PERFORATION OF THE RECTUM

BY

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Traumatic perforation of the rectum in civilian practice is not a common injury. The literature on the subject is scanty, especially in this country, and consists largely of single case reports. This is not surprising, for very few surgeons see more than one case. In the ten-year period 1938 to 1947 four cases of perforation of the rectum have been treated in the surgical wards of the Royal Victoria Infirmary; the total number of surgical admissions during this period was 74,000.

Of these four cases three have come directly under my care; one was the result of perforation by an enema tip, one occurred during sigmoidoscopy, and one followed impalement on a broom-handle. The fourth case was also an enema injury.

Anatomical Details

Whatever the wounding agents may be, the resultant perforations are either extraperitoneal or intraperitoneal, and their management presents many problems which are peculiar to this region. Anatomically, the rectum is for the most part unprotected by peritoneum, it traverses a tissue which is highly vulnerable to infection, and it is difficult of surgical access. The pelvic floor, through which the rectum passes, is shaped rather like a trough, the sides of which are formed by the levator ani and coccygei originating from the internal surfaces of the pelvis on each side and joining in a median raphe below. The triangular anterior wall is formed by the urogenital triangle, while the triangular posterior wall is formed by the sacrum and coccyx. Over these structures the pelvic peritoneum is loosely draped as a cover. The potential space which exists between the pelvic floor and the pelvic peritoneum is known as the infraperitoneal space; should this space become distended with pus or blood rigid fascial planes will prevent its expansion in any direction except superiorly.

Laterally, the fascial planes are formed by the medial investment of the levators; these layers join inferiorly over the raphe and become continuous at the rectal and urogenital outlet with a similar layer of fascia loosely investing these viscera, the endopelvic fascia. By common usage the term fascia propria is applied to the rectal sheath of the endopelvic fascia. Anteriorly, the levator fasciae fuse with the deep layer of the urogenital triangle and posteriorly with the sacrococcygeal fascia.

Expansion of the infraperitoneal space is therefore limited inferiorly, laterally, anteriorly, and posteriorly by fascial planes, but is unrestricted superiorly. Even the pelvic peritoneum, however, is rather firmly adherent laterally along the line of origin of the levators at the so-called "white line," where levator fascia fuses with obturator fascia; it is most loosely attached over the sacral promontory on each side of the rectum, and it is here that the infraperitoneal space readily communicates with the retroperitoneal space, and infection arising in one may easily spread to involve the other.

Surgical Treatment

These anatomical details vitally affect the surgical treatment of extraperitoneal perforations. Free drainage of the perirectal cellular tissues is essential if spreading infection is to be avoided; adequate exposure of these tissues can be obtained by an incision parallel to the side of the sacrum and coccyx, dividing the fibres of the gluteus maximus near

its origin. Removal of the coccyx is not necessary in most cases, and indeed coccygectomy may be followed by unpleasant sequelae, such as intractable pain in the scar. Some maintain that adequate drainage can be obtained by a transverse curved incision inferior to the tip of the coccyx and incision of the fascia propria by blunt dissection. Having exposed and divided the fascia, it will be possible in some cases to demonstrate the perforation in the bowel wall; if it is readily found and is large it should be sutured, but if it is small and cannot be easily seen it need not be sutured, because contraction of the muscle fibres will bring its edges together and allow healing.

Opinions differ considerably about the value of a temporary colostomy as a part of the treatment. My feeling is that in any but the most trivial injuries it confers an additional safeguard which should never be omitted whether the perforation be extraperitoneal or intraperitoneal; its purpose is to divert the faecal current and place the rectum at rest by preventing any newly formed faeces being packed into it and distending its walls. In addition, the rectum should be drained from below by stretching the external sphincter and stitching in a large soft rubber tube; this should reach up for an inch or so beyond the level of the perforation.

Perforation by Enema Tips

Twenty cases of perforation of the rectal wall by enema tips have been reported in the literature. They fall into two groups: (1) pregnant women at term, and (2) persons from the sixth decade on.

Perforation of the normal bowel of the conscious patient can take place without the patient feeling much pain and without the use of much force; this is especially true of the older age groups, and of these 20 cases more than half were 55 or over. Twelve of the 20 cases were extraperitoneal, with five deaths (mortality 41.7%), and eight were intraperitoneal, with three deaths (mortality 37.5%).

While these cases are rare, it is impossible to guess at the real number that have occurred, because they form a group of cases that are only reluctantly spoken of and rarely reported. The perforations that do occur are generally complicated by the admission of the highly irritating enema solution into either the pelvic cellular tissues or the peritoneal cavity. In the absence of adequate treatment the result is either a fulminating pelvic cellulitis or a chemical peritonitis which turns very quickly into a purulent peritonitis from faecal contamination. Occasionally the solution has been injected beneath the mucosa or muscularis, and this has caused widespread sloughing of the rectal walls, with subsequent cellulitis and later stricture formation.

Case 1

A previously healthy man aged 74 was admitted with acute appendicitis of 48 hours' duration. An acutely inflamed non-perforated retrocaecal appendix was removed and he made a good immediate recovery. On the evening of the fourth day after operation a nurse gave him a soap-and-water enema by means of a Higginson syringe with a bone nozzle. About 6 oz. (170 ml.) of enema solution was injected. A few minutes later he felt a violent pain in his perineum and left groin; this persisted, became more severe, and radiated to his left loin and lower abdomen. He felt ill and nauseated. I was asked to see him six hours later. Examination at that time showed that he was very ill. The appendix scar was healthy, but the skin in the perianal region, perineum, left groin, left iliac fossa, and flank was dusky red, oedematous, and extremely tender, and there was well-marked left-sided abdominal guarding.

Immediate operation was advised: proctoscopy, performed under the anaesthetic, showed a relaxed external sphincter with copious mucoid discharge from the bowel. On the left posterior wall of the anal canal, $\frac{1}{4}$ in. (1.9 cm.) from the anal margin, was a circular clean-cut perforation $\frac{1}{4}$ in. (0.85 cm.) in diameter; the nozzle of the Higginson syringe fitted exactly into this

perforation. The perforation extended through all coats of the bowel, and a vertical track passed upwards from its outer extremity in the perirectal tissues alongside the rectal wall for approximately 2 in. (5 cm.). The rectal mucosa was acutely inflamed, oedematous, and crepitating; the upper limit of these changes was not ascertained.

An incision was made alongside the coccyx on the left side and extending down through the left ischio-rectal fossa to the posterior anal margin; the posterior fibres of the levator ani were divided, the fascia propria incised, and the perirectal cellular tissues widely exposed. The perforation was identified, but owing to the sodden and friable condition of the bowel wall no attempt was made to suture it. The cellular tissues contained enema solution, and there were, in addition, acute inflammatory changes with already, in several places, greenish slough formation; the whole area was irrigated with hydrogen peroxide, dusted with sulphathiazole powder, and lightly packed with gauze.

A muscle-cutting incision was then made in the left iliac fossa; the extraperitoneal tissues contained thin turbid crepitant fluid, and similar fluid was present in the peritoneal cavity; there were several patches of green slough on the back of the anterior abdominal wall in the suprapubic region; the rectum and lower 2 in. of sigmoid colon were acutely inflamed, oedematous, and covered with large fibrin flakes. A large rubber tube was placed down to the pelvis and brought out through a separate small midline incision; a left iliac spur-type colostomy was then performed and opened immediately. The patient's condition at the end of the operation was critical; in the next few hours the cellulitis spread to involve almost the whole of the abdominal wall and lower part of the chest wall. Intensive administration of anti-gas-gangrene serum and soluble sulphathiazole intravenously appeared to have no effect whatsoever, and death took place eighteen hours later from overwhelming toxæmia.

Case 2

This case report is taken from the hospital records, which are unfortunately incomplete. This patient, a man aged 65, had been confined to bed at home for some days because of anginal attacks. He became constipated and was given a soap-and-water enema by the district nurse. This was administered by means of a Higginson syringe with a bone nozzle. During the administration he felt a sudden violent pain across the lower abdomen and in the left iliac fossa; this was accompanied by severe nausea and vomiting. He was admitted to hospital twelve hours later and was then very ill and collapsed; the exact cause of his condition was apparently not appreciated before operation. This was performed two hours after admission. It was then seen that the pelvic peritoneum was raised up by a large collection of greenish frothy fluid in the pelvic cellular tissues; this fluid was obviously enema solution. A left iliac Mikulicz-type colostomy was performed and opened immediately; the pelvic cellular tissues were not drained. Death occurred eight hours later.

These cases emphasize once again the dangers involved in the use of a Higginson syringe with a hard nozzle of any kind; they also emphasize the extreme gravity of this type of injury. Adequate surgical treatment in Case 1 had no apparent effect on the course of the infection, and, moreover, it would seem that a successful outcome can only be expected if the catastrophe is recognized and treated immediately. A delay of even seven hours would appear to make a fatal result almost inevitable.

Perforation during Sigmoidoscopy

Perforation of the rectum during diagnostic or therapeutic procedures is probably very rare and little has been written about it. While perforation is more likely to occur in cases presenting weakening of the bowel wall by disease, many cases have been reported without any discoverable lesion in the bowel. Thus, in a series of 46 cases reported by Andresen (1947), 21 showed no rectal lesion, 13 showed carcinoma, five diverticula, three ulcerative colitis, two polyps, and one each lymphopathia venereum and haemorrhoids. In this series 19 died and 27 recovered, giving a

mortality of 41.7%. The mortality rate is closely related to the time interval between perforation and operative repair. In Crohn and Rosenak's (1936) series the mortality was 47% if operation was done within seven hours of perforation; delay beyond this period results in a generalized septic peritonitis, with a mortality approaching very nearly 100%.

Diagnosis.—In most cases diagnosis is made at the time of perforation; the rent may actually be seen or a loop of small bowel or other organ may come into view when the end of the sigmoidoscope has passed completely through the rent. In a few cases there has been no suspicion of perforation at the time of the examination. Furthermore, there may be a delay of several hours in the onset of symptoms suggestive of perforation; an immediate onset of acute pain occurs only in about half the cases, even though subsequent operation shows that there has been a complete rent in the bowel wall. Once perforation is suspected ancillary methods of diagnosis may prove helpful. A flat x-ray film of the abdomen may show gas under the diaphragm; the sigmoidoscopy may be repeated and the rent seen. Air inflation during this procedure should be avoided if possible, as it may increase the risk of spreading infection.

Case 3

This patient was a previously healthy man aged 64, with a history of recent onset of ill-defined left-sided abdominal pain accompanied by diarrhoea and the passage of mucus but no blood per rectum. No abnormality was discovered on clinical examination, but a routine barium enema and sigmoidoscopy were advised.

Sigmoidoscopy was performed a few days later by a surgical resident. There was no abnormality, apart from some congestion of the mucosa in the recto-sigmoid region: a punch biopsy of this was taken from the anterior rectal wall, approximately 12 cm. from the anal margin. No suspicion of perforation of the rectal wall arose during this manipulation, which was of course performed without an anaesthetic.

Approximately four hours later the patient was seized with intense pain across the lower abdomen, accompanied by extreme rectal tenesmus, nausea, and vomiting. During an attack of straining he developed a prolapse of the rectum 4 in. (10 cm.) long; this was reduced by the house-surgeon, who, however, failed to notice whether the prolapsed portion showed any evidence of perforation. Reduction of the prolapse did not relieve his symptoms, and I was therefore asked to see him, eight hours after the sigmoidoscopy.

He was now obviously a very ill man and in severe pain; the abdomen was completely immobile and there was diffuse tenderness and board-like rigidity. The perineum was normal; there was no bleeding from the rectum, but a profuse discharge of clear mucus. No tear could be felt within the reach of the examining finger. It was also noticed that extensive surgical emphysema affected the neck and upper part of the anterior chest wall. In view of its distribution it was felt that this was probably due to the rupture of an emphysematous bulla during straining at stool. A pre-operative diagnosis of intra-peritoneal rupture of the rectum during sigmoidoscopy was made.

Operation was performed ten hours after the original sigmoidoscopy. A left paramedian incision was made; there was a large collection of thin yellowish sero-purulent fluid in the pelvis and in both flanks; a circular perforation $\frac{1}{4}$ in. (0.85 cm.) in diameter with clear-cut margins was found on the right antero-lateral surface of the pelvi-rectal junction, approximately 3 cm. above the peritoneal reflection. There was no other lesion of the large bowel to account for the patient's original symptoms, and these were presumably due to a mucous colitis. The perforation was closed with a purse-string suture of catgut and the pelvis drained with a wide sheet of corrugated rubber. A left iliac spur-type colostomy was performed and opened immediately. Apart from a moderately severe wound infection, the patient made an uneventful recovery; the colostomy was closed after two months, and

nine months later he was known to be well and with normal bowel action. Biopsy of the specimen removed at sigmoidoscopy showed a portion of normal rectal mucosa.

Comment.—This case emphasizes again the dangers inherent in the use of a sigmoidoscope. These dangers can be lessened, if not eliminated, by a thorough training in the use of the instrument, a sound knowledge of the anatomy of the area, gentle handling without force, and, above all, good lighting to visualize the direction of the intestinal canal. If good visualization is impossible owing to persistent angulation of the bowel, or to faeces, blood, new growth, or other objects obscuring the lumen, the examination should be discontinued.

Treatment.—If operation is decided upon it should be performed as soon as the patient has sufficiently recovered from the shock of perforation. Treatment consists essentially in suturing the perforation, draining the pelvis, and performing a proximal colostomy. In a very few cases it may be considered wiser to treat the patient conservatively: these will mainly be cases in which perforation has not been recognized for twenty-four hours or so, and in which localization of the infection already appears to be occurring.

Perforation by Impalement

These bizarre wounds are of interest because of their comparative rarity and possible sequelae. The methods by which they are sustained are as numerous as the instruments which cause them, but it is curious to note that the majority of reported cases resulted from a fall from a hay-loft on to the handle of a pitchfork. Men are affected in 75% of cases, and according to Habegger (1912) approximately half of them are farm-workers.

There is an anatomical reason for the occurrence of this type of injury; the thigh surfaces, the ischial tuberosities, and the soft parts surrounding the anus tend to form a funnel-like contour which directs penetrating objects, especially those that are blunt, through the anus into the rectum. Because of the oblique relation of the rectal wall to the pelvic outlet the anterior wall of the rectum is the most frequent site of perforation, and the reported cases fall roughly into one of five categories: (1) The impaling object merely enters the lumen of the rectum and causes an abrasion or tear of the mucous membrane only. (2) Penetration of the rectal wall occurs at a low level and the urethra in the male or the vagina may be lacerated. (3) At a higher level, penetration of rectum and bladder occurs without, however, entering the peritoneal cavity. (4) If the force is greater the bladder may be completely traversed and the impaling object enters the peritoneal cavity through the dome of the bladder. (5) High rectal or even sigmoid penetration occurs, missing the bladder altogether and reaching the peritoneal cavity direct.

The immediate effects are often surprisingly slight; there may be very little pain, bleeding, or shock, and this may be most misleading. The seriousness of these injuries depends largely on whether the peritoneal cavity has been penetrated or not: Habegger reported a mortality of 26.8% in 179 cases, but with peritoneal involvement the figure reached 78.5%.

Case 4

A youth aged 17 was admitted with a history that five hours previously he was walking downstairs in his dressing-gown when he slipped and slid downwards feet first: at the bottom of the stairs a broom had been left lying, and the handle of this went in between his legs and into his rectum. He immediately withdrew it, and as he did so felt an acute pain across the lower abdomen. Very free bleeding occurred from the bowel and severe rectal tenesmus developed.

On admission he looked and felt ill. The lower half of the abdomen was tender and rigid; the perineum appeared normal

and there was no bruising round the anal margin; the external sphincter was undamaged. There was still considerable bleeding and also a copious mucoid discharge. A diagnosis of intra-peritoneal rupture of the rectum was made. Sigmoidoscopy was not performed.

At operation, two hours after admission, the bladder was catheterized and 8 oz. (230 ml.) of clear urine withdrawn. On opening the abdomen free seropurulent fluid was found in the pelvis and there was a tear 1 in. (2.5 cm.) in diameter in the peritoneum of the recto-vesical pouch in the midline. This opening was enlarged laterally on each side, and a circular tear 1 in. in diameter was seen in the anterior rectal wall, 1 in. below the peritoneal reflection. The bladder was intact, but there were early inflammatory changes in the pelvic cellular tissues.

Owing to the position of the perforation deep in the pelvis, adequate suture proved impossible; a large sheet of corrugated rubber was therefore laid against the side of the bowel and brought out through the abdominal incision; the peritoneum of the pelvic floor was left unsutured. A soft rubber tube was inserted through the anus, and its proximal end was guided up to above the level of the perforation. A left iliac spur-type colostomy was then performed and opened immediately.

The patient made an uneventful recovery; the colostomy was closed after three months, and he was known to be well and with normal bowel function two years later.

Discussion

Important points in the management of these cases are to determine immediately whether the rectum has been perforated and whether there are injuries to other viscera, especially the bladder or urethra. If no gross blood is present in the urine serious bladder injury is unlikely, but if there is doubt cystoscopy should be performed.

The rectal laceration when found should be sutured if possible, adequate drainage provided, and a temporary colostomy performed. If the bladder is involved the rent should be sutured and suprapubic or transurethral drainage instituted, depending on the degree of injury.

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TREATMENT OF PERFORATIONS OF THE OESOPHAGUS

REPORT OF THREE CASES

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Perforation of the oesophagus, particularly of its thoracic portion, was until recently regarded as a condition associated with a very high mortality rate. Perhaps for this reason there has been little eagerness to diagnose the lesion in its early stages. Barrett (1946) stressed the possibility of early recognition and radical treatment for spontaneous perforation. Goligher (1948) proved that early suture of perforation of the pharyngo-oesophageal wall due to crushing between the gastroscope and the cervical vertebrae is feasible. Fish (1946) recorded the successful suture of a gunshot wound of the oesophagus.

Tearing by foreign bodies, including oesophagoscopes, still remains the commonest cause of perforation. Mosher (1935) reported 19 deaths in 938 oesophagoscopies, two of these deaths occurring among the 285 cases examined