



Retained Weapon Injuries: An Unusual Presentation with a Good Prognosis

Leire Zarain Obrador*, M Dolores Pérez Díaz, Marta Cuadrado Ayuso, Alejandro Sánchez Arteaga and Fernando Turégano Fuentes

Department of General Surgery, General of Hospital General Universitario Gregorio Marañón, Spain

Abstract

Introduction: Retained weapon injuries are unusual but present a diagnostic and therapeutic challenge. The aim of this study was to review our experience in the management of these patients.

Material and Methods: Retrospective review of patients with retained weapon injuries included in our Trauma Registry during a period of 21 years.

Results: Sixteen patients with retained weapon injuries were identified, 13 men and 3 women, with a median age of 45 years (25-88). Nine weapons were in the abdomen, three in the thorax, three in the head, and one in the neck. All patients were hemodynamically stable on admission, and the mean RTS and ISS were of 11.7 and 11, respectively. Surgical approaches included 8 laparotomies, 1 laparoscopy, 1 sternotomy, 1 VATS (video-assisted thoracic surgery), 2 craniotomies, 1 posterior neck exploration, and 2 simple extractions. There was one death, not directly related to the injury, in an 82 y.o. patient with a through-and-through cardiac wound.

Conclusions: Despite their spectacular presentation most patients will be hemodynamically stable, allowing for consideration of minimally invasive techniques in selected patients. Their overall prognosis is good.

Introduction

A retained weapon injury is that in which the weapon or a part of it is partially embedded in the body [1]. Retained weapon injuries are rare but they can pose a diagnostic and therapeutic challenge, and no established protocols exist for their management [2]. The manipulation or blind removal of the weapon before a careful evaluation can cause a significant bleeding, given a theoretical plugging effect of the weapon over adjacent vessels. Since these injuries are so infrequent, most centers have a very limited experience in their management [1,3]. Our aim was to review our experience in the management of these patients, with the hypothesis that, despite their spectacular presentation, the overall prognosis is good.

Materials and Methods

Retrospective study of patients with retained weapon injuries included in our Trauma Registry from April 1994 to August 2014. We reviewed the demographics, anatomical location, diagnostic studies, trauma scores, surgical approach, and outcome. The following trauma scores were used: ISS (Injury Severity Score), RTS (Revised Trauma Score), and PATI (Penetrating Abdominal Trauma Index).

X-rays were done in all hemodynamically stable patients in order to determine the position of the weapon. When in doubt about a vital organ involvement, a CT scan or CT-angio was done. Patients with a retained weapon injury in the precordial area had also a FAST ultrasound. All patients had the weapons removed in the operating room.

Most patients were managed by the general surgeon on call. Those patients with retained weapons in the head, thorax and heart were managed by the respective specialists.

A review of published series was carried out through a PubMed search.

Results

Sixteen patients with retained weapon injuries were identified from April 1994 to August 2014, representing 4% of the stab wounds in our trauma registry. Demographic data and diagnostic tests

OPEN ACCESS

*Correspondence:

Leire Zarain Obrador, Department of General Surgery, Hospital General, Universitario Gregorio Marañón, Madrid, Spain, Tel: 34 647144355;

E-mail: leirezarainobrador@gmail.com

Received Date: 15 Oct 2016

Accepted Date: 30 Nov 2016

Published Date: 07 Dec 2016

Citation:

Obrador LZ, Dolores Pérez Díaz M, Ayuso MC, Sánchez A. Retained Weapon Injuries: An Unusual Presentation with a Good Prognosis. Clin Surg. 2016; 1: 1224.

Copyright © 2016 Obrador LZ. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Table 1: Demographic data and imaging techniques.

Gender	13M/3F
Age (median)	45 years
Mechanism:	
self-inflicted	8 (50%)
aggression	7
occupational accident	1
Location:	
abdomen	9
thorax	3
head	3
neck	1
Median RTS	11.7 ± 0.7
Median ISS	11 ± 9.3
Imaging techniques:	
X-Ray	16
CT scan	4
CT angio	1
FAST ultrasound	3

are described in Table 1. All retained weapons were visible except for one patient. Only 5 patients had an ISS > 15. All patients but one was operated on under general anesthesia.

Location of injuries, type of weapon, injury, surgical technique, and trauma scores are described in Table 2. All patients but one could be placed in a supine position on the table; the remaining patient was injured at the back of the neck and had to be intubated with fiberoptic bronchoscopy in the sitting position (Figure 1); he was then lied down in prone position. Two of the knives were embedded in bone structures – one in the spine and, the other one in the skull (Figure 2).

Table 2: Location of injuries, type of weapon, injuries, surgical technique, and trauma scores.

Localization	Weapon	Injuries	Surgical technique	RTS	ISS	PATI
Abdomen	Knife	Head of pancreas, Mesentery	Laparotomy. Hemostasis	12	16	8
Abdomen	Knife	Perforation of jejunum	Laparotomy. Suture	10	9	4
Abdomen	Knife	Right meso-ovarian and meso- ileal tears	Laparotomy. Hemostasis	12	9	3
Abdomen	Knife	Gastric and transverse colon perforations	Laparotomy. Suture	12	17	12
Abdomen	Knife	Perforation of jejunum	Laparotomy. Suture	12	10	4
Abdomen	Knife	No visceral injuries	NTL	12	4	0
Abdomen	Knife	No visceral injuries	NTL	12	4	0
Abdomen	Knife	Omentum tear	NTL	11	4	1
Abdomen	Knife	Omentum tear	Laparoscopy	12	4	1
Thorax	Scissors	Neumohorax, lung contusion	Scissors extraction	12	9	NA
Thorax	Skewer	Transcardiac injury without tamponade	Sternotomy, heart suture	12	25	NA
Thorax	Knife	Left lung laceration	VATS	12	9	NA
Head	Metal spike	SAH, right eye injury, foreign body in left brain parenchyma	Craniotomy, extraction, eye suture	11	20	NA
Head	Fragmento metálico industrial	Foreign body in brain parenchyma	Craniotomy and extraction	12	25	NA
Head	Knife	Knife in the external table of the skull	Extraction with local anesthesia	12	1	NA
Neck	Knife	Laceration of posterior cervical muscles	Hemostasis	12	8	NA

VATS: video-assisted thoracic surgery. **SAH:** subarachnoid hemorrhage. **PATI:** Penetrating Abdominal Trauma Index. **NTL:** Non Therapeutic Laparotomy. **NA:** Not Applicable

Two patients developed surgical complications: a deep wound infection (after gastric and transverse colon injury), and an early postoperative bleeding after a pancreatic injury that needed surgery, packing and laparotomy. Only one patient died; he was an 82 year old male with dementia and a self-inflicted cardiac wound by means of a skewer. The heart was sutured through a sternotomy and he recovered well initially but ultimately died from a bilateral pneumonia 20 days after surgery.

Eight patients were lost to follow up. Two patients had late sequelae: the one with the neck wound had a suprascapular nerve injury causing persistent weakness on abduction of the upper limb; the patient injured in his brain and eye suffers from headaches and slow speech.

Discussion

Retained weapon injuries are not frequent and most centers have a very limited experience in their management [3]. We only found two published series, a very recent one with 102 cases [1] that proposes a management algorithm, and another one with 33 patients [3], both from South Africa; the rest of publications consist of case reports.

The evaluation of the patient must follow ATLS principles, and the assessment of the location and depth of the weapon can make us suspect possible visceral lesions [1]. The transfer of the patient by the EMS must be careful, with immobilization of the weapon in order to prevent further damage [4].

Around 90%-95% of patients were hemodynamically stable in the two published series, and 100% in our series; this allows for imaging techniques before the extraction of the weapon. A simple X-Ray in two projections was performed in all our patients, and further imaging was only done in doubtful cases. In some cases a CT scan can be of help in establishing possible injuries and anticipating bleeding upon extraction of the weapon [1,3,5].



Figure 1: Intubation with fibrobronchoscopy in a patient with a posterior cervical retained weapon injury.



Figure 3: Retained weapon injury in left hemithorax, which moved with the heart beats.



Figure 2: Skull retained weapon injury.

Retained weapon injuries in the neck and thorax have a higher risk of bleeding upon extraction of the weapon, in view of the possible damage to the heart and blood vessels nearby [5]. An initial CT-angio is advocated by some groups [3], whereas others prefer a simple CT scan, leaving the CT-angio only for cases without “scattering” and when it is considered that it can provide useful additional information. They argue that the distortion effect caused by the weapon is unpredictable, and that it would be convenient to avoid the unnecessary administration of intravenous contrast, in case the patient needs an interventional radiology procedure [1,6].

In the rare case of hemodynamic instability the patient should go directly to the operating room. Nevertheless, hemodynamic stability should not make us underestimate the possible presence of vascular lesions due to the occasional “plugging” effect of the weapon [7]; this is why surgical extraction under direct vision is always required. In our patient with a heart injury caused by a skewer there was no cardiac tamponade, probably because of the small cross section of the occluding weapon.

It is remarkable that in some series simple extraction of the weapon was enough in 50% of cases [3], whereas in our series it was only possible in 2 cases (12.5%). Some locations are very rare but can be life-threatening or can seriously damage organs; transorbital lesions could be an example, of which we only had one case [8,9].

The use of minimally invasive techniques in selected patients can prevent unnecessary laparotomies or thoracotomies. The low incidence of this approach in our series is partly due to the fact that a majority of cases belong to a period prior to the introduction of

these techniques in the management of trauma. Our first laparoscopy performed for a retained weapon injury was in 2012, although other laparoscopic approaches had already been performed for penetrating injuries in our centre; however, we believe there may be a concern, at least theoretical, with the possible effects of the creation of pneumoperitoneum in a patient with a retained weapon, in terms of distortion of the anatomy of the injuries. The only patient of our series who underwent VATS had a knife which moved with the heart beats (Figure 3). VATS allowed for the assessment of the integrity of the pericardium and identification of a lung laceration which was repaired with an endostapler. In experienced trauma centers this surgical approach is considered a diagnostic and therapeutic tool for the extraction of the weapon and the assessment of lung, diaphragmatic and pericardic injuries. An endovascular approach can be useful in some cranial lesions [3,10-12].

Retained weapons in the back can pose an anesthetic challenge because of the impossibility of managing them in the supine position, as shown in one of our cases; In some of these complex cases some authors have described the “double table technique”, placing two parallel operating room tables with a space between them, so that the patient can be placed supine, and the object remains in the space between the two tables [3,13,14].

Half of our patients had a history of psychiatric disorder, and the injuries were self-inflicted; in seven there was an aggression, and the other had an occupational accident [15]. This differs from the literature, where most injuries are due to accidental falls over different objects or to motor vehicle collisions, or also to aggressions [16,17].

The main limitation of this study is the small number of patients, although we believe it is the third largest published.

Conclusion

Penetrating injuries with a retained weapon are infrequent in our environment, they are usually self-inflicted, and have a mild-to-moderate severity; they mostly have a favorable outcome, despite their spectacular presentation. Most patients will be hemodynamically stable, allowing for consideration of minimally invasive techniques in selected patients.

References

1. Kong V, Khan Z, Cacala S, Oosthuizen G. Retained weapon injuries: experience from a civilian metropolitan trauma service in South Africa. *Eur J Trauma Emerg Surg*. 2015; 41: 161-166.

2. Prasad BC, Vemula RC, Varaprasad G. Nonmissile. Penetrating Spinal Injury with an Impaled Knife: Case Report. *Indian J Surg.* 2013; 75: 237-238.
3. Sobnach S, Nicol A, Nathire H, Kahn D, Navsaria P. Management of the Retained Knife Blade. *World J Surg.* 2010; 34: 1648-1652.
4. Thomson B, Knight S. Bilateral thoracoabdominal impalement: avoiding pitfalls in the management of impalement injuries. *J Trauma.* 2000; 49: 1135-1137.
5. Frangos SG, Ben-Arie E, Bernstein MP, Miglietta MA. Thoracic stab wound with impaled knife. *J Trauma.* 2006; 60: 1379.
6. Cho SH, Lee HC, Park CW. CT angiography with 3D reconstruction for the initial evaluation neck injury with retained knife. *Otolaryngol Head Neck Surg.* 2007; 136: 504-505.
7. Quraishi A. Inferior vena caval injury following self-inflicted abdominal stab wound. *Indian J Surg.* 2008; 70: 35-36.
8. Ballim S, Gundry B, Mahomed S, Visser L. Intra-orbital knife blade foreign body; a case series. *S Afr J Surg.* 2013; 51: 134-137.
9. Rana MA, Alharty A, Aleterby WT, Kulshrestha A. Transorbital stab injury with retained knife: a narrow escape. *Case Rep Crit Care.* 2014; 1-4.
10. Lunevicius R, O'Sullivan A. Unusual management of thoracoabdominal impalement injury to the right hemiliver and diaphragm. *Chin J Traumatol.* 2014; 17: 41-43.
11. Isenburg S, Jackson N, Karmy-Jones R. Removal of an impaled knife under thoracoscopic guidance. *Can Respir J.* 2008; 15: 39-40.
12. Kodadek LM, Leeper WR, Caplan JM, Molina C, Stevens KA, Colby GP. Retained transcranial knife blade with resection of internal carotid artery treated by staged endovascular and surgical therapy. *Operative Neurosurgery.* 2015; E372-E375.
13. Lipp M, Mihaljevic V, Jakob H, Mildnerberger P, Rudig L, Dick W. Fiberoptic intubation in the prone position. Anesthesia in a thoracoabdominal knife stab wound. *Anaesthesist.* 1993; 42: 305-308.
14. Kaur K, Singhai SK, Bhardwaj M, Kumar P. Anesthesia in a thoracoabdominal knife stab wound. *Indian J Anaesth.* 2014; 58: 742-745.
15. Nagar RC. Retained intra-abdominal knife in a self inflicted stab. *Indian J Surg.* 2013; 75: 414-415.
16. Edwin F, Tettey M, Sereboe L, Aniteye E., Kotei D, Tamatey M et al. Impalement injuries of the chest. *Ghana Med J.* 2009; 43: 86-89.
17. Ruano RM, Pereira BM, Biazzoto G, Bortoto JB, Fraga GB. Management of severe thoracic impalement trauma against two-wheeled horse carriage: a case report and literature review. *Indian J Surg.* 2014; 76: 297-302.