

Case Report

Survival abdominal gunshot injury: a rare case

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ABSTRACT

A 55 years old male patient came to the casualty of a medical college and hospital with alleged history of assault with firearm injury on his back. Patient was conscious with GCS 15/15, his pulse rate was 133 beats per min, blood pressure was 100/60 mmHg, SpO₂ was 95% and pallor was present. On local examination there was single entry wound at lower back on left side of size 1 cm X 1 cm with no exit wound. Generalized abdominal tenderness and guarding was present. Patient was immediately resuscitated. Blood grouping, cross match were sent immediately. Abdominal radiograph did not show any gas under the diaphragm but a foreign body (a bullet) was seen. Ultrasonography and computerized tomography scan of the abdomen was suggestive of hemoperitonium and a foreign body bullet in abdomen. Exploratory laparotomy showed moderate hemoperitonium of about 1000 ml which was sucked out completely. Evidence of retroperitoneal rent of size approximately 1 cm X 1 cm seen with oozing through it which was closed in layers. A bullet was seen in the anterior abdominal wall but skin was intact. Five jejunal perforations distal to 20 cm from the duodenojejunal flexure were seen and the bullet was removed from the anterior abdominal wall. Resection of the jejunal segment with jejunio-jejunal anastomosis was done. Jejunal mesenteric rents were closed. Abdominal wall closed in layers. Post-operative recovery was uneventful. Patient was discharged on the 10th post-operative day. Early diagnosis and treatment in the golden hours can save the life of the patients. A mass education on the dangers of these guns and the harm they can cause as well as legal regulations for their restricted use seem to be necessary.

Keywords: Bullet, Gunshot Injury, Jejunostomy, Laparotomy

INTRODUCTION

A previous study was taken up with the objective of reporting the pattern and incidence of fatal firearm injuries in Delhi and comparing it with the pattern seen in other countries. One hundred and seven firearm fatalities autopsied during the last 6 years were studied. 46.7% victims were aged between 20 and 30 years and 90.7% were males; similar findings were seen in other countries. 92.6% were victims of homicidal attacks, 6.5% suicidal and 0.9% accidental. This is in sharp contrast to the

pattern in other countries where suicides were the predominant group and homicides accounted for a small number of cases.

A high presence of illegal country made guns was an explanation for this trend. Single firings were the norm. Chest (39%) and head (29.6%) were the two most common entry sites for the bullets, a pattern somewhat similar to that of other countries. Survival time, cause of death and recovery of projectiles was also studied.

In the past abdominal gunshot wounds often mandated exploratory laparotomy, but with the advent of newer diagnostic and therapeutic modalities, and the ability for noninvasive critical care monitoring, fewer patients cross the operating room threshold. We discuss the evaluation and management of abdominal gunshot wounds.

CASE REPORT

A 55 yrs old patient came to the casualty of a Medical College and Hospital with alleged history of assault with firearm injury at around 10 am on his back while he was riding bike. Patient was rushed to the hospital by people around the accident site. Patient was conscious with GCS 15/15. His PR 133/min, BP was 100/60 mmHg, SpO2 95% and pallor present.



Figure 1: Entry wound.

On local examination there was single entry wound (Figure 1) at lower back on left side of size 1 cm X 1 cm

and there was no exit wound. Generalised abdominal tenderness and guarding was present.

Patient was immediately resuscitated. Blood grouping, cross match were sent immediately. X-RAY Abdomen (Figure 2a and b) did not showed gas under diaphragm but a foreign body (BULLET) was seen.



Figure 2: a) Opacity seen above sacrum; b) Opacity seen in the anterior abdominal wall.

Ultrasonography was done suggested moderate hemoperitoneum. Patient was shifted for Computerised Tomography abdomen which was suggestive hemoperitonium and a foreign body bullet. The bullet was visible at the anterior abdominal wall in the muscle layer. Patient then shifted immediately to emergency operation theatre for exploratory laparotomy.

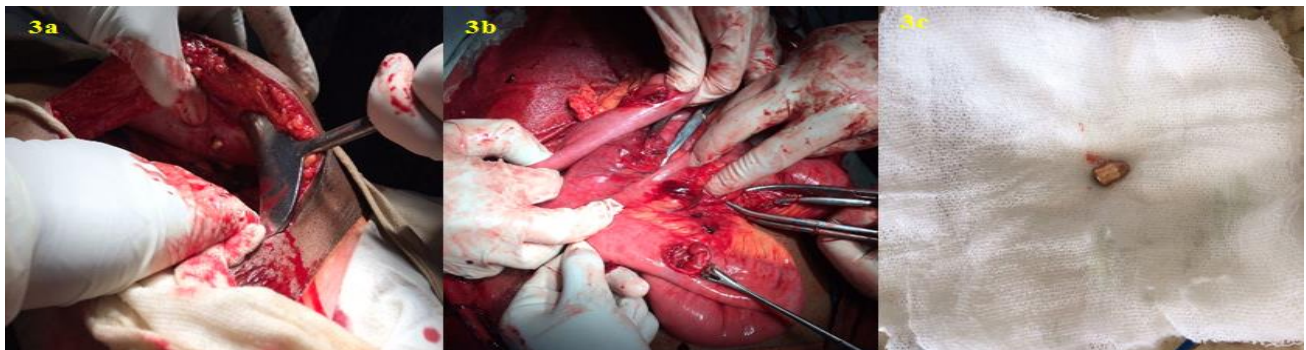


Figure 3: a) Bullet in ant. abd. wall; b) Multiple jejunal; c) Removed bullet.

Abdomen was opened by mid midline laparotomy incision, moderate hemoperitoneum seen about 1000 ml sucked completely. Evidence of retroperitoneal rent of size approx 1 cm X 1 cm seen with oozing through it which was closed in layers. A bullet seen in anterior abdominal wall (Figure 3a), skin was intact. Evidence of

five jejunal perforations (Figure 3b) were seen of sizes 3cm X 3cm, 3cm X 3cm, 3cm X 3cm, 2cm X 2cm and 1cm X 1cm in 40 cms segment of jejunum distal to 20 cm from DJ-flexure with multiple rents in underlying mesentery with active bleed.

Bullet removed (Figure 3c) from the anterior abdominal wall and the rent was closed in layers. Peritoneal wash was given. Resection of jejunal segment with jejuno-jejunal anastomosis with vicryl 2-0 done. Jejunal mesenteric rents were closed with Vicryl 2-0 suture. A feeding jejunostomy was done 10 cm distal to anastomosis. Rest of the abdominal contents were examined and found normal. Two abdominal drains were kept. Abdominal wall closed in layers. Sterile dressing done. Antibiotics Ceftriaxone 1 gm I.V, Metrogl 100 ml I.V were given intra-operatively and continued post-operatively. Two units of blood transfusion was given. Patient went through the procedure well and post-operatively was uneventful. Patient was kept nil by mouth for 7 days, jejunal feeding started on 7th post-operative day and the patient was discharged on the 10th post operative day.

DISCUSSION

The present study is conducted at Medical College and Hospital in Central India. The pathophysiology is as follows:

Mechanism of injury

The gunshot wounds sustained on the battlefield caused by military ammunition can be different in nature to those usually encountered in the civilian setting. The main difference is that military ammunition has typically higher velocity with therefore greater kinetic energy and consequently potential to destroy tissue. The surgical priorities in the management of gunshot wounds are hemorrhage control, preventing infection, and reconstruction as reported by authors.²⁻⁵

Energy transfer into extremity wounds

The amount of work or damage inflicted on tissues depends on the amount of kinetic energy possessed by the bullet when it strikes the body and the amount possessed when, and if, it exits the body. Kinetic energy (KE) is given by the following equation.⁵ $KE = mv^2/2$ (where m =mass, v =velocity). Since the mass of the bullet is a constant, its deceleration as it travels through the body dictates the amount of KE transferred. Two principle factors affect the rate at which a bullet is decelerated:

- The type of tissue the bullet is passing through
- The surface area of the bullet presented to the tissue

In simple terms, the bullet will transfer the least energy if it does not deform, fragment, tumble, or strike bone. Tumbling, fragmentation, or deformation (sometime called Bexpansion due to the increase in the surface area presented by the bullet) increases the drag on the bullet, slowing it, and increasing the transfer of energy. A similar effect occurs when the bullet strikes bone after traversing soft tissue.

The wounding effect of bullets can be divided into two types (Figures 4a and b).⁵

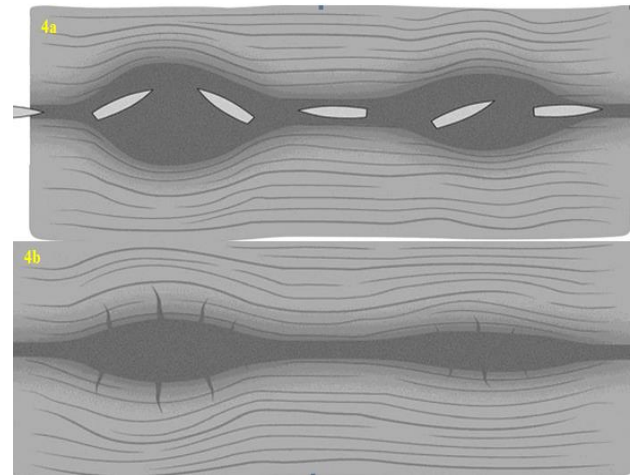


Figure 4 a and 4b: Schematic showing formation of tract of permanent cavity and temporary cavity with tensile damage to tissue due to the effect of stretching of tissue due to cavitation. © Surg Lt Cdr J Penn-Barwell.

A permanent cavity The formation of a wound tract by the direct cutting and shearing effect of the bullet forcing its way through tissue, i.e., the same wound that would be produced by a spear or arrow of the same diameter travelling through the body, a temporary cavity or cavitation. These results from the turbulent flow created in the wake of the bullet and produce an expanding bubble of low-pressure vapor that rapidly collapses back on itself.

Skin and muscle

These tissues are relatively elastic and therefore tolerate the temporary stretching effect of cavitation relatively well with limited tissue necrosis. Functionally, injuries to these tissues are also well tolerated.

Neurovascular structures

Nerves and vessels are often relatively fixed anatomically and therefore are vulnerable to the temporary distorting effect of cavitation.

Bone

The unique strength of this tissue means that it exerts a significant retarding effect on projectiles that strike it. This results in considerable energy transfer, often with extensive fragmentation of both bone and bullet.

Surgical management

The treatment of battlefield gunshot extremity wounds involves a hierarchy of surgical priorities: i) Control of

hemorrhage ii) Prevention and treatment of infection iii) Reconstruction. These priorities are addressed in three distinct phases-immediate care, damage control, and definitive surgery.

Another study was taken up with the objective of reporting the pattern and incidence of fatal firearm injuries in Delhi and comparing it with the pattern seen in other countries. One hundred and seven firearm fatalities autopsied during the last 6 years were studied. 46.7% victims were aged between 20 and 30 years and 90.7% were males; similar findings were seen in other countries. 92.6% were victims of homicidal attacks, 6.5% suicidal and 0.9% accidental. This is in sharp contrast to the pattern in other countries where suicides were the predominant group and homicides accounted for a small number of cases. A high presence of illegal country made guns was an explanation for this trend. Single firings were the norm. Chest (39%) and head (29.6%) were the two most common entry sites for the bullets, a pattern somewhat similar to that of other countries. Survival time, cause of death and recovery of projectiles was also studied.

With the advent of the use of computed tomography (CT) has changed substantially the approach to, and the treatment of, these patients, independent of the kind - blunt or penetrating, and the site of trauma - thoracic, cranial, abdominal or skeletal muscle. The preoperative diagnosis, provided by CT, allows a planned and safer approach, favoring the use of new therapeutic options for certain injuries. The non-operative management of solids abdominal organs due to blunt trauma is an excellent example of this change. The creation and use of well-designed and defined protocols shows that this approach is safe and reliable. However, even with the progress of diagnostic imaging, there are still doubts on the approach and handling of patients with penetrating abdominal or thoracoabdominal trauma. The approach to patients suffering abdominal stab wounds must be different from that for victims of gunshot wounds as reported by the author.⁶ In abdominal trauma from stab wounds the selective treatment has been used, that is, surgery is performed on patients with signs of intra-abdominal injury, namely: evisceration, presence of hemodynamic instability, peritonitis or gastrointestinal bleeding. In GSW the possibility of intra-abdominal injuries is high and the necessity of surgical treatment is the rule. However, the selective approach, choosing not to operate on patients with GSW abdominal or right thoracoabdominal, has been proposed by some authors.¹⁻³ To perform this type of treatment, the hospital must be prepared, equipped with human and material resources and have a well-defined protocol and the necessary infrastructure. However it is interesting to note that, to perform non operative management safely, it is more important that the institution be well equipped and have a team experienced in treating trauma patients than having a high volume of attended patients.

There is growing evidence that non-operative treatment of abdominal injuries of abdominal solids organs by NOM is feasible and safe. Around a third of all abdominal trauma or thoracoabdominal GSW can be approached non-operatively.^{2-4,6} To perform NOM for right thoracoabdominal GSW it is necessary to check the exact location(s) of perforation(s), conduct a thorough clinical evaluation with special attention to the hemodynamic condition and examination of the abdomen and have a detailed imaging study of the trajectory of the projectile. Another advantage of this approach is to allow less invasive techniques (endovascular, endoscopic and percutaneous) to be used in the treatment of injuries to the solids organs and their complications.⁹⁻¹¹ Como et al made the following recommendations based on a level of evidence: a routine laparotomy is contraindicated in hemodynamically stable patients with abdominal injury GSW if the same were tangential and the patient had no signs of peritonitis (level 2); patients with isolated penetrating injuries in the right thoracoabdominal region can be treated without a laparotomy in the presence of stable vital signs, a reliable physical examination and with no or minimal abdominal pain (levels 2 and 3).¹² The authors conclude the study by saying that NOM for penetrating injury trauma of solids organs (liver and kidney) require further studies. The data presented here corroborate, once again, the safety in performing NOM in selected cases of right thoracoabdominal.

CONCLUSION

Early diagnosis and treatment in the golden hours can save the life of the patients. A mass education on the dangers of these guns and the harm they can cause as well as legal regulations for their restricted use seem to be necessary.

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REFERENCES

1. Kohli Anil, Agrawal NK. Firearm Fatalities in Delhi, India. *Legal Med.* 2006;8(5):264-8.
2. Feliciano DV, Burch JM, Spjut-Patrinely VI, Mattox KL, Jordan Jr GL. Abdominal gunshot wounds. An urban trauma center's experience with 300 consecutive patients. *Ann Surg.* 1988 Sep;208(3):362-70.
3. Feliciano DV. Abdominal trauma. Maingot's abdominal operations. 1989;1:457-512.
4. Nassoura Z, Hajj H, Dajani O, Jabbour NI, Ismail MO, Tarazi TO, et al. Trauma management in a war zone: the Lebanese war experience. *J Trauma.* 1991 Dec;31(12):1596-9.
5. Penn-Barwell JG, Brown KV, Fries CA. High velocity gunshot injuries to the extremities: management on and off the battlefield. *Curr Rev Musculoskelet Med.* 2015 Sep;8(3):312-7.

6. Muckart DJ, Abdool-Carrim AT, King B. Selective conservative management of abdominal gunshot wounds; a prospective study. *Br J Surg.* 1990 Jun;77(6):652-5.
7. Zinner MJ. *Maingots abdominal operations.* 10th ed. McGraw Hill Education;2001:1:763-85.
8. Rignault DP. Abdominal trauma in war. *World J Surg.* 1992;16:940-6.
9. Adesanya AA, da Rocha-Afodu JT, Ekanem EE, Afolabi IR. Factors affecting mortality and morbidity in patients with abdominal gunshot wounds. *Injury.* 2000;31:397-404.
10. Dawidson I, Milier E, Litwin MS. Gunshot wounds of the abdomen; a review of 277 cases. *Arch Surg.* 1976;111:862-5.
11. Moore EE, Moore JB, Van Duzer-Moore S, Thompson JS. Mandatory laparotomy for gunshot wounds penetrating the abdomen. *Am J Surg.* 1980;140:487-51.
12. Moore EE, Dunn EL, Moore JB, Thompson JS. Penetrating abdominal trauma index. *J Trauma.* 1981 Jun;21(6):439-45.

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