of the originator; secondly, the production of successful results from the departments of the specialists; and, finally, confirmation from the units of the general surgeon.

Since the synchronous combined abdomino-perineal excision of the rectum was first described by Lloyd Davies in 1939, the first two steps have been most adequately negotiated. Despite the increasing popularity of the operation there is little evidence available to indicate what results the average general surgical unit can anticipate. The purpose of this paper is to present the experiences of such a unit over the past 10 years.

Scope of the Survey

Over this period of 10 years 160 cases of carcinoma in the lower 10–12 cm. of the rectum have been admitted to one surgical unit at the Royal Infirmary, Sheffield. Lesions above this level have not been included in the series, as it has been our practice to submit these to sphincter-preserving operations. Of these 160 cases, 143 (89.4%) have undergone the operation of synchronous combined abdomino-perineal excision of the rectum. Of the remaining 17 cases (10.6%), four were judged to be inoperable because of very extensive local disease at the time of the initial examination or after an examination under anaesthesia. Nine others were submitted to laparotomy, but the operation was abandoned for a variety of reasons, the chief of these being extensive local spread with fixation laterally to the vascular pedicles or posteriorly to the sacrum; this occurred in six cases. Scattered metastases in an otherwise normal liver were not regarded as a contra-indication to excision of the rectum, but in three cases the hepatic secondaries were so gross that excision was

not felt to be justifiable. One patient presented with obstructive jaundice and ascites. Of the remaining three patients, one was moribund from advanced bilateral pulmonary tuberculosis, one was in such poor general health due to cardiac and pulmonary lesions that it was felt that operation would prove fatal, and the third refused operation.

The 143 patients who came to resection provide the material for this survey.

Technique

The operative technique used has varied from case to case, as no fewer than 16 surgeons of consultant and registrar level have taken part in the series. Broadly, however, the principles enunciated by Lloyd Davies have been followed, and such deviations as have occurred have been minor ones and have not violated basic principles.

Results

Mortality

It is often stated by both surgeons and anaesthetists that this operation is excessively shocking to the patient. This has not been our experience, nor does it appear to be that of others who regularly use it. One is persistently surprised by the rapid post-operative recovery of patients with considerable chronic pulmonary or cardiac disease.

The relationship of the posture of the patient during operation to the degree of shock is a possible factor we have considered. A modest degree of head-down tilt (see Fig.) is used and we have not found it necessary to indulge in the excessive degrees of tilt that are at times recommended. With adequate anaesthesia the small intestine can be packed off successfully without much aid from gravity, and one feels that the exaggerated Trendelenburg position must at least embarrass pulmonary ventilation.

Illustrating the maximum degree of head-down tilt which has been used during synchronous combined excision of the rectum.

There were 5 (3.5%) deaths amongst our cases in the post-operative period, and in four of these the reason was known definitely. The earliest occurred 36 hours after the operation, and at necropsy the cause was found to be a massive pulmonary collapse. A second patient died 48 hours after operation, and post-mortem examination revealed a coronary thrombosis: this was in a man aged 79. One man died after retraction of his colostomy on the fifth day, with ensuing peritonitis—this despite a further operation in an attempt to redeem the situation. An intestinal obstruction developing on the fifth day after operation necessitated reoperation in a further patient, who died 24 hours after his second

operation. The last patient died on the fifteenth post-operative day, and it was thought that he had suffered a coronary occlusion; permission for necropsy was not granted.

Comparison of this mortality rate with that of the specialist is probably not justified, for the following reasons. Firstly, the more experienced the unit the higher will be the rate of attempt at resection and therefore the more frequent will be the really extensive and major procedure. Secondly, the cases referred to the specialist unit are likely to be subject to a degree of selection as regards the advanced and technically difficult cases. Finally, this series covers only the last 10 years, with the benefits of advances in pre- and post-operative care, whereas most published series date from an earlier period.

However, as a guide, the remarkable results of Naunton Morgan (1951) are recorded. In a series of 287 personal cases of carcinoma of the rectum the operability rate was 94%. The mortality rate was 5.4% in 202 synchronous combined operations.

The immediate results of the operation in our hands have seemed to us most satisfactory.

Five-year Survival Rate

The success of operations for cancer is commonly estimated in part by the five-year survival rate, which in the 70 patients operated on more than five years ago has been 41%. This is to be compared with Naunton Morgan's figures of approximately 50%.

However, consideration of the Mayo Clinic figures (Wittoesch and Jackman, 1958) for the conservative treatment of carcinoma of the rectum in patients who refused operation or were too ill for operation casts doubts on the value of five-year survival rates as an index of the value of an operation. Almost 50% of over a hundred patients, untreated or treated minimally by cautery or local excision, were alive five years later, and several of those dead had died from causes other than cancer.

Time in Hospital

The pre-operative care of these patients has varied greatly, depending chiefly upon the general health of the individual patient. The healthy patient has been seen in the out-patient department and the question of operation has been discussed. All necessary investigations have been completed and a five-day course of a sulphonamide with low intestinal absorptivity (usually succinylsulphathiazole) has been administered while the patient is still at home. Admission has then been arranged on the day prior to operation. Other patients have required extensive pre-operative physiotherapy for chest disease—advanced chronic bronchitis being prevalent in Sheffield—or correction of severe anaemia, and so were admitted several days before operation. Because of the variability of this period the post-operative time in hospital only was assessed, and the average figure for this period proved to be 26 days, with a minimum of 12 and a maximum of 80 days. No patient is discharged until he is competent to look after his colostomy alone and is provided with an adequately adjusted colostomy belt.

Complications of the Operation

As this is a major abdominal procedure the patient is exposed to such general complications as post-operative ileus, pulmonary embolism, and post-operative

psychoses. There are, however, a group of complications which are more specifically related to this type of operation. These have been divided into the following groups: (1) urological complications, (2) complications related to the colostomy, (3) post-operative intestinal obstruction, and (4) complications of the perineal wound.

Urological Complications

The urological complications may be further divided into two broad groups: (A) direct operative injury to the urinary tract, and (B) post-operative retention of urine.

Group A

Direct trauma may be imposed intentionally or inadvertently upon the urinary tract at various levels. The ureters in their long course to the bladder are unequally exposed to risk above the level of the lateral ligaments—for in this region, while there is a possibility of damaging the left ureter during the ligation of the inferior mesenteric pedicle, the right ureter is almost immune from such assault (Graham and Goligher, 1954). At the level of the lateral ligaments, however, the right ureter also enters the field of danger and is now in as much peril as is the left. The hazard is increased when extrarectal spread of the growth or previous hysterectomy has distorted the normal course of the terminal ureters.

Because of this risk it is apparent that the ureters should be identified early in the operation, and if the pelvic dissection proves to be difficult constant reference should be made to their site. If the ureter is firmly involved in the growth it may of course be necessary to resect the lower end deliberately in order to eradicate the growth. Should the ureter be divided Graham and Goligher suggest that the proximal end be reimplanted into the bladder, as in their experience ligation of the cut end is often followed by a urinary fistula.

Deliberate division of the right ureter was undertaken once in our series, and we are unaware of any ureter being divided inadvertently. It has not, however, been our practice to perform any routine post-operative urological examination such as excretory pyelography, and it is therefore possible that ureters may have been divided without our knowledge. Fistulae from ureteric trauma were not encountered.

Damage to the base of the bladder is more likely to occur in men, for in women the uterus normally protects the bladder from involvement in the growth except in the most extensive cases. A partial cystectomy was undertaken once in our series where the growth involved the base of the bladder and was followed by a perineal urinary fistula. This failed to close despite continuous bladder drainage by urethral catheter, and after three months formal operative closure was successfully performed.

The membranous urethra is exposed to slight risk in the male and if damaged should be repaired immediately. No such case was seen in this series. In the female the intervening presence of the vagina is a safeguard to the urethra.

Trauma to the distal urinary tract may be minimized by undertaking the establishment of the plane of the fascia of Denonvilliers from the abdomen. This is usually a well-defined plane, unless involved by growth, which may be more easily identified from above than below.

Group B

Urinary retention of varying degree is common after this operation and there is no single factor which can be held responsible for all cases. Neurogenic lesions after damage to the sacral parasympathetic outflow, previous incomplete bladder-neck obstruction, and derangement of the pelvic viscera all undoubtedly play their part and indicate the necessity for attention to these factors at all stages in the care of the patient. Pre-operative assessment of the state of the urinary tract is important—the chance of examining the prostate is gone after the operation. If the abdominal operator be allowed to define the retrorectal space damage to the nervi erigentes should be rare, and after the operation the use of an indwelling catheter will prevent distension of the bladder if a temporary diminution in detrusor tone occurs.

It has been our experience that temporary urinary difficulty is quite common in female patients, but this has invariably resolved after continuous catheter drainage. In one woman, however, a large vesical calculus was found five years after the original operation and transvesical operation was required. In the male, however, spontaneous resolution of the retention is far less likely, suggesting that there is an associated obstructive element. The supporting role of the uterus might afford the explanation of the sex difference in this post-operative complication, but when hysterectomy has been combined with the rectal excision urinary difficulties have still proved to be transient, provided that adequate bladder drainage is maintained. There thus seems to be much doubt whether a pure neurogenic lesion is anything but a rarity, and it is becoming increasingly apparent that American urologists are very suspicious of whether prolonged retention occurs in the absence of an obstructive element. Both Ewert (1957) and Emmett (1957) stress that in their experience the vast majority of cases of bladder dysfunction in male patients respond to transurethral resection of the prostate. Of the men in our series, four required post-operative prostatectomy—three for benign lesions and one for an associated primary carcinoma of the prostate.

When the catheter is removed at the end of the first week after the operation it is important to be certain that micturition is adequate, for often the patient will remark that there is no difficulty in micturition and further discussion reveals that the 15-minute frequency which is satisfying him is an expression of an overflow incontinence. Examination of the bladder will reveal a distended and often insensitive bladder.

Colostomy Complications

There is no doubt that the colostomy has proved to be a source of considerable trouble within the series. Various techniques have been adopted from time to time, all involving the siting of the colostomy in the left iliac fossa away from the abdominal wound. Originally it was our practice to leave the terminal colon projecting for some distance from the muscle-splitting incision, being held in place by a clamp of the de Martel variety. Unfortunately, this was associated with a definite risk of colostomy stenosis, and eight patients required refashioning of the colostomy—this complication being apparent from one to three years after the original operation. Retraction of the colostomy was seen twice using this method: on one occasion this led to a fatal peritonitis despite laparotomy to relieve the situation.

The rather high incidence of colostomy stenosis, together with the occasionally difficult manoeuvre of closing the paracolic space, dictated against the continuation of this technique, and for the last two years we have brought the colostomy out through a muscle-splitting incision but by an extraperitoneal route, and have then performed a prompt mucocutaneous anastomosis. So far this seems to have been a satisfactory procedure, but our experience is not yet sufficient to be certain. It has of course the added advantage that, as there is no paracolic gutter to close, a small incision just large enough to allow the passage of the colon is all that is needed.

Even this technique is not infallible, and in one patient, admittedly elderly and a diabetic, the colostomy broke down to some extent on the tenth day, having functioned satisfactorily until this time. It settled rapidly, but one must wonder about the risk of stenosis later in such a case. A similar episode occurred in an elderly woman who had the rectum excised for a carcinoma supervening upon an ulcerative colitis. It had been intended to perform a total colectomy at the same time, but unfortunately her condition under the anaesthetic dictated against this. On the eighth day the mucocutaneous stitches sloughed through the colon, which retracted into the wound. Under these circumstances it is comforting to think that the orifice, by reason of its extraperitoneal route, is still some considerable distance from the peritoneal cavity.

The re-routing of the colon through the abdominal wall often results in a delay of function, which in our series has been as long as 10 days, though this is unusual. Strangely, though the patients have been unaware of passing flatus the abdomen has been but little distended and it would seem that some gas must surreptitiously leak out. There is no cause to interfere when this occurs, and undue dilatation of the opening and passage of flatus tubes is likely to damage the newly established orifice.

Neither colostomy prolapse nor troublesome herniation at the colostomy site has been common. Only one patient has required reoperation to deal with a prolapse of the colostomy, and in no case has a hernia required surgery.

Intestinal Obstruction

A transient paralytic ileus is quite common after synchronous combined excision of the rectum, but the incidence is no greater than that of more minor procedures; for if there be adequate relaxation during surgery the small bowel requires minimal handling and rapidly recovers its tone.

The question of small-bowel obstruction of a mechanical nature has been fully discussed by Goligher, Lloyd Davies, and Robertson (1951). While their cases were not operated upon solely by the synchronous combined technique there is no reason to believe that this operation has any unique advantage or disadvantage over its near relations in this respect. They found an incidence of 37 cases of small-bowel obstruction in a consecutive series of 1,302 rectal excisions at St. Mark's Hospital—that is, almost 3%.

Of the 12 cases in the St. Mark's series, 10 were caused by adhesions to the suture line, and the only small-bowel obstruction in our series had a similar cause.

Time of Obstruction.—Of the 37 cases in the St. Mark's series, 25 occurred in the first four weeks after

the operation and the remaining ones in a variable period up to 14 years after operation. The authors stressed that the classical picture of mechanical obstruction with intestinal colic and exaggerated bowel sounds heard on auscultation is not inevitable in the post-operative period. Often the obstruction is insidious in its onset, hinting of its presence only by gradually increasing abdominal distension and vomiting, or more copious gastric aspirate. This was certainly so in our patient, and at no time did he complain of any pain, being rather generally distressed and sweating, with only a modest amount of distension. There is thus much risk of mistaking such a mechanical obstruction for a prolonged paralytic ileus, and subsequent laparotomy may be excessively delayed.

Complications of the Perineal Wound

While there has been considerable controversy over the question of closure of the perineal wound, our policy has been dictated by the findings in each particular case. The peritoneal floor has been closed whenever this is possible, and after mobilization laterally of the peritoneal flaps, if necessary, closure is nearly always possible. If the wound in the perineum is dry at the end of the operation a primary closure without drainage is performed. If there is much oozing which cannot be controlled then a small pack is left in place. A corrugated rubber drain brought through the centre of the line of closure is used for the remaining cases.

Minor degrees of infection in the perineum are not uncommon, but in only five cases did a gross infection or breakdown of the perineal wound delay discharge from hospital. This figure would doubtless be much higher were not antibiotics available.

Herniation at the perineum of a degree to be noticed by the patient was found only twice, and in both cases no active treatment was undertaken. It is surprising that this is not a more common sequel of the operation.

On one occasion the wound broke down suddenly six months after it had apparently first been completely healed: serous fluid only was discharged and no foreign material was found. The wound healed satisfactorily after this episode, no evidence of tumour being found in the disrupted wound edges.

Summary

The results of the past 10 years' experience, in a general surgical unit, of the procedure of synchronous combined abdomino-perineal excision of the rectum are reported and discussed. It is suggested that these confirm the views of the specialist units, already well known, that this is a relatively safe and very justifiable operation, considering its magnitude. The variants on the original basic technique are examined in the light of our own experience.

It is a great pleasure to acknowledge the kindness of Mr. W. J. Lytle in allowing me to publish the results of these cases, which have been treated under his care with results that are self-apparent.

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