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The management of penetrating rectal trauma has been evolving over the last century. There has more recently been a shift in policy from the mandatory colostomy suggested from the military experience to the realisation that civilian low-velocity *intraperitoneal* rectal injuries can be managed similar to other colonic injuries. The introduction of laparoscopy in trauma has provided screening for and the identification of the transpelvic gunshot wound that has not breached the peritoneal cavity. This has allowed for a far more conservative but safe approach to the management of the extraperitoneal rectal injury. Debate has also arisen about the need for distal rectal washout and the effectiveness of presacral drainage.

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## 55.1 Historical Perspective

The mortality rate from rectal injuries was in the order of 90 % at the turn of the twentieth century. This rate dropped to 60 % during the First World War due to debridement and primary repair of rectal wounds. Mandatory proximal faecal diversion and presacral drainage during the Second World War saw a further decrease in mortality to 30 %. Irrigation of the distal rectal stump was introduced during the Vietnam and Korean conflicts, and the wide availability of antibiotics, intensive care management and blood products saw a further decline in mortality to 15 %.

There is no universal consensus on the application of this military surgical experience in the field of civilian low-velocity penetrating rectal trauma, but the following are presented as guidelines that have been effective and safe in the management of these injuries at our own institution.

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## 55.2 Surgical Anatomy

The surgical management of the penetrating rectal injury is dependent on the part of the rectum that is injured and whether this is extra- or intraperitoneal.

The rectum is around 12 cm long and is divided into thirds according to the peritoneal attachments. The peritoneal covers the upper one-third of the rectum on the front and sides, and this is the intraperitoneal rectum. The middle third is only covered on the anterior aspect by peritoneum. The lower third is completely extraperitoneal as the peritoneum is reflected on to the upper part of the bladder in the male (to form the rectovesical pouch) or on to the upper vagina in the female (to create the rectouterine pouch).

Injuries to the lower one-third of the rectum and to the entire posterior wall are considered to be extraperitoneal.

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## 55.3 Incidence

Penetrating rectal injuries occur infrequently, but the majority (>80 %) that occur are secondary to gunshot wounds as reported from most trauma centres. Our own experience has shown low-velocity gunshot injuries to be responsible for 99 % of rectal trauma. Stab wounds and impalements are uncommon.

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## 55.4 Special Investigations

The presence of blood on the rectal examination should alert the surgeon to the presence of a colonic injury. If there is suspicion of a potential rectal injury from the tract of the gunshot wound or the knife, then a sigmoidoscopy must be carried out to exclude this even in the absence of blood on rectal examination. Genitourinary tract injuries are commonly associated with rectal injuries, and indeed, concomitant bladder injuries have been present in up to

one-third of patients with rectal trauma. Ensure that a CT scan (with rectal contrast) and CT cystogram have been performed preoperatively on the haemodynamically stable patient. This will provide information with respect to the tract of the bullet and allow you to plan the most appropriate form of intervention.

## 55.5 Surgical Strategies

### 55.5.1 Patient Position

The patient should be positioned in the Lloyd-Davies position. This provides the best access into the pelvis particularly if bleeding is encountered and the extraperitoneal rectum requires mobilisation. A sigmoidoscopy should be performed on the haemodynamically stable patient in order to diagnose and locate the position of the rectal injury. A urinary catheter should already be in situ.

### 55.5.2 Laparotomy

A midline laparotomy is performed in haemodynamically unstable patients or in those with an acute abdomen. Ensure that your skin incision reaches the pubic symphysis. Do not injure the bladder on entering the peritoneal cavity. The principles of abdominal trauma surgery apply; control any haemorrhage and prevent contamination.

Intraperitoneal rectal injuries are dealt with in a similar fashion to other colonic trauma. Ensure that the wound edges have been debrided and are bleeding. Simple holes are closed with a single-layer absorbable suture. No drains are required.

In the event of a high-velocity destructive gunshot wound to the rectum, the surgeon should be in a damage control frame of mind, and the sigmoid should be ligated and the distal rectal stump transfixed with a TA stapler. Identify the ureters bilaterally or follow them down from the bifurcation of the common iliac artery to ensure that they are not ligated. We find a silk is superior to linen in the ligation of bowel. Simply pass an artery forceps through the mesentery and then pull the silk suture through and tie off the colon. A single suture usually suffices. At the subsequent relook laparotomy, the sigmoid colon is brought out as an end stoma and the injured rectum removed.

In stab wounds and in low-velocity gunshot wounds, the site of the injury needs to be identified. If there is a single hole, ensure that you are not missing the second hole. Place a finger in the hole and palpate the colon for any further holes. It can be easy to miss a hole where the mesentery attaches to the rectum. If there is any doubt, then the hole in the intraperitoneal rectum can be enlarged and looked at under direct vision. If there is a second hole

but this is extraperitoneal, then this second hole can be left unsutured and a proximal defunctioning loop sigmoid colostomy performed.

The extraperitoneal rectum only needs to be mobilised if there is massive haemorrhage adjacent and if there is involvement of the vessels in the mesorectum (superior and middle rectal arteries). This may also depend on the experience of the surgeon involved as these can also be packed with abdominal swabs into the pelvis for haemostasis. If the injury to the rectum is entirely extraperitoneal, then these holes do not need to be sutured. There is no advantage to repair, and in many cases, it is technically difficult to do so. A defunctioning sigmoid loop colostomy should be the mainstay in the management of these extraperitoneal injuries.

Look also for any bladder involvement. The bladder may even be opened in the anterior midline if necessary to exclude an injury. Another option is to have an unscrubbed assistant fill the bladder with a mixture of sterile water and methylene blue via the urinary catheter. Traumatic rectovesical fistulas need to be recognised and dealt with. The bladder must always be repaired and then an omental pedicle placed between the bladder and the rectum in order to reduce the high incidence of rectovesical fistulas from combined rectal and genitourinary trauma.

### 55.5.3 Laparoscopy and a Trephine Loop Colostomy

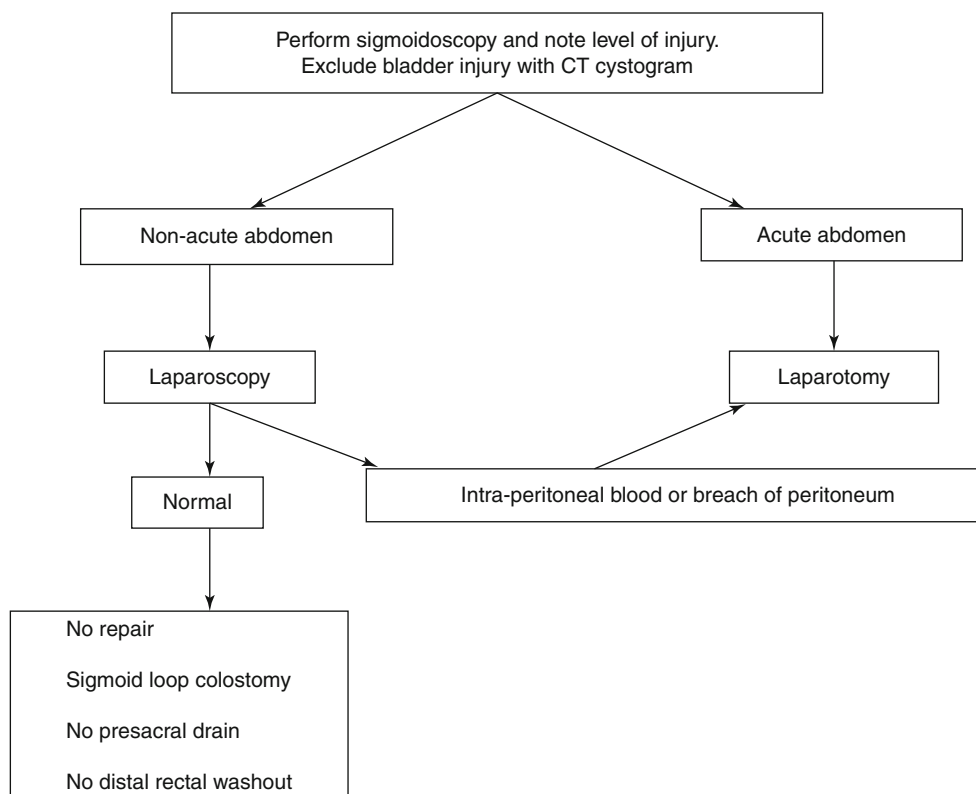
A laparoscopy is indicated in the haemodynamically stable patient with a transpelvic gunshot wound who presents with blood per rectum but no abdominal peritoneal signs. If there is no blood or urine in the peritoneal cavity, then the patient can be safely managed with a trephine loop sigmoid colostomy in the left iliac fossa without the need for a laparotomy (Fig. 55.1).

### 55.5.4 Distal Rectal Washout

The value of distal rectal washout in civilian injuries has been questioned. Present-day experience with low-velocity gunshot wounds tends to show no benefit from distal rectal washout, and it is considered to be associated with a high risk of infection because of spillage from the unrepaired extraperitoneal rectal perforation. This has resulted in most trauma surgeons abandoning this procedure.

### 55.5.5 Presacral Drainage

The placement of a drain in the presacral space through an incision in the anococcygeal raphe was advocated in



**Fig. 55.1** Management strategy for an extraperitoneal gunshot wound of the rectum

the military experience, but the only randomised clinical trial in the civilian setting has shown that this did not reduce septic complications and is currently not recommended.

### 55.5.6 Antibiotic Treatment

Broad-spectrum antibiotics should be administered for a full period of seven days in the event of an extraperitoneal injury that has been purely managed with a loop colostomy and no laparotomy, and the patient should be monitored closely for the development of pelvic sepsis. If this does occur, then the

collection is usually amenable to percutaneous drainage under ultrasound guidance.

### Recommended Reading

1. Cinman NM, McAninch JW, Porten SP, Myers JB, Blaschko SD et al (2013) Gunshot wounds to the lower urinary tract: a single-institution experience. *J Trauma Acute Care Surg* 74: 725–731
2. Franko ER, Ivatury RR, Schwalb DM (1993) Combined penetrating rectal and genitourinary injuries: a challenge in management. *J Trauma* 34:347–353
3. Gonzales RP, Falimirski M, Holevar R (1998) The role of presacral drainage in the management of penetrating rectal trauma. *J Trauma* 45:656–661
4. Navsaria PH, Edu S, Nicol AJ (2007) Civilian extraperitoneal rectal gunshot wounds: surgical management made simpler. *World J Surg* 31:1345–1351
5. Navsaria PH, Graham R, Nicol A (2001) A new approach to extraperitoneal rectal injuries: laparoscopy and diverting loop sigmoid colostomy. *J Trauma* 51:532–535
6. Navsaria PH, Shaw JM, Zellweger R, Nicol AJ, Kahn D (2004) Diagnostic laparoscopy and diverting sigmoid loop colostomy in the management of civilian extra-peritoneal rectal gunshot injuries. *Br J Surg* 91:460–464
7. Velmahos GC, Gomez H, Falabella A, Demetriades D (2000) Operative management of civilian rectal gunshot wounds: simpler is better. *World J Surg* 24:114–118

#### Important Points

- Always place the patient in the Lloyd-Davies position as the surgical access into the pelvis is improved.
- Identify and sling both ureters early in the dissection. This avoids an iatrogenic injury and helps exclude any traumatic injury to the ureter.
- Follow the tract of the bullet and ensure that any bone or joint involvement is extensively washed out.