

Surgical treatment of ano-rectal gunshot injuries caused by low-velocity bullets

Küçük çaplı kurşunun yol açtığı anorektal yaralanmaların cerrahi tedavisi

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BACKGROUND

The aim of the study was to evaluate the results of treatment for ano-rectal gunshot injuries in civilian population, caused by low-velocity bullets.

METHODS

Nine patients with ano-rectal gunshot injuries were admitted to the emergency department. All the patients were males, with a mean age of 23 years (range 20 to 37 years) and presented within the first two hours following injury. Complete physical and abdominal examinations were performed and injury severity scores (ISS) were calculated. Injuries were evaluated by rectosigmoidoscopy in the operating room. Seven patients had associated tissue or organ injuries including bladder disruption, pelvic bone fractures, and wide muscular defects. Surgical procedures included a diverting ostomy, irrigation of distal rectum, presacral drainage (6 patients), and retrorectal drainage through the abdomen (3 patients). Antibiotic prophylaxis was routinely administered. Control examinations were made at the end of the second month.

RESULTS

Seven patients had rectal blood discharge on admission. The mean ISS score was 7.3 ± 3.7 , with only one patient having an ISS of 15. Early postoperative complications were urinary infection in three patients, wound dehiscence in five patients, and osteomyelitis in one patient. Anal continence was not adversely influenced after surgery.

CONCLUSION

Our results suggest that a diverting ostomy, distal rectal irrigation, and presacral drainage yields favorable outcome in patients with ano-rectal gunshot injuries.

Key Words: Anus; colostomy; rectum; wounds, gunshot.

AMAÇ

Bu çalışmada, normal kişilerde küçük çaplı kurşunun neden olduğu anorektal yaralanmalarda uyguladığımız tedavi yöntemleri ve sonuçları değerlendirildi.

GEREÇ VE YÖNTEM

Çalışmada, küçük çaplı kurşunun yol açtığı anorektal yaralanma nedeniyle tedavi edilen dokuz erkek hasta (ort. yaş 23; dağılım 20-37) değerlendirildi. Acil servise başvuru tüm hastalarda yaralanmadan sonra ilk iki saat içinde yapılmıştı. Hastalar, tam fizik muayene yapıldıktan sonra yaralanma şiddeti skoru (ISS) ile değerlendirildi. Ameliyat öncesinde her hastaya rektosigmoidoskopi yapıldı. Yedi hastada mesane perforasyonu, pelvis kemik kırığı, geniş musküler defekt gibi ek doku ve organ yaralanmaları görüldü. Cerrahi tedavi olarak ostomi, distal rektumun irigasyonu, presakral drenaj (6 hasta) ve rektorektal drenaj (3 hasta) uygulandı. Tedavi boyunca geniş spektrumlu antibiyotikler ile antibiyotik profilaksisi uygulandı. Ameliyatın ikinci ayı sonunda hastaların kontrol muayeneleri yapıldı.

BULGULAR

Başvuru sırasında yedi hastada rektal kanama görüldü. Ortalama ISS skoru 7.3 ± 3.7 bulundu; bir hastada skor 15 idi. Ameliyatın erken dönem komplikasyonları olarak üç hastada üriner enfeksiyon, beş hastada yara yeri enfeksiyonu, bir hastada osteomyelit saptandı. Kontrollerde cerrahi girişimlerin anal kontinansı olumsuz yönde etkilemediği görüldü.

SONUÇ

Sonuçlarımız ostomi, distal rektum irigasyonu ve presakral drenaj ile tedavinin küçük çaplı kurşunun yol açtığı anorektal yaralanmalarda başarılı sonuç verdiğini göstermektedir.

Anahtar Sözcükler: Anus; kolostomi; rektum; yaralanma, ateşli silah.

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During World War I, mortality from rectal gunshot injuries was high up to 50%.^[1,2] After this period, the surgeon working in the field of trauma started performing diverting ostomies, which decreased mortality to 30% with the use of antibiotics. In the Vietnam conflict, many soldiers with rectal injury were treated by diverting colostomy, distal rectal washout, and presacral drainage, which were associated with a mortality rate of 14%.^[3-5] However, in civilian practice, ano-rectal gunshot injuries are rare and the treatment approaches are mainly based on the procedures used on the battlefield. There is no consensus on the treatment of civilian ano-rectal injuries.^[5,6] Diverting ostomy, cleaning distal rectum with warm saline solution, and the use of broad-spectrum antibiotics seem to be appropriate in this type of injuries. However, presacral drainage and distal rectal washout have come under scrutiny with regard to their effectiveness in reducing infectious complications.^[5-10]

The purpose of this study was to evaluate treatment approaches to traumatic injuries caused by low-velocity projectiles in civilian practice.

MATERIALS AND METHODS

From 1997 to 2002, nine patients were admitted to our department for ano-rectal gunshot injuries. All were males, with a mean age of 23 years (range 20 to 37 years). All the patients presented within the first two hours following injury.

In the emergency room, the trajectory of the gunshot was carefully evaluated. Rectal digital examination was performed for each patient, without any other anal or rectal instrumentation. Seven patients were found to have rectal blood discharge. The injury severity score (ISS) for each patient was calculated. On admission, two patients had a systolic blood pressure less than 90 mmHg. Plain radiography, cystography, computed tomography (CT), and abdominal ultrasonography (US) were used to evaluate the abdominal space. In the operating room, each patient underwent rigid rectosigmoidoscopy under general anesthesia. Explorative laparotomy was performed via a midline incision. Six patients exhibited near-normal abdominal findings, with less than 100 ml fluid in the abdomen. Care was given to the evaluation of the trajectory in the rectum, bladder, ileum, and the other adjacent vascular organs in

the pelvic space. There was no disruption to the major vascular structures in the pelvic region. A sigmoid loop colostomy was carried out for each patient, during which the distal part of the rectum was irrigated by 7-8 liters of warm saline. No further attempts were made to repair the rectal wall unless dissection showed disruption to other extraperitoneal structures or vascular bleeding. Three patients had retrorectal drainage through the abdomen. Presacral drainage was employed in six patients, after a curvilinear incision in the anococcygeal raphe. The presacral space was entered digitally and a closed suctioning tube was placed. The tube was left for five days and irrigated by sterile saline two times daily. Antibiotic prophylaxis was routinely administered and continued based on the clinical findings. Control examinations were made at the end of the second month. After stomas were restored, all patients were administered a quality-of-life questionnaire (QLQ-C30 adapted from EORTC, the European Organization for Research and Treatment of Cancer).^[11]

RESULTS

The mean ISS score was 7.3 ± 3.7 , with only one patient with an ISS of 15 (Table 1). Two patients had a systolic blood pressure less than 90 mmHg due to bleeding from rectal vascular structures. Resuscitation was performed with a mean of 2 units of blood (range 1 to 4 units) and 1 unit (1 to 3 units) of fresh frozen plasma solutions. Seven patients had rectal bloody discharge in the emergency room. Seven patients (77.7%) had associated tissue or organ injuries such as bladder disruption, pelvic bone fractures, and wide muscular defects. Hematuria due to bladder disruption was

Table 1. Injury severity scores

Patient	Localization	Injury scale	ISS
1	Ano-rectum	3	9
2	Ano-rectum + abdomen	2	4
3	Ano-rectum + abdomen	2	8
4	Ano-rectum	3	9
5	Ano-rectum	2	4
6	Ano-rectum	2	4
7	Ano-rectum	2	4
8	Ano-rectum	3	9
9	Ano-rectum + abdomen	3	15
<i>Mean</i>			7.3 ± 3.7

detected in four patients at the operation. Ano-rectal injuries were accompanied by fragmented pelvic bone fractures in five patients, and ileal perforation in three patients (Table 2). Ileal injuries were sutured with the use of 2/0 Vicryl, followed by debridement. None of the patients had major vascular injuries. Loop colostomy and transperitoneal perirectal drainage were performed in three patients, and loop colostomy, rectal wall repair (when necessary), distal rectal irrigation with warm saline solution, and presacral drainage in six patients. Early postoperative complications were mild (Table 3). Mortality was not encountered during the follow-up.

Within postoperative three months to three years, phone interviews were conducted and the patients were invited to fill the QLQ-C30 questionnaire. General health condition was defined as good by all the patients; all reported that anal continence had not been adversely influenced after surgery.

DISCUSSION

The principals of treatment of gunshot injuries were initially derived from the experience gained on the battlefield, which was associated with a mortality rate of nearly 50% during World War I. However, since the advent of colostomy during the Vietnam conflict, morbidity and mortality rates have decreased to 14% and almost 0%, respectively.^[2,4]

When a bullet penetrates, it causes tissue disruption and perforation, and creates a cavity, which is defined as "work" of the projectile in the body. This work, quantified by joule, represents an available kinetic energy that is transferred to each centimeter of any organ through which the bullet travels. It may be much larger than 1500 joules for high velocity bullets from a rifle. In civilian practice, however, gunshot injuries are generally caused by low-velocity bullets from a firearm. Due to its transferred energy of less than 500 joules, the effect of a bullet is less, resulting in a smaller temporary cavity, disruption, and laceration in the tissues.

On the other hand, a low-velocity bullet on its way, sucks many pieces of materials like cloth, soil, dust, and bone fragments into adjacent tissues, which are all a source of infection.^[8,12,13]

Table 2. Distribution of associated injuries

Injury	No.	%
Rectal bloody discharge	7	77.8
Bladder injury with hematuria	4	44.4
Ileal perforation	3	33.3
Pelvic bone fractures	5	55.6

Table 3. Distribution of complications

Complication	No.	%
Abdominal wound infection and dehiscence	5	55.6
Urinary infection	3	33.3
Osteomyelitis	1	11

Many studies reported improved results following civilian ano-rectal injuries treated by surgical procedures consisting of a diverting colostomy, distal rectal cleaning, presacral drainage, and antibiotic administration. Rectal wall repair was also performed when the laceration of the rectum was easy to reach. The most accepted stage of treatment is proximal diverting colostomy. The type of colostomy maybe at the discretion of the the surgeon; but loop colostomy can divert feces almost completely, which has been advocated in several studies.^[3,5,6,14,15] We performed loop colostomy in all the patients and noted that, with an easy reconstruction, it enabled an almost complete diverting of the bowel stream.

Several authors performed primary repair of wall penetration with debridement and drainage of the gunshot wound as the main treatment of colorectal injuries with low complications.^[16-18] In our series, unless it was necessary, we did not attempt for any further dissections to repair penetrations on the rectal wall.

Distal rectal cleaning with warm saline is a matter of debate in ano-rectal injuries. It has been associated with significantly lower incidence of abdominal abscess^[3] and decreased bacterial colonization.^[14,19] In addition, it has been recommended to prevent the lavage fluid from extravasating into the perirectal tissues and causing contamination, thereby reducing septic morbidity following civilian rectal trauma.^[20] In our limited series, we performed distal rectal irrigation with 7-8 liters of warm saline

via loop colostomy after anal canal dilatation. Irrigation had been maintained until the fluid from the anal canal became almost clear. We believe that mechanical cleaning also allows to get rid of any unwanted particles that might have entered into adjacent tissues following the trajectory of the bullet. We encountered no perirectal infections, pelvic sepsis, or fistula formation during the follow-up period.

The use of presacral drainage in ano-rectal traumas is based on small retrospective series of injuries that occurred in the Vietnam conflict. However, it is questioned whether presacral drainage is necessary for injuries seen in civilian practice on the grounds that low-velocity bullets do not induce severe tissue destruction.^[5,21,22]

Bearing in mind that even low-velocity bullets may be associated with the entrance of many foreign particles through their trajectory,^[23] we performed presacral drainage and intraperitoneal perirectal drainage without any complications.

Injuries to the genitourinary tract, particularly the bladder, and to the posterior urethra usually accompany ano-rectal injuries.^[24-26] At the operation, we identified bladder wall perforations, with hematuria as the initial sign in four patients and repaired them by a two-layer primary closure. No leakage or other genitourinary tract complications were detected other than postoperative urinary infection in three patients. No major complications were seen, but osteomyelitis in one patient. In addition, five patients developed abdominal wound infection and dehiscence. The QLQ-C30 questionnaire administered to the patients showed that their health condition was good, with almost normal anal functions.

Despite the small size of this series, our results seem to justify the treatment approach consisting of diverting colostomy, distal rectal irrigation, and presacral drainage in patients with ano-rectal gunshot injuries.

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