

Impalement Injuries of the Rectum

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It is proposed to present a case of impalement injury of the rectum and to review briefly the diagnosis, prognosis, and treatment of such cases. From a study of the literature, it appears that these injuries are not very common. One of the earliest reviews of this subject was in 1896, when Van Hook of Chicago analysed fifty-eight cases, two of which were his own. Stiassney and Tillman added further cases in 1905, but the most extensive early survey was done by Habegger of Wisconsin in 1912, when he analysed one hundred and seventy-five injuries of this type. Of this total, there was penetration of the peritoneal cavity in seventy. Spencer (1912) and Roquès (1931) recorded further cases. In 1938 Hambly reported a case in which a steel tube penetrated to a distance of eighteen and a half inches. His patient was a boy aged fifteen years, and the rod, after penetrating the perineum, entered the peritoneal cavity, passed through the transverse mesocolon and small intestine, coming to lie under the skin of the chest wall, in front of the sixth and seventh costal cartilages. Other cases have been published by Conway (1938), James, Powers, and O'Meara (1939), and Crymble (1943). In Professor Crymble's case the handle of a hayfork penetrated through the ischio-rectal fossa, perforated the levator ani, and left the pelvic cavity through the great sciatic notch without damaging any important structures. O'Regan (1947), in an excellent review of the subject, was able to account for two hundred reported cases and he, himself, added four more. Thomas (1953) recorded three further cases, two of whom had peritoneal involvement and recovered following operation.

The following case is interesting in that a metal tube not only penetrated the perineum and peritoneal cavity, but also passed through the left dome of the diaphragm into the left pleural cavity. Having examined the literature on the subject, I can find reference to one similar case only—that reported by Roquès (1931) in France. Unfortunately, the thesis in which this case was reported is unobtainable.

CASE REPORT.

A boy aged sixteen years was admitted to the Downe Hospital, Downpatrick, on 8th May, 1953. A history was given that one hour previously, while jumping over a tubular metal crossbar ($\frac{1}{2}$ in. diameter), he accidentally landed on it. The crossbar collapsed, and part of it, turning into the vertical position, penetrated his perineum. The boy's father removed the tube and his doctor had him transferred to this hospital.

On admission, the patient was extremely shocked, semi-conscious, with an imperceptible pulse, very shallow respirations, and a blood pressure that could not be recorded. An intravenous drip was started and three pints of blood run in under

pressure. This resulted in some improvement, as the patient was now conscious, with a pulse of 146 per minute and a blood pressure of 85/45. Examination showed a $\frac{1}{2}$ in. circular laceration of the skin on the anterior anal margin. Rectal examination showed that the anterior fibres of both external and internal anal sphincters had been divided, that the rectum was almost empty, and that there was a tear of the anterior rectal wall, with damage to the adjacent part of the prostate. The abdomen was slightly distended, rigid, tender, and dull on percussion. The patient's condition did not further improve in spite of another three pints of blood and, as an intra-abdominal hæmorrhage was suspected, the abdomen was opened under general anæsthesia, through a lower mid-line incision. A 1 in. tear in the left external iliac vein, just distal to where it is crossed by the ureter, was identified and plugged with a finger. Several pints of blood were sucked out of the peritoneal cavity, the vein separated from the artery, clamped on either side of the tear and ligated with linen thread. The tear in the anterior rectal wall was repaired with interrupted catgut sutures, as was the tear in the peritoneum on the lateral pelvic wall. Apart from several small areas of subserous hæmorrhage in the small bowel surface, no gross damage to other viscera was noticed. However, the patient's poor general condition did not permit a thorough search being made. The abdomen was closed with drainage. An intravenous drip was continued until a total of eleven pints of blood had been given and penicillin and streptomycin therapy commenced.

The following day the boy's father was interviewed and, after questioning him and examining the rod, it was estimated that penetration to a depth of 18 in. had taken place.

Thirty-six hours after operation the patient developed marked respiratory distress and a marked cardiac shift to the right. Ten ounces of blood was aspirated from the left pleural cavity, giving considerable relief. There was no history or clinical evidence of chest injury, and repeated X-rays during the next few days failed to show any evidence of fractured ribs. During the next thirty-six hours a further ten ounces of brighter blood was aspirated from the chest to relieve respiratory distress, and it was now suspected, towards the end of aspiration, that the material was semi-purulent. Further aspirations through a needle were now impossible, and a nasal type of catheter was inserted under local anæsthesia into the sixth left interspace. Aspiration through this produced foul smelling *B. coli* pus and laboratory examination showed the presence of pus cells, Gram negative bacilli and coliforms, sensitive to chloromycin, streptomycin, and sulphamethazine. The catheter was connected to an underwater drain and streptomycin injected daily into the chest. In spite of this, it was necessary, two months after admission, to transfer him to the thoracic surgical unit in Belfast, where Mr. Smiley, F.R.C.S., operated on him and reported as follows: "I was surprised to find a piece of tissue which, unmistakably, had hairs upon it. Unfortunately, the laboratory were not able to identify it as skin, but there seemed no doubt that this was in fact so. The explanation can only be that he carried a piece of his skin from the perineum on the point of the crossbar, right up through his diaphragm into his chest."

Following this, his chest condition steadily improved, but while in hospital he developed calculi in his right kidney. An intravenous pyelogram at the beginning of October, 1953, showed that both kidneys were functioning, but there was some degree of hydronephrosis on the left side with dilatation of the left ureter above the point where the ureter crosses the pelvic brim. The calculi were removed from the right kidney by Mr. Loughridge on 19th October, 1953, and he was discharged from the Royal Victoria Hospital on 26th December, 1953.

However, on 4th January, 1954, he was readmitted to the Downe Hospital with severe right-sided pain, vomiting, headache, and a temperature of 102.6°. He stated that he had not passed urine during the previous forty-eight hours, but, in spite of this, he had no demonstrable bladder enlargement. There was, however, a history of "watery diarrhoea." Blood urea on admission was 154 mg. per 100 ml. A catheter could not be passed beyond the prostatic urethra and a diagnosis of recto-urethral fistula was confirmed by an intravenous injection of methylene blue. With treatment, his condition improved, and seven days after admission he, spontaneously, passed thirty-six ounces of urine per urethra. Two weeks later his blood urea was 27 mg. per 100 ml., and an intravenous pyelogram now showed "Good function on the right side with a normal right renal tract, but no evidence of function on the left side." Repeated X-rays confirmed this finding and, on 6th July, 1954, the late Mr. Woodside explored the left ureter and found that the lower end was embedded in a mass of fibrous tissue. It was found that the kidney was secreting urine. Under considerable tension the proximal end of the ureter was anastomosed to the bladder. This fibrous obstruction of the left ureter below the pelvic brim was obviously of slow onset and was apparently due to infection, as there was no evidence of injury to the ureter before or during operation.

The boy, a bright student, is now back at school and feeling well. His empyema is closed, his general health is good; but there is still no evidence of return of function to the left kidney.

Analysis. Analysing this case in retrospect, it is felt that the metal tube, after passing through this boy's abdomen, entered his left pleural cavity. The following facts support this claim: (1) the absence of any other cause for the left-sided hæmothorax; (2) the Father's statement and the fact that the rod was stained to a depth of 18 in.; (3) the presence of a *B. coli* pleural infection, and (4) the finding of a section of skin-like tissue in the chest.

The course of metal tube is shown in Figures 1 and 2.

DISCUSSION.

Types of impalement injury. Probably the simplest classification is as follows: (1) impalement without penetration of peritoneal cavity; (2) impalement with penetration of peritoneal cavity but without visceral damage, and (3) impalement with penetration of peritoneal cavity and visceral damage.

Common objects causing this type of injury. Shooting-sticks, pitchfork handles, steel rods, spiked railings, billiard cues, broken chair legs, mop handles, and home-made bougies.

Diagnosis. Early diagnosis of peritoneal perforation is of paramount importance. This may very occasionally be easy, for Morley cites a case where omentum actually prolapsed through the anus. Abdominal examination may not reveal much in the early stages unless there has been damage to major pelvic or abdominal blood vessels or viscera. If, however, there has been much soiling of the peritoneum with fæces from the rectum a virulent peritonitis with abdominal rigidity will develop within a few hours. If possible, an estimate should be formed of the depth and direction of penetration. The rectum should be palpated and, if empty, the presence and position of tears noticed. The presence of a tear may be confirmed by proctoscopy, but sigmoidoscopy is of doubtful value and, if the bowel is inflated

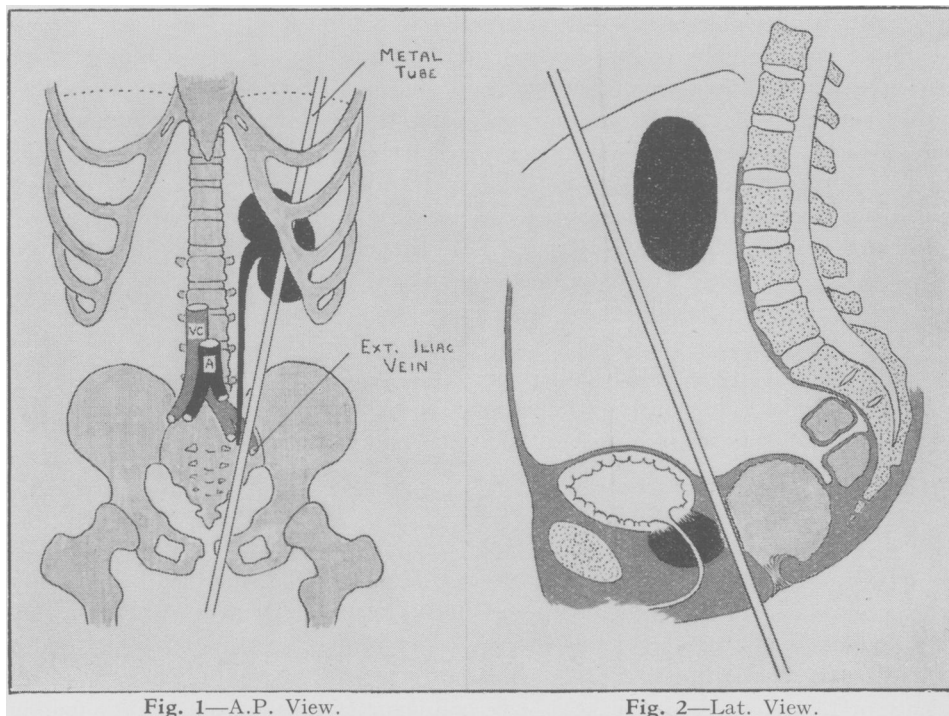


Fig. 1—A.P. View.

Fig. 2—Lat. View.

during the latter procedure, harm can be done by forcing fæces or fæcal gas into the peritoneal cavity. A straight X-ray of abdomen may help by showing the presence of gas and cystoscopy has been advised to exclude bladder damage.

Treatment. (1) The extra-peritoneal type of injury requires no special treatment apart from exploration, possibly excision and adequate drainage of the perineal wound. If the urethra is damaged it should be repaired over a urethral catheter; (2) if the peritoneum has been penetrated early laparotomy has been advised. The rectal tear should be carefully sutured and the peritoneum closed over it. Other abdominal viscera, especially the bladder, should be examined for possible damage. In cases where the bladder has been perforated, supra pubic drainage has been

advised, but it would seem sufficient to repair the bladder tear and tie in a urethral catheter. The abdomen should always be drained and a colostomy is generally advised, but with modern chemotherapy it is probably unnecessary in cases where there has not been gross peritoneal contamination and where the rectal tear can be satisfactorily repaired.

Thomas (1953) advises a colostomy in the following circumstances :—(a) A large laceration of rectum which is difficult to close; (b) a wound involving rectum and buttock, where it may be attempted to lessen infection; (c) severe damage involving rectum and bladder.

Surgical toilet and inspection of the perineal wound should be carried out as in the extra-peritoneal type of injury. If the anal sphincter has been damaged, no rectal drainage is necessary, but if the sphincter is intact and a colostomy has not been performed, it is probably safer to fix a tube in the rectum for a few days, in an attempt to reduce rectal tension. It was with a similar idea in view that some surgeons formerly practised splitting the anal sphincter in the mid-line posteriorly.

Intensive antibiotic treatment is, of course, advisable.

Influence of full bladder and rectum. O'Regan (1947) suggests that a full bladder at the time of injury is probably beneficial in that it is likely to act as a buffer, thus protecting the peritoneum from contamination. A full bladder also serves to protect the bowel from injury by displacing it upwards out of the pelvis.

A full rectum, however, is a decided disadvantage in that it increases the risk of gross peritoneal contamination by faecal matter.

Prognosis. It is generally agreed that prognosis in cases with peritoneal involvement is serious. Habegger (1912) reported a mortality of 25 per cent. in cases with peritoneal involvement and no visceral damage and a mortality of 78 per cent. in cases with visceral injury.

In contrast, O'Regan (1947), reviewing a much smaller series of cases (16), had a mortality of 60 per cent. in cases with peritoneal involvement only and no deaths in six cases with visceral damage. He believes that the prognosis is directly proportionate to the interval between injury and operation and that the grosser the injury the easier the diagnosis, and, therefore, the earlier the case comes to treatment.

In recent years there is no doubt that prognosis has improved considerably with the use of modern antibiotics.

SUMMARY.

In a boy of 16 years a metal tube penetrated through the perineum for 18 inches, tearing the rectal wall and the left external iliac vein, and, passing through the abdomen, it entered the left pleural cavity, where an empyema developed. Despite this, and infection and fibrosis around the left ureter and unilateral loss of renal function, the boy is now well.

The literature is reviewed and the treatment of impalement injuries discussed.

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