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# Conservative management of abdominoperineal impalement trauma – A case report

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## ABSTRACT

**INTRODUCTION:** Adult perineal impalement injuries are uncommon and notorious for their complex injury pattern and risk of massive pelvic bleeding. They present a challenge for the treating physician as there is no consensus about the optimal treatment in the existing literature. In most cases patients need operative intervention.

**CASE PRESENTATION:** In this article the authors present a case report of a 63-year old man with an impalement injury in the left gluteus, who was managed conservatively.

**DISCUSSION:** With the recent trends towards conservative management of abdominal penetrating trauma, increased morbidity and costs associated with nontherapeutic laparotomy, conservative management of impalement injuries in hemodynamically stable patients should be considered. Accurate determination of the impaling object trajectory path is vital for the decision and aids to answer two important questions: Did the impaling object enter the peritoneal, retroperitoneal or pelvic cavity? Is there an injury that will require an operation?

**CONCLUSION:** Abdominoperineal impalement injuries have high mortality, but those patients, who manage to reach hospital alive, can sometimes be managed conservatively, as shown in our case report.

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## 1. Introduction

In Central Europe abdominal penetrating trauma, such as stab injuries or gunshot wounds, is very uncommon with a low incidence (0.1%) [1]. Adult perineal impalement injuries are even more uncommon, there are several vital organs that could be damaged in pelvic cavity, thus they usually present with complex injury patterns and risk of massive pelvic bleeding [2]. In many cases, impaled patient dies at the scene [3], but the ones who manage to reach the hospital alive and are hemodynamically stable have a good chance of overcoming traumatic event. There are no accepted guidelines in managing of those injuries in the existing literature, therefore, they present a rare challenge for the treating surgeon. In this article, we present a case of a 63-year old male, with a 1.5–2 cm external cut on the skin in the left gluteal region and estimated depth of penetration around 15 cm. The patient was managed conservatively.

**Abbreviations:** CT, computed tomography; ATLS, Advanced Trauma Life Support; FAST, ultrasonography (focused assessment with sonography for trauma); WTA, Western Trauma Association Multicenter Trials Group; OR, operating room.

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The work has been reported in line with the SCARE 2018 criteria [4].

## 2. Case presentation

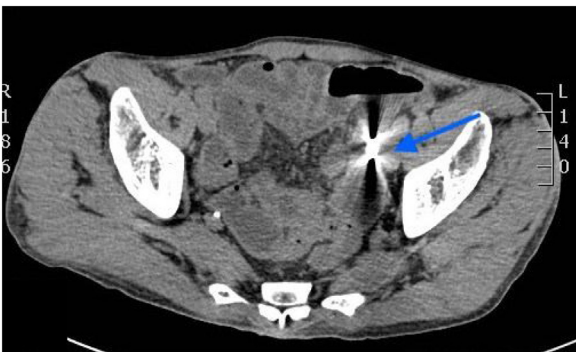
Our patient, a 63-year old drug abuser on substitution therapy, presented to the emergency department with a painful stab wound in the left gluteal area (Picture 1). The patient was hemodynamically stable, there was no haematuria or blood around urethra and normal digital rectal exam. X-ray showed a 15 cm long blade (Picture 2), which travelled along the left pelvic wall. Computed tomography (CT) of abdomen showed, that the blade is in close proximity to the small bowel on the left middle side of the abdominal cavity (Picture 3). There were no signs of perforation or free fluid in the peritoneum. The foreign object was extracted manually in the emergency department operating room, it was a 15 cm long blade (Picture 4). The patient was admitted to the department of abdominal surgery for serial clinical assessments. He received intravenous fluids, gentamicin and flucloxacillin and the tetanus injection. During the hospitalization he was hemodynamically stable, haemoglobin levels did not fall and inflammatory parameters were low, thus he was managed conservatively. Micturition and defecation were normal. After 7 days the patient was discharged from the hospital.



**Picture 1.** Stab wound in the left gluteal area.



**Picture 2.** X-ray of the abdomen, showing 15 cm long blade in pelvis.



**Picture 3.** CT of abdomen, showing blade in close proximity of the small bowel.

### 3. Discussion

Impalement injury is very uncommon type of penetrating trauma [5]. Impalement injury is the penetration of the organism by an object such as pole, hook, stake or spear, by complete perforation of a central body mass. Transfixion and immobilization are also important components [3]. Clinical definitions have ranged from transfixing a body cavity or extremities by a rigid object of variable size to have a foreign body penetrate and embed in a body part with the object still remaining in the wound, to being suspended by the



**Picture 4.** 15 cm long blade, which was extracted from the patient.

impaling object [3]. In our case, there was no complete perforation of the central body mass, but the object was long, narrow and still remained in the wound and also penetrated pelvic-abdominal cavity.

In the last decades, management of patients with penetrating abdominal trauma changed significantly, from mandatory operative exploration to selective nonoperative algorithms [1]. Possible conservative management in selected patients with abdominal stab wounds was described as early as 1960 [6]. In the following decades clinical experiences and studies showed that not all abdominal stab wounds penetrate the peritoneum, but approximately only half of them. Additionally, even if they do breach the peritoneum, only about 20–40% of stab wounds cause a significant injury [1]. Those observations led to development of selective nonoperative algorithms for the management of abdominal penetrating trauma, which proved to be effective [7]. Impalement, however, is an unusual type of penetrating trauma and because it is fairly rare, there are no accepted protocols for injury management. When dealing with penetrating trauma, one must always take into consideration different injury types (size of object, trajectory path), but due to diverse injury patterns and possibility of multiorgan damage, this is especially important in impalement injuries [8,9]. Thus, best therapeutic approach should be tailored to the state and clinical condition of the patient, as well as individual injury patterns.

For optimal treatment results, assessment of patients with abdominal stab wound must be fast and systematic, treating physicians should follow the guidelines and screen for lesions according

to the ATLS (Advanced Trauma Life Support) protocol [10]. In such injury as in our case, the assessment of possible nerve injuries, especially sciatic nerve injury is important. Our patient had no neurological failure on clinical assessment. For hemodynamically unstable patients, presence of evisceration or peritonitis, urgent laparotomy is necessary [11].

The best therapeutic approach is widely discussed in patients, who are asymptomatic and hemodynamically stable [11]. The safest and most conservative approach is urgent laparotomy because one can identify and manage all potential injuries immediately. However, it is unnecessary in up to 70% of abdominal stab wound patients and is also associated with significant morbidity, increased length of stay and costs [6]. The reported incidence of early laparotomy or anesthesia-related complications can be as high as 26% [12]. The reported overall incidence of late (or delayed) complications is approximately 5% [13]. Also, overall cost and hospital stay for patients undergoing nontherapeutic laparotomy are also significantly greater than for patients successfully managed nonoperatively [14].

In the recent decades, along with the advancements of diagnostic modalities (ultrasound, CT, diagnostic laparoscopy), selective nonoperative management of abdominal penetrating trauma has become routine in most trauma centers for hemodynamically stable patients [15]. Ultrasonography (FAST) has become almost a routine investigation in trauma care, but its role in abdominal trauma management is doubtful. Detection of free fluid in abdominal cavity in hemodynamically stable and asymptomatic patients does not mean that there is a bleeding or any other significant injury. According to the Western Trauma Association Multicenter Trials Group (WTA) trials, 50% of such patients ultimately had nontherapeutic laparotomy [16,17]. However, if hemoperitoneum is not detectable, this does not mean absence of injury. WTA trials showed that 17% of patients underwent a therapeutic laparotomy, even though FAST exam was normal at first [16,17]. In the setting of penetrating abdominal trauma, we must be aware that a significant injury might be present even if the FAST is negative, but it can be valuable in detecting hemoperitoneum along with clinical examination of the patient [18].

CT has become more affordable and accessible in most trauma centers and is considered the modality of choice for any major trauma. For anterior abdominal penetrating trauma, studies show that it has high sensitivity (93%) and specificity (85%) for detecting organ injury and the need for laparotomy [1]. It is especially valuable when assessing trauma to the back and flank [19]. Although those injuries seldom cause significant damage because of the thick muscle layer, retroperitoneal organs are difficult to evaluate with physical exam and FAST [11]. Moreover, modern CT scanners are able to adequately assess colon and rectum without application of intraluminal contrast, to facilitate the decision for operative therapy [20]. Although, CT has high sensitivity and specificity, there are still some false-positive findings and should be evaluated along with the clinical condition of the patient by the treating physician, to avoid nontherapeutic laparotomies [21].

There are several different opinions about the use of a diagnostic laparoscopy. Some authors suggest its use when there is evidence of peritoneal violation, because it is less invasive, has less postoperative morbidity, shorter hospital stay and can reduce unnecessary laparotomy rate from 60% to 0–11% [22,23]. Other authors state that observation with serial clinical assessment is cheaper and equally effective especially in asymptomatic patients [17]. Pitfalls of diagnostic laparoscopy are small wounds underneath pericolic fat or on posterior wall of the stomach, which could be hard to recognize by the surgeon. A prospective randomized study by Leppaniemi and Haapiainen [22] showed that in stable patients with a breached

peritoneum, 60% of patients had unnecessary operation. Results were comparable to the mandatory laparotomy group. In terms of costs, time off of work and increased length of stay, serial clinical assessments showed superior over laparoscopy. Nevertheless, laparoscopy could be beneficial for low volume areas, and should be considered in cases of doubt to avoid unnecessary laparotomy in hemodynamically stable patients with signs of peritoneal perforation [1].

According to the WTA trials [16,17], serial clinical assessment is indicated for patients with abdominal stab wound, that are hemodynamically stable and do not need immediate laparotomy. Serial clinical assessment requires serial physical examination every couple of hours, preferably by the same examiner. In a recent prospective observational multicenter trial nonoperative observation with serial clinical assessment showed to be safe and effective, even in those cases when the treatment was delayed and patients ultimately needed therapeutic laparotomy, with no apparent increase in morbidity [16]. Length of stay of patients admitted for serial clinical assessment in the WTA trials was 1 day or less, which is significantly lower than 3.6 days in patients who had nontherapeutic laparotomy. Additionally, the mean length of stay for patients undergoing laparotomy after serial clinical assessment were two days shorter compared to those undergoing therapeutic laparotomy immediately (5.1 days). For optimal cost effective care and to avoid unnecessary laparotomies and morbidity, serial clinical assessment proved to be a safe treatment strategy [11].

In the published literature, there are many cases of operative treatment for impalement injuries [5,24–26], but only a few cases were managed conservatively [27,28]. The fact is not surprising if we consider that impaling objects usually traverse multiple body cavities and thus can injure multiple organs. However, with the recent advancements in the management of blunt and penetrating trauma tilting towards conservative treatment, we should consider this approach also in selected impalement injuries.

The decision about whether a patient can undergo nonoperative management depends on the clinical evaluation and trajectory determination [14]. When the patient is being evaluated for possible conservative management, two questions must be asked. First, did the impaling object enter the peritoneal, retroperitoneal, or pelvic cavity? And second, if it did, is there an injury that will require an operation? Accurate determination of the impaling object trajectory can help answer both of these questions. Clinical evaluation in our case was made according to the ATLS protocol, the patient was hemodynamically stable with no signs of peritonitis or pelvic organ injury (blood on meatus or anus) [10]. For the initial assessment of blade trajectory X-ray was done. It showed that the blade was around 15 cm long and it could lie in the peritoneal cavity, which raised concern of associated intraperitoneal or retroperitoneal damage. Due to the anatomically restricted pelvic space being occupied by numerous important anatomic structures, penetrating injuries to this region have an 85% chance of causing an internal organ injury [14]. Also retroperitoneum poses a special problem because of the difficulty in clinically evaluating the retroperitoneal organs with physical exam [11]. To reliably exclude any injury, CT scan was made which showed no organ or major blood vessel damage. Due to patient excellent clinical state and no apparent concomitant injuries, decision was made to remove the blade in the emergency department OR. Bear in mind that the anesthesiology and surgical teams were prepared for immediate surgery in case of massive bleeding, any other complications or any missed injuries. After the impaling object removal, the patient was admitted to the ward for serial clinical assessment and made an uneventful recovery, confirming that the conservative approach was the right one.

#### 4. Conclusion

To conclude, we can say that, impalement injury represents a rare and potentially lethal traumatic situation, thus nonoperative management of impalement injuries can be challenging and is not the standard of care. However, with the advent of sophisticated imaging technologies and adjunctive minimally invasive techniques combined with serial clinical assessment the authors believe it is feasible for hemodynamically stable patients.

#### Declaration of Competing Interest

The authors report no declarations of interest.

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#### Ethical approval

The informed consent was given by the patient and the ethical approval was obtained from Institutional Ethical Committee.

#### Consent

The patient gave written informed consent, which is stored in his medical documentation.

#### Author contribution

Jurij Janež – data collection, manuscript writing, manuscript revision and approval.

Urban Stupan - data collection, manuscript writing, manuscript revision and approval.

Gregor Norčič - data collection, manuscript writing, manuscript revision and approval.

#### Registration of research studies

N/A.

#### Guarantor

Jurij Janež.

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#### Availability of data and materials

The data of this case report is available from the corresponding author upon reasonable request. The authors would like to add this article to their individual PubMed records.

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#### References

- [1] P. Malkomes, P. Störmann, H. El Youzouri, S. Wutzler, I. Marzi, T. Vogl, et al., Characteristics and management of penetrating abdominal injuries in a German level I trauma center, *Eur. J. Trauma Emerg. Surg.* 45 (April (2)) (2019) 315–321.
- [2] B. Xie, C.M. Leong, J. Joethy, D. Koh, J.C.F. Ng, Perineal impalement injury by steel bar – a near miss, *Trauma Case Rep.* 6 (October) (2016) 1–7.
- [3] R.W. Byard, A forensic evaluation of impalement injuries, *Med. Sci. Law* 58 (2) (2018) 85–92 [Internet] Apr 24 [cited 2020 Mar 29]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29363383>.
- [4] Agha Ra, M.R. Borrelli, R. Farwana, K. Koshy, A.J. Fowler, D.P. Orgil, For the SCARE Group, The SCARE 2018 statement: updating consensus surgical CARE RReport (SCARE) guidelines, *Int. J. Surg.* 60 (2018) 132–136.
- [5] L. Ugoletti, M. Zizzo, C. Castro Ruiz, E. Pavesi, F. Biolchini, V. Annessi, Gluteal, abdominal, and thoracic multiple impalement injuries: a case report on management of a complex polytrauma, *Medicine (Baltimore)* 98 (May (22)) (2019), e15824.
- [6] G.W. Shaftan, Indications for operation in abdominal trauma, *Am. J. Surg.* 99 (5) (1960) 657–664 [Internet] May [cited 2020 Apr 5]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/14445378>.
- [7] J.J. Como, F. Bokhari, W.C. Chiu, T.M. Duane, M.R. Holevar, M.A. Tandoh, et al., Practice management guidelines for selective nonoperative management of penetrating abdominal trauma, *J. Trauma Inj. Infect Crit. Care* 68 (3) (2010) 721–733 [Internet] Mar [cited 2020 Mar 29]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20220426>.
- [8] K.L. Mattox, E.E. Moore, D.V. Feliciano, *Trauma*, McGraw-Hill Medical, 2013, 1224 p.
- [9] X. Tang, H. Chen, C. Chen, J. Xu, A case report of a polytrauma patient with penetrating iron rods in thorax and head, *Medicine (Baltimore)* 97 (41) (2018), e12376 [Internet] Oct 1 [cited 2020 Mar 29]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/30313033>.
- [10] K.J. Brasel, *Advanced trauma life support (ATLS®): The ninth edition*, *J. Trauma Acute Care Surg.* 74 (May (5)) (2013) 1363–1366.
- [11] W.L. Biffi, A. Leppaniemi, Management guidelines for penetrating abdominal trauma, in: *Presentations from the 9th Annual Electric Utilities Environmental Conference*, Springer New York LLC, 2015, pp. 1373–1380 [Internet] [cited 2020 Apr 5]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25315088>.
- [12] N. Hasaniya, D. Demetriades, A. Stephens, R. Dubrowskiz, T. Berne, Early morbidity and mortality of non-therapeutic operations for penetrating trauma, *Am. Surg.* 60 (10) (1994) 744–747 [Internet] Oct [cited 2020 Apr 5]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/7944035>.
- [13] A. Leppäniemi, J. Salo, R. Haapiainen, Complications of negative laparotomy for truncal stab wounds, *J. Trauma* 38 (1) (1995) 54–58 [Internet] Jan [cited 2020 Apr 5]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/7745660>.
- [14] S.P.A. Stawicki, Trends in nonoperative management of traumatic injuries - A synopsis, *Int. J. Crit. Illn. Inj. Sci.* 7 (1) (2017) 38–57 [Internet] Jan1 [cited 2020 Apr 5]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28382258>.
- [15] D. Demetriades, G. Velmahos, Technology-driven triage of abdominal trauma: the emerging era of nonoperative management, *Annu. Rev. Med.* 54 (1) (2003) 1–15 [Internet] Feb [cited 2020 Apr 5]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/12471178>.
- [16] W.L. Biffi, K.L. Kaups, C.C. Cothren, K.J. Brasel, R.A. Dicker, M.K. Bullard, et al., Management of patients with anterior abdominal stab wounds: a western trauma association multicenter trial, *J. Trauma Inj. Infect Crit. Care* 66 (5) (2009) 1294–1301 [Internet] May [cited 2020 Apr 5]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19430229>.
- [17] W.L. Biffi, K.L. Kaups, T.N. Pham, S.E. Rowell, G.J. Jurkovich, C.C. Burlew, et al., Validating the western trauma association algorithm for managing patients with anterior abdominal stab wounds: a western trauma association multicenter trial, *J. Trauma Inj. Infect. Crit. Care* (2011) 1494–1502 [Internet] [cited 2020 Apr 5]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22182859>.
- [18] P. Malkomes, P. Störmann, H. El Youzouri, S. Wutzler, I. Marzi, T. Vogl, et al., Characteristics and management of penetrating abdominal injuries in a German level I trauma center, *Eur. J. Trauma Emerg. Surg.* 45 (2) (2019) 315–321 [Internet] Apr 1 [cited 2020 Apr 9]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29356844>.
- [19] E.M. Boyle, R.V. Maier, J.D. Salazar, J.C. Kovacich, G. O'Keefe, F.A. Mann, et al., Diagnosis of injuries after stab wounds to the back and flank, *J. Trauma Inj. Infect. Crit. Care* 42 (February (2)) (1997) 260–265.
- [20] R.M. Ramirez, E.L. Cureton, A.Q. Ereso, R.O. Kwan, K.C. Dozier, J. Sadjadi, et al., Single-contrast computed tomography for the triage of patients with penetrating torso trauma, *J. Trauma* 67 (3) (2009) 583–588 [Internet] Sep [cited 2020 Apr 9]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19741404>.
- [21] W.L. Biffi, E.E. Moore, Management guidelines for penetrating abdominal trauma, *Curr. Opin. Crit. Care* 16 (2010) 609–617.
- [22] A. Leppäniemi, R. Haapiainen, Diagnostic laparoscopy in abdominal stab wounds: a prospective, randomized study, *J. Trauma* 55 (4) (2003) 636–645 [Internet] Oct [cited 2020 Apr 9]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/14566116>.
- [23] H.F. Lin, J.M. Wu, C.C. Tu, H.A. Chen, H.C. Shih, Value of diagnostic and therapeutic laparoscopy for abdominal stab wounds, *World J. Surg.* 34 (7) (2010) 1653–1662 [Internet] Jul [cited 2020 Apr 9]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20165846>.
- [24] S. Özaydin, Penetrating injury caused by a long construction iron: a case report, *North Clin. Istanbul* 5 (1) (2018) 75–78.
- [25] J. Dar Rawat, P. Goel, S.V. Kunnur, B. Kushwaha, R. Kushwaha, Penetrating injury of pelvis, abdomen and thorax in a child with a trident (trishula), *APSP*

- J. Case Rep. 4 (1) (2013) 3 [Internet] Jan [cited 2020 Apr 9]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23277885>.
- [26] A. Abdullahi, R. Salahi, A. Foroutan, S.-A. Banani, H.-R. Abbasi, S. Paydar, et al., Nonfatal perineal impalement injury traversing pelvic, abdominal, and thoracic cavities, *Am. Surg.* 77 (11) (2011) E232–E235 [Internet] Nov [cited 2020 Apr 9]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22196633>.
- [27] R. Lunevicius, A. O'ullivan, Unusual management of thoracoabdominal impalement injury to the right hemiliver and diaphragm, *Chin. J. Traumatol.* = *Zhonghua chuang shang za zhi* 17 (1) (2014) 41–43 [Internet] [cited 2020 Apr 9]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24506923>.
- [28] J. Schijns, F.B. Plötz, A conservative approach in a child with haematuria after accidental rectal impalement trauma, *Afr. J. Paediatr. Surg.* 12 (3) (2015) 191–192 [Internet] Jul 1 [cited 2020 Apr 9]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26612125>.

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