

# 1 **Treatment of Rectal War Wounds**

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32 **Abstract**

33 Treatment strategies for penetrating rectal injuries (PRI) in civilian settings are still  
34 not uniformly agreed, in part since high energy transfer PRI, such as is frequently  
35 seen in military settings, are not taken into account. We describe three cases of PRI,  
36 treated in a deployed combat environment and outline the management strategies  
37 successfully employed. We discuss the literature regarding PRI management. Where  
38 there is a major soft tissue component, repetitive debridement and vacuum therapy is  
39 useful. A loop or end colostomy should be used, depending on the degree of damage  
40 to the anal sphincter complex.

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42

43 **Introduction**

44 Penetrating ballistic injuries are commonly seen in war, and the shift in recent  
45 conflicts in Iraq and Afghanistan away from gunshot wounds (GSW) as the main  
46 cause of injury is significant. The increased use of Improvised Explosive Devices  
47 (IEDs) has resulted in more severely injured victims with an increase in perineal soft  
48 tissue injury and a likely concomitant increase in penetrating rectal injury (PRI). [1 2 3  
49 4]PRI may be externally visible if the perineum is disrupted or easily identified by  
50 presence of blood on digital rectal examination (DRE). On other occasions, injuries  
51 are found only with careful inspection at the time of surgery because of a high degree  
52 of suspicion from the injury pattern. There is still debate about optimal treatment  
53 strategies in high energy transfer PRI, because publications of combat zone PRI are  
54 sparse.

55 Conventional care for civilian PRI is a temporary diverting loop colostomy [5] and pre-  
56 sacral drainage [6], but several experienced trauma groups have questioned the  
57 need for pre-sacral drainage [6-8]. The diversity of opinions in current literature on  
58 PRI treatment seems inadequate for many of the high-energy transfer (HET) injuries  
59 encountered in military surgical practice. The goal of this paper was to describe  
60 practical management strategies of PRI (and concomitant soft-tissue loss) to aid in  
61 the management of PRI sustained in military conflict based on representative cases  
62 and review of the current literature.

63

64 **Case 1: Penetrating rectal injury due to gunshot**

65 A 38-year-old Afghan national male was transferred from the point of injury to the  
66 emergency department (ED) of an International Security and Assistance Force  
67 (ISAF) Role 3 medical treatment facility (R3MTF) in the Kandahar region after  
68 sustaining a GSW to the right flank two hours previously. Initial observations were  
69 with a heart rate of 110/min and blood pressure 90/40 mmHg. Abdominal  
70 examination showed signs consistent with peritonitis and a single wound in the right  
71 lower abdomen; DRE was normal and no other injuries were found. Anterior-posterior  
72 abdominal X-ray revealed a projectile at the level of the promontory of the sacral  
73 spine (Figure 1). An immediate laparotomy revealed gross faecal contamination from  
74 circumferential destruction of the caecum, treated by right hemicolectomy and side-  
75 to-side ileotransverse colonic anastomosis. In addition to the caecal injury,  
76 exploration of an expanding retroperitoneal haematoma, necessitated suture ligation

77 of the left internal iliac vein and renorrhapy of the lower pole of the right kidney to  
78 control bleeding.

79

80 No additional bowel injuries, including injuries of the intra-abdominal rectum were  
81 found and the projectile was not identified during laparotomy. After temporary  
82 abdominal closure, the patient was admitted to the Intensive Care Unit (ICU) for  
83 further resuscitation. Proctoscopy prior to relook laparotomy revealed an intraluminal  
84 projectile without evident rectal injury or luminal blood (Figure 2). A diverting loop  
85 colostomy was performed after copious intra abdominal and distal rectal washout and  
86 the abdomen closed. The patient recovered without complications and was  
87 discharged from hospital within one week. The colostomy was closed in a local  
88 facility six weeks later.

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## 90 **Case 2: Transgluteal injury due to rocket-propelled grenade**

91 A 25-year-old Afghan male was presented to the ED after a rocket-propelled grenade  
92 (RPG) had broadsided his unarmoured vehicle without detonating. He suffered  
93 grade II shock that responded to resuscitation efforts. Inspection revealed an isolated  
94 but massive wound of both buttocks and rectum through which the missile had  
95 passed (Figure 3). No bony injury of the pelvis was discernible on radiographs. An  
96 exploratory laparotomy revealed no intraperitoneal injuries. A proctectomy with end  
97 colostomy was performed with resection of the remainder of the rectum. Thorough  
98 debridement and washout of both rectal, perineal and gluteal wounds was followed  
99 by vacuum assisted therapy (VAC). The patient returned to the operating room three  
100 times for completion of debridement followed by VAC dressing and progressive  
101 partial closure over the following 5 days. The anorectal sphincter complex had been  
102 completely destroyed without prospect for reconstruction. With the patient in the  
103 prone position, rotation flaps of skin and subcutaneous tissue were mobilised  
104 bilaterally to close the perineal defect over Penrose type drains. The drains were  
105 removed after 5 days. The patient was discharged to a local civilian facility for  
106 mobility rehabilitation 3 weeks after admittance.

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### 111 **Case 3: Tangential injury of the coccyx and rectum due to gunshot**

112 A shocked 7-year-old Afghan male presented to the R3MTF 8 hours after suffering a  
113 HET tangential GSW to the pelvis . Following resuscitation in the ED he was  
114 transferred to the operating room where laparotomy revealed no intraperitoneal  
115 injury and a descending loop colostomy was formed with distal washout of the  
116 sigmoid colon and rectum. The patient was turned prone for wash out of the rectal  
117 wound. The skin and gluteal muscles were severely injured. The coccyx was  
118 completely destroyed and there was a 75% circumferential laceration of the rectum  
119 approximately five centimetres from the anal verge, but the anus and sphincter  
120 complex were intact, as was the surrounding skin. After debridement, primary repair  
121 of the rectum was achieved with minimal mobilisation using inverting interrupted  
122 sutures of 3.0 Vicryl. A VAC dressing was applied over gauze covered with adhesive  
123 plastic dressing, which had been placed to protect the rectal repair. The patient  
124 returned to the operating room three times for debridement and irrigation over the  
125 next week. At each procedure, the skin defect was increasingly covered using skin  
126 advancement flaps until it was closed. The patient resumed diet on the third day after  
127 admission. He was able to walk with assistance after the first week. He was  
128 discharged to the care of his family. He returned for closure of the colostomy six  
129 weeks later. Resumption of bowel movement per rectum with normal continence  
130 occurred a week later.

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### 133 **Discussion**

134 The first patient had an injury from a single GSW and we believe that even though it  
135 was originally a high available energy projectile, by the time it had reached the  
136 rectum it had already dissipated most of its energy to penetrate the rectum with no  
137 discernible tissue destruction. The literature suggests that non-destructive rectal  
138 injuries such as this may be treated without colostomy[9], but unfortunately the  
139 austere situation of a war zone does not (always) afford the luxury of a wait and see  
140 policy and emergent evacuation to the next level of care may be difficult and so we  
141 believe our choice of defunctioning loop colostomy is justified, particularly in the face  
142 of the massive faecal contamination caused by the destruction of the caecum. The  
143 injuries suffered by the second and third patients resulted from much greater transfer  
144 of energy to the rectum causing complete destruction of the posterior pelvis and the

145 anorectum – anorectal preservation was possible in the latter case because the anal  
146 sphincter complex was preserved. Defunctioning colostomies in local nationals were  
147 closed as soon as possible because of the harsh conditions resulting in a lack of  
148 supplies.

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150 In civilian practice, most penetrating rectal injuries are caused by low energy transfer  
151 (LET) projectiles and can easily be treated by performing diverting colostomy without  
152 the need for further repair of the rectal injury or distal rectal washout [5,6]. In contrast  
153 to LET PRI, literature on high energy transfer or blast injury of the rectum, as  
154 encountered in the current conflict in Afghanistan, is rare. Our experience suggests  
155 that multiple operations of a more intense nature are required for combat-related PRI  
156 and is needed to treat the gross soft injuries due to the massive energy transfer  
157 encountered in the perianal and buttock wounds of war. The primary phase often  
158 includes initial cleaning, packing of both the perineal wound and the pre-peritoneal  
159 space of the pelvis to control haemorrhage and a diverting colostomy. Subsequent  
160 operations are required to complete debridement of soft tissue wounds that close by  
161 secondary intention. The colostomy may only then be closed if the rectum has been  
162 repaired with preservation of the anorectal complex. This is particularly true for PRI  
163 associated with perineal injuries from anti-personnel IED [10].

164 In a retrospective analysis of penetrating pelvic battlefield trauma in 28 patients, 12  
165 suffered extraperitoneal rectal injury from HET projectiles[11]. The study  
166 demonstrated a significant correlation between pelvic fractures, massive soft tissue  
167 injury and rectal injuries resulting in a mortality rate of 33%. High energy transfer  
168 injuries usually result in rectal injuries that require some form of local surgical  
169 debridement and repair in combination with a diverting colostomy for faecal diversion  
170 [7,8,11]. In a cohort of colo-rectal injuries in 977 coalition forces serving in Iraq and  
171 Afghanistan rectal injury led to faecal diversion twice as often as colonic injury with  
172 more than half of patients requiring an 'ostomy' (56.2%) [12].

173 The role of presacral drainage in the management of civilian LET penetrating rectal  
174 injuries is limited since morbidity and mortality do not increase when faecal diversion  
175 is performed without presacral drainage [13]. However in HET wounds of the  
176 extraperitoneal rectum, such as combat injuries, the administration of pre-sacral  
177 drainage and distal washout is still advocated [7,14].

178 Based on 26 extraperitoneal civilian rectal gunshot injuries Levy et al recommended

179 that in most cases a loop colostomy is sufficient to divert the faecal stream while  
180 Hartmann's procedure must be considered in cases with massive rectal and perineal  
181 disruption; rectal wound repair should only be attempted when easy to perform;  
182 presacral drainage should be performed via the transperineal route only in cases with  
183 significant posterior rectal laceration and dissection of the perirectal spaces; and  
184 distal rectal washout is not mandatory, but may be performed in cases of massive  
185 disruption of rectal and surrounding tissues [15].

186 In a series of 29 patients suffering from penetrating rectal injuries a trauma to  
187 treatment interval of more than 8 hours, the presence of perianal or gluteal injuries  
188 and the presence of faecal contamination were significant factors affecting  
189 development of morbidity [16]. In the largest published series by Burch et al. [17], and  
190 in all subsequent series [11, 18-22], no benefit in reducing septic complications was  
191 achieved when distal rectal washout was added to diversion and pre-sacral drainage  
192 although Burch et al. showed a significant reduction in pelvic septic complications  
193 through the application of presacral drainage [14].

194 There are too few publications on combat PRI for evidence based advice for  
195 treatment of these patients, but based on the experience of the authors in  
196 combination with the published literature, we recommend repetitive debridement in  
197 combination with washout of penetrating rectal wounds with high energy transfer to  
198 the tissue, such as those IEDs. They may be managed well with aggressive surgical  
199 debridement and assisted by subatmospheric pressure therapy if available.

200 The liberal use of proctoscopy in penetrating trauma in the region of the lower  
201 abdomen, buttocks and upper femur is advocated, since it may reveal rectal injuries  
202 otherwise missed by digital rectal examination. The diagnostic accuracy of the digital  
203 rectal examination and proctoscopy in diagnosing rectal injuries is 76-95% [17,19-  
204 21,23,24]. Data on false-negative proctoscopy is rare but may be as as high as 31%  
205 [25].

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212 **Conclusion**

213 In contrast to treatment of LET PRI, in which an expectant treatment in combination  
214 with a diverting colostomy might suffice (although in austere conditions this may not  
215 be the safest option), HET PRI requires aggressive surgical management. Massive  
216 soft tissue injuries require repetitive washout and debridement in combination with an  
217 end colostomy and drainage or subatmospheric pressure therapy to save the patients  
218 life. Only when the patient's condition and healing of the rectal and perineal injuries  
219 are deemed to be sufficient, is reversal of the colostomy advised feasible.



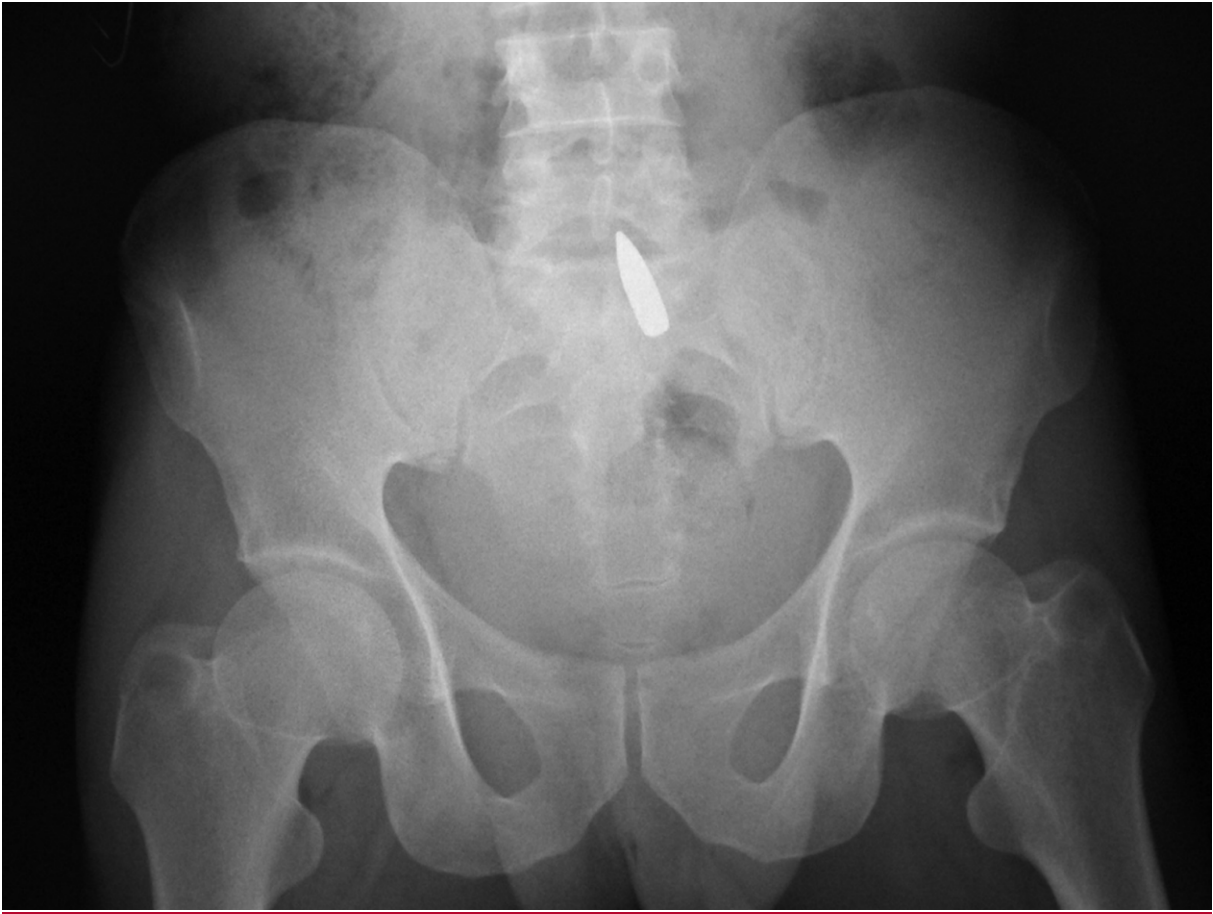
220 **References**

- 221 1. Sarić D, Tudor M, Grandić L et al. Penetrating combat injuries of the colorectal  
222 region. *Chirurg*. 2001;72:425-32
- 223 2. Brisebois RJ, Tien HC. Surgical experience at the Canadian-led Role 3  
224 multinational medical unit in Kandahar, Afghanistan, *J Trauma*. 2011;71:397-400
- 225 3. Belmont PJ Jr, McCriskin BJ, Sieg RN et al. Combat wounds in Iraq and  
226 Afghanistan from 2005 to 2009. *J Trauma Acute Care Surg*. 2012;73:3-12
- 227 4. Owens BD, Kragh JF, Wenke JC et al. Combat wounds in operation Iraqi freedom  
228 and operation enduring freedom. *J Trauma*. 2008;64:295-299
- 229 5. Navsaria PH, Edu S, Nicol AJ. Civilian extraperitoneal rectal gunshot wounds:  
230 surgical management made simpler. *World J Surg*. 2007;31:1345-51
- 231 6. Steinig JP, Boyd CR. Presacral drainage in penetrating extraperitoneal rectal  
232 injuries: is it necessary? *Am Surg*. 1996;62:765-7.
- 233 7. Brogden TG, Garner JP. Anorectal injury in pelvic blast. *J R Army Med Corps*.  
234 2013;159:i26-31
- 235 8. Barkley S, Khan M, Garner J. Rectal trauma in adults. *Trauma*. 2013;0:1-13
- 236 9. Plummer JM, McDonald AH, Newnham JP et al. Civilian rectal trauma: the surgical  
237 challenge. *West Indian Med J*. 2004;53:382-6.
- 238 10. McAlister VC. "The Role of Surgery in Building Resilience to Blast Attacks" *NATO*  
239 *Research & Technology Organisation RTO-MP-HFM-207.KN4* (2011): 1-3.  
240 <ftp://ftp.rta.nato.int/PubFullText/RTO/MP/RTO-MP-HFM-207/\$MP-HFM-207-  
241 KN4.doc> accessed 18 Nov 2012
- 242 11. Arthurs Z, Kjorstad R, Mullenix P et al. The use of damage-control principles for  
243 penetrating pelvic battlefield trauma. *Am. J. Surg*. 2006 May;191(5):604–9.
- 244 12. Glasgow SC, Steele SR, Duncan JE et al. Epidemiology of modern battlefield  
245 colorectal trauma: a review of 977 coalition casualties. *J Trauma Acute Care Surg*.  
246 2012 Dec;73(6 Suppl 5):S503–8.
- 247 13. Gonzalez RP, Falimirski ME, Holevar MR. The role of presacral drainage in the  
248 management of penetrating rectal injuries. *The Journal of Trauma: Injury, Infection,*  
249 *and Critical Care*. 1998 Oct.;45(4):656–61.
- 250 14. Burch JM, Feliciano DV, Mattox KL. Colostomy and drainage for civilian rectal  
251 injuries: is that all? *Ann. Surg*. 1989;209:600
- 252 15. Levy RD, Strauss P, Aladgem D et al. Extraperitoneal rectal gunshot injuries. *The*  
253 *Journal of Trauma: Injury, Infection, and Critical Care*. 1995 Feb.;38(2):273–7.

- 254 16. Gümüş M, Kapan M, Önder A et al. Factors affecting morbidity in penetrating  
255 rectal injuries: a civilian experience. *Ulus Travma Acil Cerrahi Derg.* 2011  
256 Sep.;17(5):401–6.
- 257 17. Burch JM, Brock JC, Gevirtzman L et al. The injured colon. *Ann. Surg.* 1986  
258 Jun;203(6):701–11.
- 259 18. Thomas DD, Levison MA, Dykstra BJ, et al. Management of rectal injuries:  
260 dogma versus practice. *Am. Surg.* 1990;56:507
- 261 19. Ivatury RR, Licata J, Gunduz Y, et al. Management options in penetrating rectal  
262 injuries. *Am. Surg.* 1991;57:50-57
- 263 20. Levine JH, Longo WE, Pruitt C, et al. Management of selected rectal injuries by  
264 primary repair. *Am. J. Surg.* 1996;172:575 68.
- 265 21. McGrath V, Fabian TC, Croce MA, et al. Rectal trauma: management based on  
266 anatomic distinctions. *Am. Surg.* 1998;64:1136
- 267 22. Bostick PJ, Johnson DA, Heard JF, et al. Management of extraperitoneal rectal  
268 injuries. *J. Natl. Med. Assoc.* 1993;85:460
- 269 23. Morken JJ, Kraatz JJ, Balcos EG, et al. Civilian rectal trauma: a changing  
270 perspective. *Surgery* 1999;126:693–700
- 271 24. Velmahos GC, Gomez H, Falabella A et al. Operative  
272 management of civilian rectal gunshot wounds: simpler is better. *World J Surg*  
273 2000;24:114–118.
- 274 25. Grasberger RC, Hirsch EF. Rectal trauma: a retrospective analysis and  
275 guidelines for therapy. *Am J Surg* 1983;145:795–799.
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277 Figure 1

278 X-ray image: projectile at the level of the promontory of the sacral spine

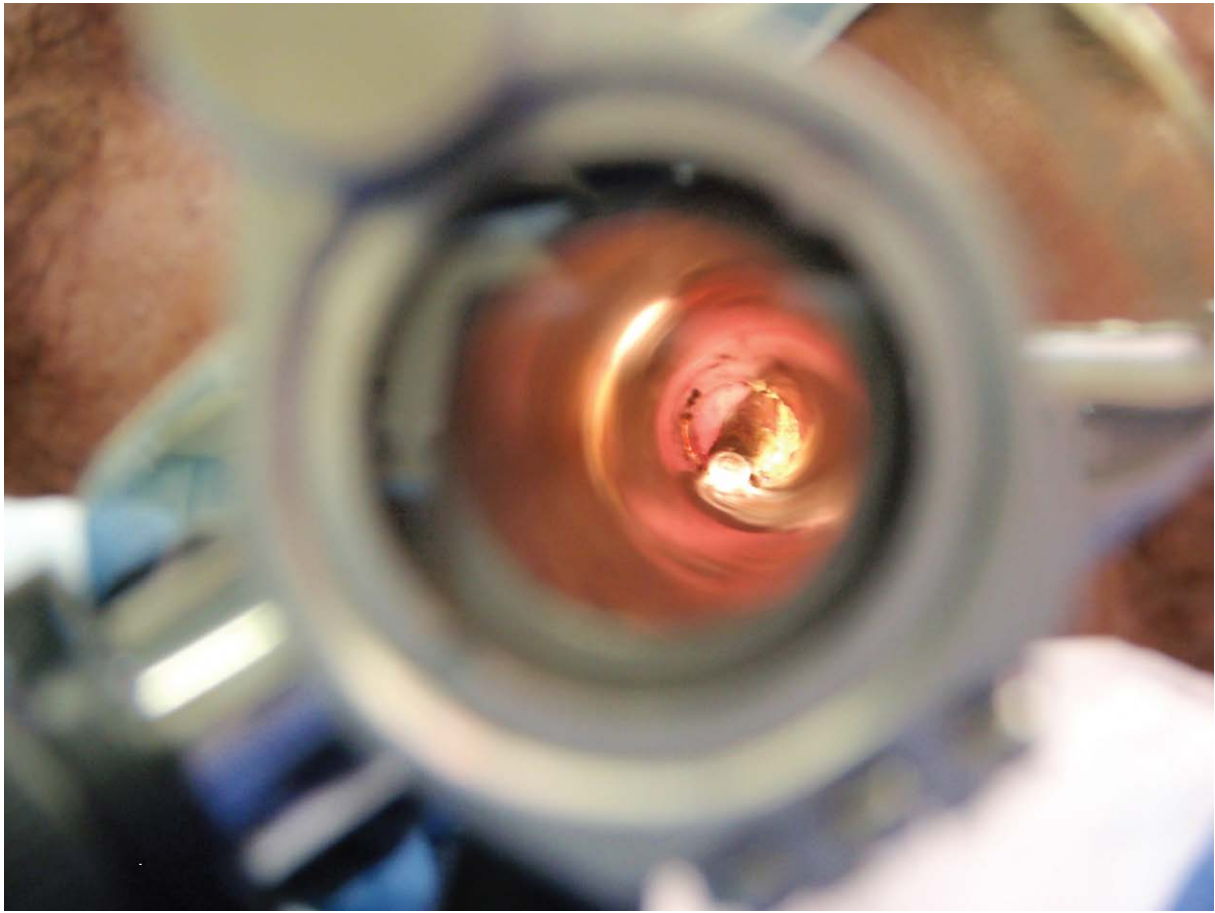


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281 Figure 2

282 Rigid rectoscopy revealing an intraluminal projectile without evident rectal injury



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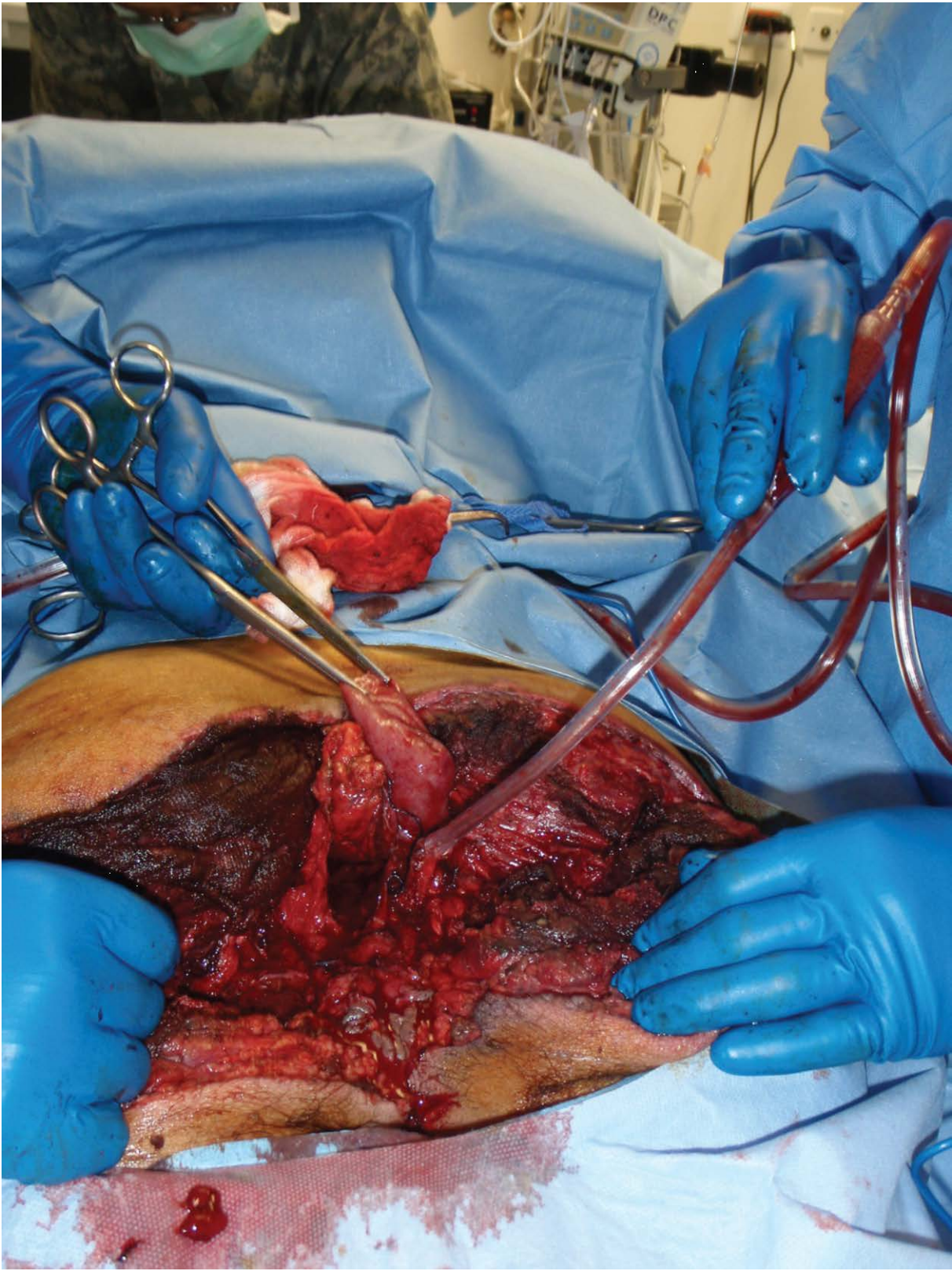
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285 Figure 3

286 Massive trans gluteal and anorectal wounds caused by rocket-propelled grenade.

287 Patient in prone position.





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