entirely owing to its expense: probably the best thing would be for clinicians to use radiology intelligently and thus cut down hospital expenses and treatment of the patient.

Radiology an Aid to Study

It is thought, by those least qualified to judge, that radiological knowledge is now so general that there is no need for anyone to specialize in radiology. But is not clinical medicine or surgery a full-time study, leaving little or no time to acquire adequate knowledge of radiology? I would remind you of the valuable contributions which were made to medicine and surgery before the advent of radiology, when clinical medicine was unhampered by multiple ancillary departments. There is a tendency to-day to desire quantity rather than quality; to report on 1,000 incompletely investigated cases in which calls have been made on all ancillary departments, rather than on one case after careful clinical examination over a period. Sir James Paget studied one case of osteitis deformans during the 20 years of its development and then described it. His description is as valuable to-day as when he contributed it. He had not the advantages, perhaps the disadvantages, of distraction of the ancillary services of radiology, biochemistry, etc., yet his description of his one case was so complete that little has since been added to our knowledge of that disease by many who have made great demands on these ancillary services in the investigation of many thousands of cases.

Radiology is now recognized as an essential aid to the study of anatomy, physiology, pathology, clinical medicine, surgery, and midwifery, and medical students must now be taught something of its possibilities throughout their university studies. This will result in a better and more complete knowledge of the possibilities of radiology, but this wider knowledge will mean that the radiologist, if he is to retain his high status and earn and keep the respect of his colleagues, must shoulder greater responsibilities and acquire an ever-increasing knowledge, for he can claim to be the general practitioner of the specialists. He should be in a position satisfactorily to render full co-operation to each.

Conclusion

It is fitting that in this City of Brotherly Love one should preach the gospel that radiology attains its highest perfection in the contribution to the relief of human suffering only when it is directed to spare the patient pain.

Wilhelm Konrad Roentgen (Brailsford, 1946b) was a man with sagacity and great ability. His observations were keen and extremely critical; he recorded them clearly, concisely, yet exhaustively, and with scrupulous care. His modesty, honesty, sincerity, and integrity to his science and his friends helped to secure his immortality. We follow in the footsteps of a great master, and it is fitting that I should end with the words of your great countryman:

"Lives of great men all remind us
We can make our lives sublime,
And, departing, leave behind us
Footprints in the sands of time."

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VALUE OF SPHINCTER-PRESERVING OPERATIONS IN CANCER OF RECTUM

WITH SPECIAL REFERENCE TO RECONSTRUCTIVE ABDOMINO-PERINEAL EXCISION

BY

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In 1908 Ernest Miles published the details of his operation for cancer of the rectum. Based as it was on close anatomical studies of the potential zones of spread of the disease, the abdomino-perineal excision came to be regarded as the standard operation for the treatment of cancer affecting any part of the bowel between the lower sigmoid and the anal canal. No limitation of the excision was regarded as permissible, no matter at what level the growth was sited, and it is only in recent years that doubt has been cast on the necessity for sacrificing the sphincter mechanism in those cases in which the neoplasm lies above this region.

Surgery in this country has remained very true to the teachings of the great master of proctology, and little has been published in the English journals in favour of sphincter-preserving operations. But in America much has been written and many divergent views have been expressed, and as great a surgeon as Rankin (1947) has said, in condemning all such operative procedures: "Sphincter-saving operations are little more than local excisions for cancer below the peritoneum. I had thought that the question of colostomy had been definitely settled 20 years ago, but apparently a new generation insists on a re-exploration of an already discredited field." On the other hand, Babcock (1932) and Bacon (1945) champion such operations in the majority of cases. Lynch (1945) goes so far as to say, in commenting upon recent pathological investigations: "It permits one to discard entirely such radical and unnecessary operations as that popularized by Miles."

Perhaps a far more acceptable opinion is that of Wangenstein (1947), who has recently said: "A tempered ambition to save the rectal sphincter, as well as to cure the cancer, is a praiseworthy objective in suitable cases of cancer of the upper rectal ampulla."

Support for this point of view is to be found in the follow-up figures of Babcock, in which, of over 80 patients considered suitable for a sphincter-preserving operation, 50% survived disease-free for five or more years. Such figures can hold comparison with any series in which the wider abdomino-perineal operation has been performed for similarly sited growths.

Until the late 'thirties the idea of sphincter-preserving operations had lain largely dormant for three decades. Before Miles came to tower over his contemporaries limited excisions and anastomoses had been explored by the great surgeons of the latter end of the last century and the beginning of this. But enthusiasm for their methods was quieted by the logic of the great man. Maunsell (1892) had described a combined abdominal and anal approach in which continuity was achieved after excision of the rectal growth. Balfour (1910) described C. W. Mayo's method of resection and anastomosis, again by a similar approach, but these very limited excisions were rightly relegated to the past. Later, Lockhart-Mummery (1934)

employed a method of restoration of continuity, but abandoned it as being too limited in its extent.

Lymphatic Spread in Rectal Cancer

What, then, has caused this controversy to break out once again? In 1935 Gabriel, Dukes, and Bussey published their paper on the lymphatic spread in cancer of the rectum. In 1938 Gilchrist and David published a similar work, and in 1940 Collier, Kay, and MacIntyre studied the regional metastasis in this disease.

From these and similar papers it appears that the downward and lateral spread of the disease had been over-emphasized by Miles. In those cases in which the neoplasm is sited from 6 to 7 cm. or more above the anal orifice such spread occurs only in a late stage of the disease, when the haemorrhoidal lymphatics are already blocked by metastases and when the progress of the cancer has reached an advanced stage. It thus appears that, provided the upward zone of spread can be eradicated, and provided a suitable length of bowel is resected below the macroscopic margin of the tumour, a radical removal of the area of lymphatic spread can be performed with sphincter salvage and avoidance of a colostomy.

With regard to the submucous spread of the disease below the margin of the tumour, most pathological opinion is that it is very limited, and, indeed, such opinion was held by Miles (1936) as well. Black and Waugh (1948) suggest that it extends only to a maximum of 3 mm. from the tumour edge, but it is generally regarded as more extensive than this.

Nevertheless, the interpretation of these pathological findings must be correlated with the post-operative history of the patients. To his cost Wangenstein (1945) has found this out, and he has said: "Whereas Collier and his associates failed to find evidence of lateral lymphatic spread in lesions lying more than 3 cm. above the ano-rectal line, I am convinced from the experience with low-lying fixed lesions that an operation which does not excise the levatores ani in juxtaposition to the bowel invites recurrence."

Sphincter-preserving Operation

However, in selected cases a sphincter-preserving operation seems likely to carry as good a chance of recovery as the more extensive abdomino-perineal excision. Such an operation does not mean a local excision. The upward extent of removal must be as wide as in the operation of Miles. The clearance of pelvic peritoneum and underlying fascia, the removal of the tissues behind the rectum lying between it and the sacrum, and the excision of as much of the diaphragmatic portion of the levatores ani complex as is possible must all be included in the dissection.

It is for these reasons that I do not regard an anterior resection operation as radical enough in its extent. Babcock's operation fulfils all the anatomical requirements, but the interference with the sphincters at the time of operation is, I believe, something to be avoided if that can be achieved.

Removal by the combined abdominal and perineal routes, with primary suture of the bowel at the time of operation and leaving the sphincter mechanism untouched, is, I believe, the best approach. Reconstructive abdomino-perineal excision of the rectum undoubtedly leaves the patient with good faecal control.

In America this procedure was first suggested by Pratt (1938), and no doubt it has been tried by some proctologists in this country. It is not widely known, and is deserving

of further record. In addition, certain modifications of the technique are worth emphasis.

Indications for the Operation: (1) The lower palpable margin of the neoplasm must be at least 7-8 cm. from the anal verge. (2) At operation there must be no evidence of extensive extramural spread. (3) If secondary deposits are present in the liver, or if there are advanced metastases in the aortic nodes, the sphincter-preserving operation is the one of choice. It offers the patient the greatest comfort in his remaining span of life.

Operative Technique

Ten days before the main operation transverse colostomy is desirable. In any case, if not performed before the main procedure it should be carried out at the end of the abdominal part of this operation. Faecal contamination of the perineal wound is thereby avoided should there be any breakdown in the perineal anastomosis. The remaining pre-operative preparation of the patient is the routine employed prior to Miles's operation.

Immediately before the operation an assistant passes a short sigmoidoscope and packs the rectum below the growth with cotton-wool soaked in 1 in 1,000 perchloride of mercury. This is an important detail. There is no doubt that during the manipulations of the rectum through the abdominal incision small portions of a friable growth may be broken off. When the rectum is subsequently excised through the perineum these small fragments may become implanted in the line of the anastomosis, giving rise to what is apparently a local recurrence. By packing the rectum with cotton-wool the small fragments of growth are held up and prevented from contaminating that area of the bowel through which the resection is going to be carried out.

The initial stages of the operation are those of the abdomino-perineal excision. A left paramedian incision is preferable in view of the fact that mobilization of the descending colon to a higher level is required. The pelvic peritoneum is incised in routine fashion and the rectum separated from the bladder, from the sacrum, and, by dividing the lateral ligaments, from the lateral pelvic walls.

FIG. 1.—Composite plate showing the division of the mesocolon after mobilization of the bowel. The division is carried out as far as the mesocolic margin of the pelvic colon.

The vascular supply to the lower pelvic colon and rectum is then divided. Vascular anatomy in this area varies, but the main ligature is usually placed around the inferior mesenteric artery below its first sigmoid branch. The mesocolon is divided outwards close to the remaining vascular channel upon which the blood supply of the proximal colon is to depend. The division extends as far out as the margin of the bowel (Fig. 1).

The descending colon is then reflected inwards after incising the peritoneum, if necessary as high as the splenic flexure. This inward reflection of the gut gives small though valuable increases in downward mobilization. Division of the fibro-fatty bands amongst the arterial arcades of the mesocolon gives further mobility when required. It is essential that that point of the pelvic colon opposite the divided mesocolon is freed sufficiently to permit its reaching down as far as the coccyx without undue tension. The mobilized bowel is pushed down into the pelvis and the pelvic peritoneal floor re-established. This is carefully sutured around the emerging loop of pelvic colon (Fig. 2). The abdomen is closed.

FIG. 2.—The mobilized bowel has been packed into the pelvic cavity and the pelvic peritoneal floor is being re-established. It is sutured around the emerging loop of pelvic colon.

first in the upper part of the wound and then in the lower, the corresponding posterior halves of the diaphragmatic portion of the levatores ani muscle are severed. The coccyx is separated from its attachments and removed (Fig. 3).

The bowel is then drawn out from the perineal wound with ease. In the distal end of the wound, the pubo-rectalis muscle is identified, curving in sling fashion around the rectum and merging intimately with the internal sphincter. A crushing-clamp is placed across the bowel, at least 3 cm. below the lowest palpable margin of the growth. The bowel is divided below this clamp, between it and the internal sphincter complex, with diathermy. A spring clamp is placed on the pelvic colon, proximal to the line of division of the mesocolon. The bowel is divided between this and a crushing clamp placed distal to it (Fig. 4). A few cuts with the

FIG. 3.—The curved skin flap has been turned down and the coccyx removed.

knife separate any remaining attachments of the divided posterior portions of the levatores ani, and the excised bowel, with its attached tissues, is freed. A specimen removed by the operation is shown in Fig. 5.

It remains to anastomose the ano-rectal stump with the distal end of the pelvic colon. The latter is of course covered with peritoneum, but the former has no such protective covering. Anastomosis in two layers, with subsequent reinforcing sutures, must be carried out with exacting care (Fig. 6). For the first layer of sutures, anastomosing the anterior fibro-muscular rectal wall to the anterior sero-muscular layer of the pelvic colon, interrupted

FIG. 4.—The mobilized bowel has been brought out of the wound and the resection is proceeding.

FIG. 5.—The specimen removed by the operation described.

thread sutures are best. A continuous catgut suture is then used. This passes through all layers of the opposed edges of the two ends of the gut and, on completion, continuity of the lumen of the bowel is restored. The second layer of the posterior part of the anastomosis is also made with interrupted thread sutures.

The line of anastomosis is reinforced with several stitches and the wound is closed with drainage of the presacral space.

Post-operative Treatment

This is similar to that of any major abdominal procedure, the drainage-tubes being removed after three or four days.

Provided that the division of the pelvic colon is made obliquely, thus ensuring an adequate blood supply to the anti-mesenteric margin of the gut, breakdown of the anastomotic line is unlikely. Should this occur, although the perineal sinus that forms persists for some time, it is not necessary to postpone closure of the colostomy until it

FIG. 6.—Anastomosis of the anal stump and the end of the pelvic colon in two layers has been started. To the left of the diagram the internal sphincter complex is seen.

FIG. 7.—Abdomen of patient following closure of the colostomy. Partial hepatectomy for secondary deposits in the liver has been carried out through a left sub-costal incision.

lowered and the patient is not always conscious that the pelvic colon and the rectal stump are loaded with faeces.

FIG. 8.—Healing perineal wound. A small sinus is still present at the lower end.

its concept, and anatomically its boundaries of excision are wide. It seems to be well worthy of trial in selected cases, and especially for those to whom a colostomy would prove an intolerable burden.

has completely healed. As soon as rectal examination reveals that the sinus opening into the bowel lumen is adherent to surrounding structures and admits no more than the tip of the little finger, repair of the colostomy can be effected (Fig. 7). Formed stools will then by-pass the small sinus (Fig. 8) and be evacuated through the anal canal.

It has been found that for some months after the operation rectal sensation is lowered and the patient is not always conscious that the pelvic colon and the rectal stump are loaded with faeces. Glycerin suppositories are of great help in aiding regular evacuation, and with these the patient rapidly procures the habit of normal bowel action.

This operation is not advocated as a routine procedure for the treatment of carcinoma of the rectum, but it is suggested that in the type of cases described it is of value. So far as can be established by pathological investigation it is sound in

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A NEW MECHANISM OF VITAMIN DEPRIVATION

WITH SPECIAL REFERENCE TO THE SPRUE SYNDROME

BY

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Vitamin deprivation may be of dietary, intestinal, or metabolic origin.

Dietary Deficiency of Vitamins.—Vitamin deprivation was originally based on the conception of dietary deficiency. The classical cases of scurvy which occurred in sailors on long sea voyages may be a true example of this type of deprivation. Beriberi and pellagra, on the other hand, can hardly be regarded as simple vitamin deficiencies (Williams, Mason, Wilder, and Smith, 1940; Meiklejohn, 1940), although some of the main features of each condition can be reproduced in animals by selective deprivation of thiamin or nicotinic acid. It is quite clear that the diets which usually induce beriberi or pellagra in human subjects are grossly deficient in many other dietary essentials. The selective dietary deficiency of one vitamin is not likely to occur under ordinary conditions of life, but such selective deficiencies may be induced by the destruction of vitamins during processing, cooking, or digestion of food. Thus, vitamin C is well known to be relatively heat-labile, and an otherwise adequate diet may be rendered deficient in this vitamin by faulty cooking methods. Again, vitamins A and E are readily destroyed by oxidation. Oxidative rancidity of fats included in the diet may destroy these vitamins, with consequent deprivation (Mattill, 1938; Whipple, 1936).

Intestinal Deficiency.—The signs and symptoms of vitamin deprivation may occur even though the diet contains an adequate supply of vitamins and in the absence of any evidence of destruction. This may be due to faulty digestion of the vitamins, or to their inclusion in unabsorbed residue. The latter may occur when large quantities of liquid paraffin are taken, resulting in absorptive deficiency of fat-soluble vitamins (Andersen, 1938). Alternatively, the mechanism of absorption of the vitamin may be defective. Thus, in obstructive jaundice, low blood prothrombin due to inadequate absorption of vitamin K may occur. Bile salts assist the absorption of this vitamin (Lord, Andrus, and Moore, 1940). The condition can be corrected by the parenteral administration of vitamin K.

Metabolic Failure.—Theoretically, faulty utilization of absorbed vitamins might occur. It is difficult to establish vitamin deficiency in such a condition, since even parenteral administration of the vitamin may give no response. Faulty utilization of vitamin A has been described in cases of alcoholic cirrhosis (Patek and Haig, 1939). Faulty phosphorylation was thought to account for certain riboflavin deficiencies (Verzar and Laszt, 1936), but the relationship of this deficiency to the adrenal cortex has not been substantiated (Nelson, 1940; Ferrebee, 1940). A second form of metabolic fault is defective synthesis. This may be observed in the case of vitamin D. The incidence of rickets was particularly high in smoky industrial towns in England and in negro children living in the northern part of the United States (Howe, 1920; Hess and Abramson, 1931). Sterol precursors of vitamin D can be synthesized in the body and vitamin activity induced by irradiation