

Emergency treatment of violent trauma

Clinical cases and surgical treatment of penetrating thoracoabdominal, perineal and anorectal trauma



Ann. Ital. Chir., 2013 84: 11-18
pii: S0003469X13018460

William Zuccon, Roberto Paternollo*, Luca Del Re**, Andrea Cordovana, Giovanni De Murtas, Giacomo Gaverini, Giulia Baffa, Claudio Lunghi

Azienda Ospedaliera 'Fatebenefratelli e Oftalmico', Milan, Italy
Struttura Complessa di Chirurgia Generale (Direttore: Dr. C. Lunghi)

* Struttura Semplice di Chirurgia d'Urgenza e Pronto Soccorso

** Struttura Semplice di Coloproctologia

Emergency treatment of violent trauma. Clinical cases and surgical treatment of penetrating thoracoabdominal, perineal and anorectal trauma

AIM: The Authors analyse clinical cases of penetrating thoracic, abdominal, perineal and anorectal injury and describe the traumatic event and type of lesion, the principles of surgical treatment, the complication rate and follow up.

MATERIALS AND METHODS: In the last 24 months, we analyzed 10 consecutive cases of penetrating thoracic and abdominal wounds [stab wound (n=7), with evisceration (n=4), gunshot wound (n=1)], and penetrating perineal and anorectal wounds (impalement n=4). In addition, we report an unusual case of neck injury from a stab wound. All the patients underwent emergency surgery for the lesions reported.

RESULTS: In 7 cases of perforating vulnerant thoracoabdominal trauma from stab wounds there was hemoperitoneum due to bleeding from the abdominal wall (n=3), the omentum (n=1), the vena cava (n=1) and the liver (n=2). Evisceration of the omentum was observed in 4 cases. In 2 cases laparoscopy was performed. In one case laparotomy and thoracoscopy was performed. In a patient with an abdominoperineal gunshot wound, exploration was extraperitoneal. The 4 cases of perineal and anorectal impalement were treated with primary reconstruction, while in one case a laparotomy was needed to suture the rectum and fashion a temporary colostomy. In one case of anorectal injury rehabilitation resulted in a gradual improvement of fecal continence, while in the patient with the colostomy follow up at 2 months was scheduled to plan colostomy closure.

CONCLUSIONS: Based on the our clinical experience and the literature, in penetrating abdominal trauma laparotomy may be required if patients are hemodynamically unstable (or in hemorrhagic shock), in patients with evisceration and peritonitis, or for exploration of penetrating thoracoabdominal and epigastric lesions. In anterior injuries of the abdominal wall from gunshot or stab wounds, laparotomy is indicated when there is peritoneal violation and significant intraperitoneal damage. In patients with actively bleeding wounds of the abdominal wall muscles minimal laparotomy is often necessary for control of hemorrhage and abdominal wall reconstruction to avoid herniation. If patients are asymptomatic, in cases of anterior lesions the indications for diagnostic laparoscopy are uncertain. Selective conservative treatment is reserved for asymptomatic patients who are hemodynamically stable. Further controlled studies are needed. Early surgery for perineal and anorectal trauma, and also for complex injuries, is the gold standard for treatment.

KEY WORDS: Impalement, Penetrating abdominal wounds

Pervenuto in Redazione Dicembre 2011. Accettato per la pubblicazione Marzo 2012

Correspondence to: Zuccon William, S.C. Chirurgia Generale, Ospedale Fatebenefratelli e Oftalmico - Milano (E-mail: wzuccon@libero.it)

Introduction

Penetrating trauma involving the chest, abdomen, perineum and anorectum is an infrequent occurrence, usu-

ally due to attacks with firearms or sharp weapons (especially knives), or accidents such as impalement (a term commonly used for penetrating lesions caused by sharp and/or large objects). In the perianal or anorectal region impalement is sometimes caused by other means such as uncommon sexual practices ¹.

The management of this type of trauma is generally complex and involves not only rapid evaluation and treatment but also, especially in cases of perineal or anorectal impalement, limitation of early and late complications as well as invalidity resulting from the trauma ².

The main objective, however, is quick definitive diagnosis and timely intervention so that useless procedures can be avoided ^{3,4}.

The authors analyze their recent cases of violent trauma in light of their clinical experience and the literature on

the main aspects of cases of violent trauma and the principles of surgical treatment.

Materials and methods

In the period from January 2010 and December 2011, at our institution, 13 consecutive cases of penetrating trauma were included in the study. These consisted of 8 cases of thoracoabdominal trauma (7 caused by a sharp instrument 4 of which were cases of evisceration, and 1 by a gunshot wound), 4 cases of perineal and anorectal trauma (impalement) as shown in Tables I and II, and one special case of neck trauma (cut throat). There were 10 men and 3 women. All the patients underwent the necessary emergency surgery performed by different sur-

TABLE I - Cases of penetrating thoracoabdominal injury from gunshot wounds or sharp instruments.

Patient (Male Or Female)	Age (Years And Nation)	Cause	Type Of Lesion	Diagnostic Exams	Associated Wounds	Hemodynamic Status	Surgical Procedure	Clinical Course
Case 1 L.D. (M)	22 ITA	Attack with a cutting instrument with a sharp point	Penetrating wound in the left iliac fossa	US Abdomen: free fluid in the peritoneal cavity	Non-penetrating wound in the right hemithorax: repaired with direct suturing	Normal and stable	Explorative laparoscopy, minilaparotomy in left iliac fossa, hemostasis and reconstruction of the anterior abdominal wall (due to full thickness active bleeding laceration of the rectus abdominis muscle) Hemoperitoneum due to penetration in the peritoneal cavity (>250ml)	Discharged on postoperative day 3 Follow-up at 21 months: normal, no complications.
Case 2 B.B (M)	47 ALG	Attack with a cutting instrument with a sharp point	Penetrating wound of left and right hemithorax (infero-posterior third) Penetrating wound in mesogastrium (left-middle third) with exposure of the omentum	Thoracoabdominal CT scan: minimal pneumothorax at left apex, minimal bilateral pleural effusion, alteration in the right posterior costophrenic angle due to the lesion, lesion in the left lobe of the liver (segment II), free fluid in the peritoneal cavity	Wounds in bilateral hemithorax: repaired with direct suturing Conservative treatment of the minimal pneumothorax and pleural effusion.	Normal and stable	Explorative midline laparotomy, liver hemostasis with Tachosyl due to actively bleeding laceration of segment II (O.I.S.: Grade 2 – AIS 90 2), diaphragm sutured Hemoperitoneum >500ml	Discharged on postoperative day 7 The patient refused follow-up Death 1 year later from tuberculosis.
Case 3 M.L. (M)	20 ECU	Attack with a cutting instrument with a sharp point	Penetrating wound in mesogastrium (midline), exposure of bleeding omentum	-----	-----	Normal and stable	Explorative midline laparotomy and partial omental resection due to damage of a vascular pole Hemoperitoneum >250ml	Discharged on postoperative day 3 Follow-up at 12 months: normal, no complications
Case 4 P.S. (W)	23 ITA	Attack with a cutting instrument with a sharp point	Penetrating wound in right iliac fossa	US Abdomen: free fluid in the peritoneal cavity	Non-penetrating wounds of right arm and shoulder wounds, deltoid fascia cut, right hip: repaired with direct suturing	Normal and stable	Explorative laparoscopy, minilaparotomy in the right iliac fossa, hemostasis and reconstruction of the rectus abdominis muscle (due to large transverse full thickness actively bleeding laceration of the muscle) Hemoperitoneum due to penetration in the peritoneal cavity >250ml	Discharged on postoperative day 6 Local infection of the wound in the right iliac fossa, site of dagger wound, resolved on postoperative day 10 Follow-up at 12 months: normal, no complications

geons. In 2 cases of abdominal trauma explorative laparoscopy was performed. Patients with thoracoabdominal wounds that did not penetrate the pleural cavity, or the peritoneal cavity, and superficial anoperineal wounds were excluded from the study. The cause of the trauma, the type of lesion, the treatment, the complication rate, and the long-term outcome was described in all cases.

TABLE I - Cases of penetrating thoracoabdominal injury from gunshot wounds or sharp instruments.

Patient (Male Or Female)	Age (Years And Nation)	Cause	Type Of Lesion	Diagnostic Exams	Associated Wounds	Hemodynamic Status	Surgical Procedure	Clinical Course
Case 5 R.G. (M)	56 ITA	Attack with a gun	Penetrating wound in right iliac fossa (bullet entry wound) and in the internal gluteus muscle-perianal area (bullet exit wound), and very large hematoma developing in the right ilioinguinal region	-----	-----	Normal and stable	Explorative midline laparotomy, preparation of suprafascial flap, extraperitoneal exploration with identification of the trajectory of the bullet, drainage of hematoma and hemostasis (for laceration of epigastric and spermatic vessels)	Discharged on postoperative day 10 Follow-up at 6 months: normal, no complications
Case 6 O.V. (M)	36 UKR	Attack with a cutting instrument with a sharp point	Penetrating wound in hypogastrium with evisceration	-----	-----	Normal and stable	Explorative laparotomy, hemostasis and reconstruction of the rectus abdominis muscle (due to large transverse full thickness actively bleeding lesion) Hemoperitoneum due to penetration in the peritoneal cavity >250ml	Discharged on postoperative day 6 Follow-up at 3 months: normal, no complications
Case 7 M.E. (M)	31 MAR	Attack with a cutting instrument with a sharp point	Penetrating wound in left hypochondrium with exposure of the viscera	-----	Non-penetrating left lumbar wound	Unstable	Explorative midline laparotomy, priority: attempt to control hemostasis due to large lesions of anterior and posterior gastric wall, the body of the pancreas (full thickness), and the inferior vena cava Massive hemoperitoneum	Intraoperative death
Case 8 H.M. (W)	29 PER	Attack with a cutting instrument with a sharp point	Penetrating wound of right hemithorax (IV intercostal space, anterior axillary line), and anterior cervical penetrating wound (subhyoid, with exposure of the laryngeal vestibule and the hypopharynx with amputation of the epiglottis at the level of the petiole)	Chest x-ray, very large pneumothorax	Non-penetrating wounds of the left hemithorax and the fingers of the hands: repaired with direct suturing	Normal and stable	Right hemithoracostomy, decompression Exploration of the anterior cervical wound, fashioning of a temporary tracheostomy, direct suturing of the mucosa of the laryngeal vestibule with anchoring of the petiole on the thyroid cartilage and suturing of the subhyoid muscles	Discharged on postoperative day 10 Follow-up at 1 month: normal, no complications. To plan closure tracheostomy
Case 9 B.M. (M)	34 TUN	Attack with a cutting instrument with a sharp point	Penetrating wounds in right hemithorax (inferolateral third) & right hypochondrium	US chest and abdomen: hemopneumothorax and free fluid in the peritoneal cavity	-----	Unstable	Explorative midline laparotomy, liver hemostasis with direct suturing because laceration actively bleeding segment VIII (O.I.S.: Grade 2 – AIS 90 2), direct suturing of right diaphragm, combined video-assisted thoracoscopic and pleural drainage Hemothorax > 1000 ml Hemoperitoneum > 500 ml	Discharged on postoperative day 15 Follow-up at 1 month: normal, no complications

ITA= Italian - ALG= Algerian - ECU= Ecuadorian - UKR= Ukrainian - PER= Peruvian - MAR= Moroccan - TUN= Tunisian

Results

In all cases surgery was performed within 2 hours after the trauma. All patients were given maintenance therapy and supportive care and were hemodynamically stable throughout the operation, except 2 cases reanimation was required. There was 1 intraoperative death for hemorrhagic shock. Surgery was performed to control hemorrhage, make a precise assessment of the lesions and provide definitive treatment. Hemoperitoneum was observed in all 7 cases of penetrating injury caused by sharp weapons, due to actively bleeding lacerations of the anterior abdominal wall (n=3), vascular lesions in the omentum (n=1) or the vena cava (n=1), or liver lesions (n=2). In 4 cases of dagger or stiletto wounds there was visceration of the omentum. In 2 cases laparoscopy was performed, and in 1 case transpleural thoracoscopy was performed in addition to laparotomy. In the patients with gunshot wounds, exploration was extraperitoneal. In the 4 cases of perineal and anorectal trauma due to impalement injury transanal reconstruction with primary suturing of the damaged tissue, was required. In one

of the 2 cases of anorectal trauma due to fisting, transanal reconstruction of the rectal wall and anal sphincter by layers was required, while in the other, due to a major early complication delayed laparotomy was needed for repair of the anterior wall of the intraperitoneal rectum and construction of a temporary protective colostomy (rectal perforation 'in 2 phases'). In the first of these cases of complex trauma of the rectum and anal sphincter, continuation of pelvic floor re-education is permitting gradual (although slow) resumption of fecal continence, while a follow-up at 2 months, to plan colostomy reversal, is scheduled for the patient with the temporary colostomy.

Discussion

SURGICAL AND CONSERVATIVE TREATMENT OF PENETRATING WOUNDS CAUSED BY FIREARMS OR SHARP WEAPONS

Rapid diagnosis, based on the dynamics of the trauma and a careful clinical evaluation, makes it possible to give

TABLE II - Cases of penetrating wounds due to perineo-anorectal impalement

Patient (Male And Female)	Age (Years And Nation)	Cause	Type Of Lesion	Associated Wounds	Hemodynamic Status	Surgical Procedure	Clinical Course
Case 1 D.N. (M)	28 ITA	Impalament injury from an iron stake	Penetrating wound in the right perianal region with involvement of the ischiorectal fossa and uninjured rectal walls	Non-penetrating wounds in left perianal region & both gluteal regions, repaired with direct suturing	Normal and stable	Transanal exploration, hemostasis, muscle repair (because of laceration of the levator ani muscles) and perianal reconstruction	Discharged on postoperative day 4 Follow-up at 6 months: normal, no complications
Case 2 M.F. (M)	27 ROM	Impalament injury from a sheet of glass	Penetrating perineal wound (right gluteal region, the intergluteal sulcus) becoming superficial in the perianal region.	-----	Normal and stable	Transanal exploration, hemostasis and perineal reconstruction	Discharged on postoperative day 3 Follow-up at 6 months: normal, no complications
Case 3 B.L. (W)	34 ITA	Impalement due to fisting	Complex penetrating anorectal wounds with sifinterial injury	-----	Normal and stable	Transanal exploration, hemostasis, anorectal reconstruction, anoplasty (direct primary closure of each layer) due to multiple full thickness actively bleeding lacerations, of varying depths (within the extraperitoneal rectum), with exposure of the soft tissue around the anus and rectum, multiple full thickness, and circumferential perianal hematoma (O.I.S. Grade IV)	Discharged on postoperative day 16 Follow-up at 3 months: normal with resumption of continence
Case 4 M.D. (M)	31 ITA	Impalement due to fisting	Penetrating anorectal wounds	-----	Normal and stable	Transanal exploration, hemostasis and direct primary closure of multiple actively bleeding lacerations of the walls of the extraperitoneal rectum (O.I.S. Grade III) At 36 hours: Explorative midline laparotomy, repair of the rectum and construction of temporary colostomy in left iliac fossa, because of perforation 'in 2 phases' of the anterior wall of the intraperitoneal rectum	Discharged on postoperative day 28 Wound infection and interstitial pulmonitis (HIV+ patient) resolved on days 15 and 20 respectively. Follow-up at 2 months: normal To plan closure of protective colostomy

ITA= Italian - ROM= Romanian

the patient adequate treatment. The first phase of treatment always involves hemodynamic stabilization, and possibly an abdominal ultrasound or computed tomography (CT) scan with contrast agent, or paracentesis if the patient is hemodynamically unstable^{5,6}.

In patients with thoracoabdominal and upper abdominal wounds it is necessary, in the first place, to rule out both hemopneumothorax (by performing a chest x-ray) and ventricular laceration (as well as cardiac tamponade) due to penetration of the diaphragm; the latter complication is often identified when emergency laparotomy (and conversion to sternotomy) is performed⁷.

If the patient's clinical condition and hemodynamic status permit, the primary evaluation also involves wound exploration using simple probing, or better yet surgical exploration under local anesthesia for direct visual examination which permits correct identification of the wound path and the deep parietal layers to confirm peritoneal violation.

Usually, in cases of penetrating trauma caused by a sharp weapon, when the peritoneal sheath is involved or the end of the wound path cannot be identified, selective conservative treatment can be started in selected patients who are asymptomatic and hemodynamically stable whereas for hemodynamically unstable patients who are suspected to have intraperitoneal hemorrhage or peritonitis, emergency laparotomy is required. Laparotomy is also necessary in cases of evisceration because there may be concomitant injury to the hollow viscera. In addition, laparotomy is indicated if there is a knife or other sharp, pointed instrument stuck in the abdomen since the foreign body causing the wound must always be extracted under direct vision in the operating room. In patients with gunshot wounds, conservative treatment is also reserved for selected patients without a clinical manifestations of peritonitis who are hemodynamically stable³.

The data in the literature demonstrates that explorative midline laparotomy, when indicated based on the vital signs of the patient, peritoneal violation, and the site of the trauma, is almost always curative since it completes the evaluation of all abdominal structures, even in cases of multiple lesions, and thus is indicated not only in patients with hemorrhagic shock, evisceration or peritonitis but also in those with penetrating thoracoabdominal or upper abdominal wounds. On the other hand, in patients with a wound in the anterior abdominal wall, laparotomy is necessary if there is peritoneal violation and significant intraperitoneal damage^{8,9}.

Actively bleeding wounds of the abdominal wall merit special attention. It is our opinion that laparotomy, even if it is only minimal laparotomy, is essential for controlling hemorrhage and that, especially in patients with large wounds, abdominal wall reconstruction is needed to prevent herniation. Traumatic injury to the rectus abdominis muscle and the muscles of the lateral abdominal wall, which seemingly absorb the entire impact of the

blow, can cause tears of varying dimensions in the fascia, necessitating reconstruction, and also varying degrees of lacerations which may be actively bleeding, depending on the size of the lesion, and thus necessitate adequate hemostasis and repair. The rich vascularization of the abdominal wall, due to the superior and inferior epigastric vessels which anastomose within the muscle layer, makes it prone to hemorrhage. This is especially the case with the branches of the inferior epigastric artery which supply the abdominal wall muscles and the peritoneum and give rise to perforating arteries which have a high perfusion pressure.

Although in the muscles of the lateral abdominal wall the vessels run parallel to the muscle fibers, in the rectus abdominis muscle they are at some points perpendicular to the muscle fibers and as a result when there is penetrating trauma to the lumbar, iliac, and subcostal regions the vessels supplying the abdominal muscle are at high risk of being damaged.

In general, laparoscopy in the abdomen wounds is reserved for selected patients and is effective both in the diagnostic phase, when it can also serve to rule out associated lesions, and in the treatment phase, leading to a definitive cure in up to 80% of cases. Laparoscopy can be used to treat concomitant visceral lesions or bleeding from the mesentery and to evaluate the parietal peritoneum, or even, according to some authors, to plan successive conservative treatment. It is also possible to reduce the number of useless laparotomies by up to 60% and thus reduce the patient morbidity¹⁰.

Videolaparoscopy is especially useful in patients with penetrating thoracoabdominal wounds, especially those on the left side and in the epigastrium, since it can rule out involvement of the cupola of the diaphragm. Although its usefulness for exploration, or rather for diagnostic purposes, in cases of penetrating wounds on the right side is debatable, due to the right lobe of the liver (which in any case plugs up the defect), in cases of wounds on the left side laparoscopy is essential for evaluating the hemidiaphragm. If the hemidiaphragm is damaged laparotomy and reconstruction are required in order to prevent herniation and strangulation of the viscera^{11,12}.

Laparoscopy has other advantages when used in obese patients with penetrating upper abdominal wounds (even when the lesion only extends through the parietal fascia), in cases of lesions otherwise overlooked during conservative treatment, or when searching for suspected intrabdominal lesions not identified clinically or with diagnostic imaging. Sometimes laparoscopy can be a valid alternative to diagnostic peritoneal lavage since the latter procedure is associated with problems like excessive sensibility, which leads to a larger number of unnecessary laparotomies, insufficient accuracy in cases of retroperitoneal and diaphragmatic lesions, as well as a lack of specificity in evaluating the injured organ. In the diagnostic phase and in selected cases it can be per-

formed under local anesthesia and sedation ("awake" laparoscopy) ¹³. Laparoscopy is contraindicated in patients with penetrating trauma who are hemodynamically unstable (systolic blood pressure <90 mmHg), a history of laparotomies, peritonitis and adhesive disease, evisceration, posterior penetrating trauma, cardiorespiratory disease, unstable chest injuries, neurological deficits (GCS - Glasgow Coma Scale < 12), diaphragmatic hernia, and severe obesity.

As regards non surgical treatment, the primary evaluation phase, in which careful evaluation of the patient's hemodynamic status and clinical condition, as well the increasing reliability of diagnostic techniques, permit conservative treatment in selected cases, thus avoiding diagnostic laparoscopies that are negative or rather non therapeutic (with identification of the lesion) ¹⁴.

Non surgical treatment can be used for both gunshot and stab injuries though the former are more frequently associated with visceral lesions (due to the unpredictable trajectory of the bullet and the explosive effect). The data reported in the literature shows that 50-75% of all knife wounds of the anterior abdominal wall penetrate the peritoneal cavity and 50-75% require surgical repair, whereas in cases of gunshot wounds in patients carefully selected for attentive monitoring, the number of laparotomies performed can be reduced by one third ³.

When it is possible to use selective conservative management (non surgical management in asymptomatic, hemodynamically stable patients), it is important to plan careful clinical observation (at least every 1-3 hours for the first 24 hours), hourly monitoring of basic parameters, a series of blood tests and possibly ultrasound scans, and adequate maintenance therapy/supportive treatment, preferably with 'continuity of care'.

Clinically, pain at the site of penetration should not be confused with peritonism. The evaluation criterion that should be used is monitoring of the extension of the pain and assessment of any changes in the clinical picture. In hemodynamically stable patients with penetrating wounds in the back, flanks or lumbar region, a CT scan with contrast is indicated to correctly evaluate the retroperitoneal organs ¹⁵.

Active observation has the following goals: to reduce the number of early, unnecessary laparotomies (the incidence of negative laparotomies falls from 53% to 11% in patients with wounds caused by sharp instruments), and to reduce the number of late laparotomies needed because of unrecognized intraabdominal lesions in patients undergoing conservative treatment and as a result the high mortality rate (17%) and morbidity rate (83%) ^{10,16}.

As regards the cases reported, the decision to perform surgical exploration in symptomatic patients with penetrating wounds is based on both the presence of evisceration and suspicion of associated lesions, and on the presence of significant, actively bleeding lesions of the abdominal wall. The determining factors are penetrating

wounds, hemoperitoneum, and peritoneal irritation. In patients with gunshot wounds to the abdomen, surgical exploration is indicated in order to achieve hemostasis (and drain the large hematoma) in cases of active bleeding which results from the laceration of the epigastric and funicular blood vessels.

In 2 symptomatic hemodynamically stable patients explorative laparoscopy was justified and turned out to be opportune, because preoperatively there was suspicion of associated lesions (wound penetrating the peritoneum, hemoperitoneum, peritonism).

In the special case of the penetrating thoracoabdominal wound, videoassisted transpleural thoracoscopy and laparotomy made it possible a more complete evaluation, especially as regards repair of the diaphragm, assessment of concomitant pulmonary lesions, and drainage of the hemothorax ¹⁶.

SURGICAL TREATMENT OF IMPALEMENT INJURIES

If penetrating perianal and anorectal wounds are treated quickly they usually heal and there are less early and late complications. This type of wound is especially serious if the anal sphincter is involved, due to the high probability of disabling effects on fecal continence ⁴.

The surgical strategy adopted, and therefore the surgical timing, depend on various factors, such as the type of trauma, tissue trophism, risks of bacterial contamination, associated lesions, and age or condition of the patient. In consequence, the patient's prognosis is closely related to the sphincter damage sustained.

In general, and according to international criteria, when the lesions are 'not severe', direct primary reconstruction is usually the best choice, whereas if there are major lesions of the rectum and the sphincters reconstruction should be postponed. In fact, when the anal sphincter is completely destroyed, and there is tessutal loss, creation of a colostomy is the most suitable means of minimizing complications, especially fecal contamination and bacterial infection. If there are lesions of the proximal (pelvic) rectum reconstruction, in some cases with fecal diversion, should be performed by laparotomy. A Hartmann's procedure may even be needed in cases of severe intraperitoneal lesions. The rule that direct primary repair should always be attempted, to favour wound healing lessen contamination from perirectal fat, and prevent stenosis, holds good. Moreover, a colostomy should be fashioned only if the wound is complex and involves extensive damage to the rectal walls, and if healing by second intention is planned. Adequate parenteral alimentation and specific antibiotic therapy must also be administered ¹.

Regarding the cases of rectal bleeding due to fistula, the treatment plan for complex lesions of the anorectum and sphincter involved anorectal reconstruction and anoplasty 'à la demande' in one operation. In this way direct

suturing of each layer with absorbable sutures, and plastifying the layers (from the mucosa and muscularis propria of the rectum to the levator ani muscles and sphincter muscle, and on to the anal mucosa and the subcutaneous and cutaneous layers of the perineum).

However, in the second case, in which laparotomy was required after 36 hours, treatment was conservative to start with due to the initial lack of clinical data blood test results and radiological data indicating involvement of the proximal rectum, and the aim of the surgical strategy adopted was control of the hemorrhage and direct repair of the lesions, careful clinical monitoring of the patient, and appropriate medical therapy (a solid-free diet, antibiotic therapy, and parenteral nutrition). Since this was 'chronically traumatized' tissue it was not possible to rule out unrecognized lesions of the upper rectum, a hematoma or a discontinuity of the rectal wall.

Rectosigmoidoscopy is of no benefit (also possible iatrogenic perforation) and these unrecognized lesions are often responsible, for rupture of the rectum 'in 2 phases' as in our patient.

Conclusions

Based on clinical experience and the data reported in the literature regarding penetrating trauma, gunshot wounds to the abdomen may necessitate early explorative laparotomy due to the high probability that there are associated lesions, whereas abdominal wounds made by sharp objects can be managed conservatively in selected cases since the incidence of associated lesions is lower. As regards surgical decision making, laparotomy is indicated in cases of hemodynamic instability (hemorrhage), evisceration, and peritonitis, that is, for exploration of thoracoabdominal wounds, even those in the upper quadrants. In cases of penetrating wounds of the anterior abdominal wall, laparotomy is indicated if there is peritoneal violation, and significant intraperitoneal injury. When there are actively bleeding wounds of the abdominal muscles, laparotomy, even if minimal, is indispensable for controlling hemorrhage, just as abdominal wall reconstruction is necessary to avoid the risk of herniation.

We agree with those authors who state that selective conservative treatment should be carefully reserved for asymptomatic patients who are hemodynamically stable. There is actually more agreement in the literature regarding treatment of wounds made by sharp objects than regarding treatment of gunshot wounds.

There is still debate about the indications for performing laparoscopy in asymptomatic patients with penetrating trauma, especially trauma to the anterior abdominal wall. Active clinical observation is a more widely adopted approach than 'when in doubt explore'.

The advantages of the laparoscopy observation are accurate diagnosis and treatment in up to 80% of cases, iden-

tification of diaphragmatic lesions, a shorter hospital stay and lower costs, reduction the laparotomies and the associated morbidity (laparocèle, occlusion, respiratory complications). Like laparoscopy, conservative treatment reduces the complication rate, shortens patients hospital stay and therefore reduces costs, but more controller studies on this subject are needed.

Penetrating perineal and anorectal trauma requires rapid surgical management, which is the gold standard for treatment. This shortens wound healing and recovery time. Moreover, mortality and morbidity rates are drastically reduced by antiseptic measures, antibiotic therapy, and parenteral nutrition, as well as the use of the latest, most innovative, surgical techniques.

Riassunto

SCOPO: Gli Autori hanno analizzato una loro recente casistica di ferite traumatiche penetranti toraco-addominali e perineo - anorettali, descrivendo gli aspetti principali, quali la causa dell'evento traumatico e il tipo di lesione, con i principi operativi, e riportando l'incidenza di complicanze e i risultati a distanza.

MATERIALI E METODI: Negli ultimi 24 mesi sono stati considerati 13 casi consecutivi di ferite vulneranti toraco - addominali (7 casi da arma bianca, di cui 4 casi con eviscerazione, 1 caso da arma da fuoco) e perineali - anorettali (4 casi da impalamento) provocate da trauma violento; è stato compreso anche un caso particolare di sgozzamento. Una procedura chirurgica in urgenza si è resa necessaria per tutti i pazienti.

RISULTATI: Nei 7 casi di ferita penetrante toraco - addominale da arma bianca è stato riscontrato emoperitoneo provocato sia da lacerazione attivamente sanguinante del ventre muscolare parietale (3 casi), sia da lesione vascolare omentale (1 caso), sia da lesione vascolare cavale (1 caso), sia da lesione epatica (2 casi); in 4 casi di ferita da pugnale vi è stata l'eviscerazione della componente omentale. In 2 casi è stata eseguita la laparoscopia. In 1 caso la laparotomia è stata associata alla toracosopia. Nel caso della ferita addomino - perineale da arma da fuoco, l'esplorazione si è dimostrata extraperitoneale. I 4 casi di trauma perineale e anorettale da impalamento sono stati trattati con una ricostruzione diretta delle lesioni, mentre in 1 caso è stato necessario associare la laparotomia differita per eseguire una rafia del retto anteriore e la colostomia temporanea (perforazione da rottura 'in 2 tempi' del retto). Nel caso di trauma complesso ano - rettale con lesione sfinteriale, la riabilitazione ha consentito la graduale ripresa della continenza fecale, mentre nel paziente portatore di colostomia è in programma un follow up a 2 mesi per pianificare la chiusura dell'ano praeter.

CONCLUSIONI: Sulla base dell'esperienza clinica e dai dati della letteratura, il decision making chirurgico impone la laparotomia nei casi di instabilità emodinamica, di evi-

scerazione e di peritonite, ovvero l'esplorazione delle ferite toraco – addominali, anche localizzate ai quadranti superiori; nelle ferite della parete addominale anteriore, la laparotomia è indicata in presenza della violazione del peritoneo e di un danno significativo intraperitoneale. Le ferite attivamente sanguinanti della muscolatura addominale necessitano di una laparotomia, seppur di minima, per il controllo dell'emorragia, e di una parietoplastica per evitare erniazioni. Nelle ferite penetranti dell'addome anteriore, in assenza di sintomi, le indicazioni ad una laparoscopia diagnostica rappresentano un argomento ancora dibattuto, propendendo più per una osservazione clinica attiva. Il trattamento conservativo 'selettivo' dovrebbe essere cautamente riservato ai pazienti asintomatici e con un quadro clinico di stabilità emodinamica. In termini di guarigione, il trattamento chirurgico precoce rappresenta il gold standard dei traumi, anche complessi, del perineo - ano retto.

References

1. Crossingham G: *Traumatic injuries to the rectum*. Trauma Grapevine, 2001; 3:11-12.
2. Merlino JR, Reynolds HL: *Management of rectal injuries*. Sem Colon Rectal Surg, 2004; 15:70-79.
3. Biffl WL, Moore EE: *Management guidelines for penetrating abdominal trauma*. Current Opinion in Critical Care, 2010; 16:609-17.
4. Levine JH, Longo WE, Pruitt C, Mazuski JE, Shapiro MJ, Durham RM: *Management of selected rectal injuries by primary repair*. Am J Surg, 1996; 172:575-79.
5. Nordenholz KE, Rubin MA, Gularte GG, Lian HK: *Ultrasound in the evaluation and management of blunt abdominal trauma*. Ann of Emerg Med, 1997; 29:357-60.
6. Udobi KF, Rodriguez A, Chiu WC: *Role of ultrasonography in penetrating abdominal trauma: A prospective clinical study*. J Trauma 2001; 50:475-79.
7. Moore EE, Marx JA: *Penetrating abdominal wounds: Rationale for exploratory laparotomy*. J Am Med Assoc, 1985; 253:2705-08.
8. Topgul K, Kucukel F, Demir A, Sari S: *Diagnostic laparoscopy decreases the rate of unnecessary laparotomies and reduces hospital costs in trauma patients*. J of Laparoendosc & Advanced Surg Techniques, 2001; 11:201-11.
9. Miles EJ, Dunn E, Howard D, Mangram A: *The role of laparoscopy in penetrating abdominal trauma*. J of Laparoendosc & Advanced Surg Techniques, 2000; 10:41-45.
10. Marks JM, Youngelman DF, Berk T: *Cost analysis of diagnostic laparoscopy vs laparotomy in the evaluation of penetrating abdominal trauma*. Surg Endosc, 1997; 11:272-76.
11. Chol YB, Lim KS: *Therapeutic laparoscopy for abdominal trauma*. Surg Endosc, 2003; 17:421-27.
12. Simon RJ, Rabin J, Kuhls D: *Impact of increased use of laparoscopy on negative laparotomy rates after penetrating trauma*. J of Trauma Injury Infection & Critical Care 2002; 53:297-302.
13. Weinberg JA, Magnotti LJ, Edwards NM, Claridge JA, Minard G, Fabian TC, Croce MA: *Awake laparoscopy for the evaluation of equivocal penetrating abdominal wounds*. Injury, 2007; 38:60-64.
14. Hashemzadeh S, Pourzand A, Fakhree M, Bassir A, Golmohammadi H, Daryani A: *Nonoperative management of anterior thoracoabdominal stab wounds in selected patients*. Europ J of Emerg Med 2011 - Lippincott Williams & Wilkins, Inc.
15. Shanmuganathan K, Mirvis SE, Chiu WC: *Penetrating torso trauma: triple contrast helical CT in peritoneal violation and organ injury: A prospective study in 200 patients*. Radiol, 2004; 231:775-84.
16. Addante LM, Angelillo V, Procacci V, De Ruvo P, Tentarelli M: *Gli attuali percorsi diagnostici nelle lesioni traumatiche dell'addome*. www.tuttosanita.it.