

Treatment of penetrating trauma to the buttock assisted by spinal endoscopy

Journal of International Medical Research

48(1) 1–7

© The Author(s) 2019

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/0300060519887303

journals.sagepub.com/home/imr



Zhi-Sheng Long¹, Xiao-Yang Nie¹ and
Yuan-Wei Zhang^{1,2} 

Abstract

Objective: Penetrating trauma to the buttock is relatively common. Because of the location of the trauma and complicated peripheral anatomical structures, surgery to the area can be difficult. We report the cases of 2 patients who sustained penetrating trauma to the buttock and underwent operative treatment assisted by spinal endoscopy.

Methods: With the rapid development of minimally invasive spine surgery techniques in recent years, especially the wide application of endoscopy, we treated 2 cases of penetrating trauma with endoscopic probing within the wound channel, followed by hemostasis and postoperative irrigation and drainage.

Results: Drainage tubes were removed from the 2 patients within 7 days after the surgery. Their wounds were healing well and they were discharged from the hospital within 12 days.

Conclusions: If there is no injury to the large blood vessels, intestines, or urinary system, satisfactory clinical results can be obtained using spinal endoscopy to probe, irrigate, and identify foreign objects, when combined with hemostasis, postoperative short-term irrigation and debridement, and the use of antibiotics.

Keywords

Spinal endoscopy, penetrating trauma, buttock, soft tissues, open injury, minimally invasive

Date received: 30 August 2019; accepted: 17 October 2019

Zhi-Sheng Long and Xiao-Yang Nie contributed equally to this work.

Corresponding author:

Yuan-Wei Zhang, Jiangxi Provincial People's Hospital Affiliated to Nanchang University, No.152 Aiguo Road, Nanchang, Jiangxi 330006, China.
Email: zyw812726327@163.com

¹Department of Orthopedics, Jiangxi Provincial People's Hospital Affiliated to Nanchang University, Nanchang, Jiangxi, China

²Medical Department of Graduate School, Nanchang University, Nanchang, Jiangxi, China



Introduction

With the rapid industrial development over the past decades, an increasing number of people are injured at construction sites and in traffic accidents. A variety of cases with penetrating trauma to the buttock have been reported in prior studies, and are usually deep in the body and involve complicated peripheral anatomical structures.¹ If a patient is diagnosed with no injury to his or her intestines, large blood vessels, or urinary tract, a fistulotomy-type surgery usually results in secondary injuries to the neurovascular bundles and tissues around the wound. If the penetrating object is simply pulled out, the wound channel may not be detected after the removal; this can lead to risk of residual foreign bodies, bleeding, injury to the surrounding tissues, and postoperative infections. Our team used a spinal endoscope to probe the wounds of 2 patients with penetrating trauma caused by rebar, and achieved satisfactory therapeutic effects after the removal of retained foreign objects, hemostasis, postoperative irrigation, and antibiotics.

Case presentation

Case 1

A 28-year-old male was admitted to the hospital 5 hours after a fall from height. The patient fell from a 5-meter height and was wounded by a rebar (2 cm in diameter) penetrating through his buttock to his inner thigh. The patient was conscious, and had no nausea or vomiting, abdominal distension, chest pain or distress, or numbness of the lower limbs. The rebar penetrated from the right side of the buttock near the anus to the inner thigh, and his scrotum was punctured by the rebar, with a visible wound of around 3 × 4 cm. There was no

bleeding or intestinal rupture on direct rectal examination (Figure 1).

As indicated on the X-ray, computed tomography (CT), and vascular ultrasound performed at the time of admission, a visible rebar penetrated through the inner femur. The vascular ultrasound showed no rupture of the proximal or distal vessels. CT examination indicated that the rebar penetrated without touching the femoral triangle or the intestine, and the rebar did not pass through the sciatic nerve area (Figure 2).

Case 2

A 54-year-old male was admitted to the hospital 8 hours after falling from a 3-meter height and was wounded by a rebar penetrating from the right side of his buttock to his upper iliac spine. He was conscious without pain in the head, chest, or abdomen, and did not have bloody stool. The rebar penetrated from the right side of the buttock near the anus to the upper iliac spine. The muscles of his lower limbs felt normal. As indicated on the X-ray and the CT scan, the rebar did not enter his abdominal cavity, intestines, or sciatic nerve area.

Treatment procedures

- (I) Complete relevant preoperative tests, including complete blood counts, coagulation tests, and CT angiography of the abdomen and pelvis were performed. Consultations with the gastrointestinal surgery department and the urology department were also obtained. A physical examination was performed to exclude intestinal and urethral injuries.
- (II) After entering the operating room, anesthesia was induced to the extent possible given the clinical situation. After successful anesthesia, the patient was placed in the lateral position, because both patients had

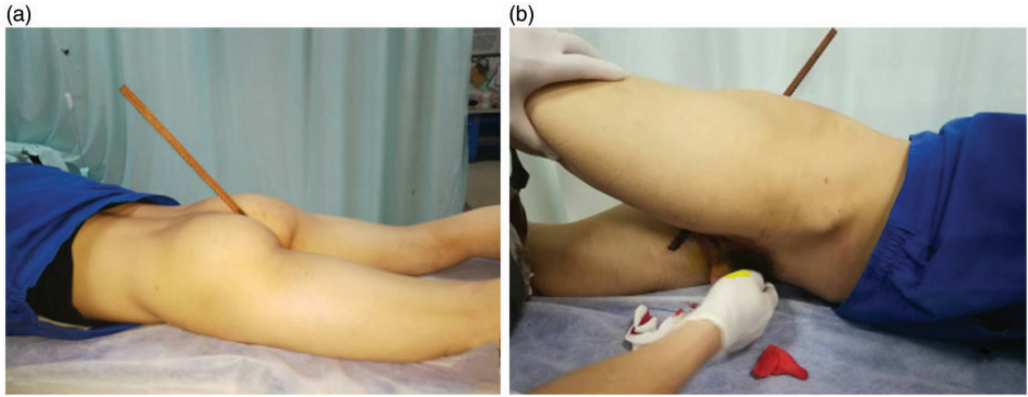


Figure 1. Rebar penetrated from the buttock to the inner thigh, and the scrotum was punctured.

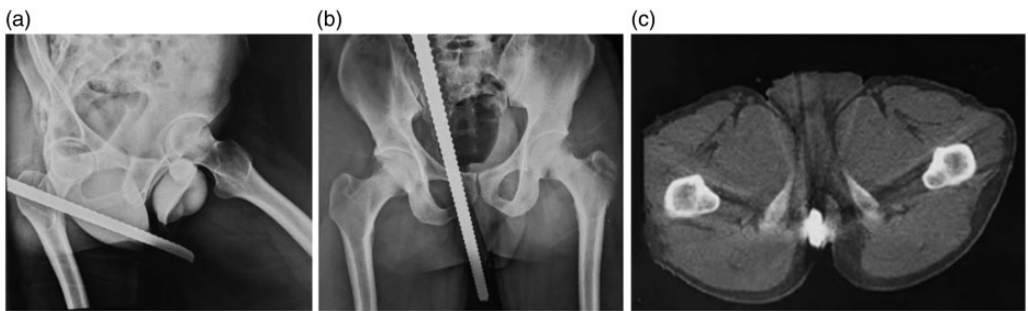


Figure 2. Preoperative X-rays and computed tomography scans.

penetrating injuries caused by the rebars. Before the surgery, both sides of a rebar were disinfected with complex iodine, followed by placement of a surgical towel and a waterproof layer at the top of the bed. One end of a rebar was tied with absorbable suture, the stability of which was checked repeatedly (a step that is crucial for the successful creation of the working channel). An assistant fastened the other end of the rebar, and the sutures were successfully channeled through the penetrating wound.

(III) We paid close attention to ensure there was no heavy bleeding within the channel after pulling out the

rebar. If this were to have occurred, the channel would be compressed for the purpose of hemostasis, and a fistulotomy surgery would be performed to probe the bleeding. When such a condition becomes stabilized, an expandable tube may be placed within the wound channel gradually under the guide of Ethibond sutures for probing and irrigation. Small intraoperative spots of bleeding were treated with bipolar electrocautery. A cloth foreign body was found in the body of Case 1, and shavings of metal were found in the channel of Case 2 (Figure 3).

(IV) After the handling of foreign bodies and bleeding was completed,

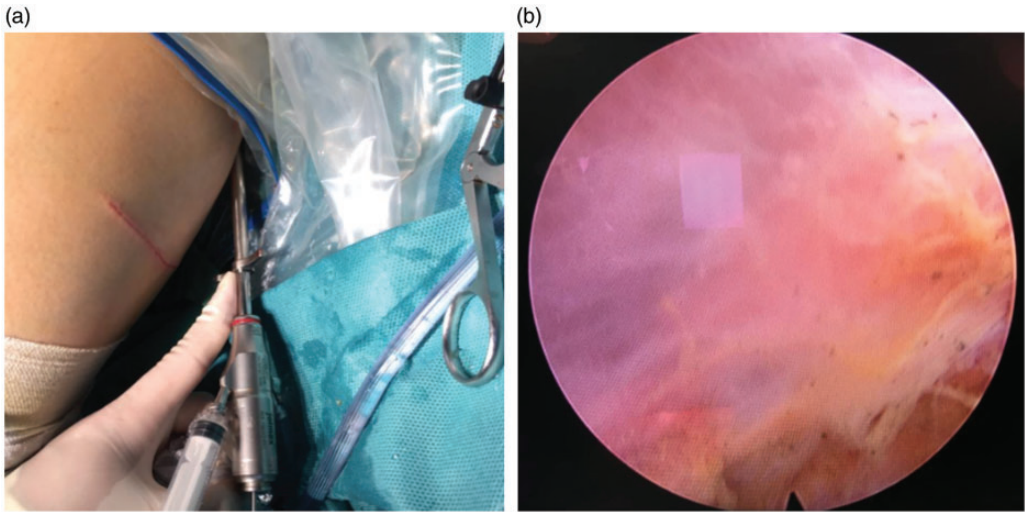


Figure 3. Shavings and other foreign objects were found in the wound channel with the aid of spinal endoscopy.

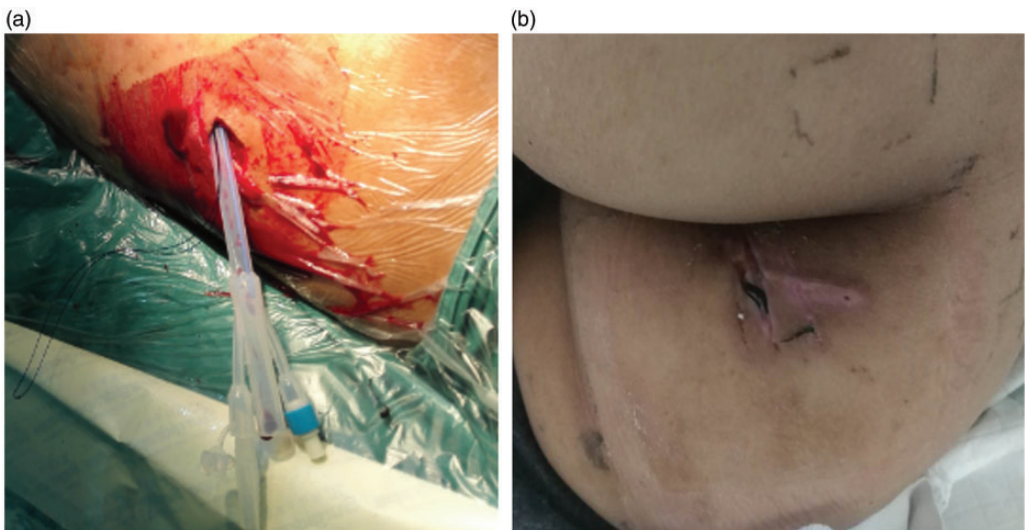


Figure 4. Placement of a triple-lumen catheter and well-healed postoperative wounds.

a triple-lumen catheter was placed from the working channel for irrigation, and the other end was placed with drains through the channel. Both tubes were located within the wound channels (Figure 4).

(V) Postoperative routine saline irrigation was performed with the application of second-generation cephalosporins for 48 hours. We determined whether to continue the irrigation according to the color of the irrigation liquid and

the postoperative temperature, complete blood count, C-reactive protein, and erythrocyte sedimentation rate.

- (VI) Drainage tubes were removed from the 2 patients within 7 days after the surgery. Their wounds were healing well and they were discharged from the hospital within 12 days (Figure 4).

Discussion

Penetrating trauma refers an injury to the soft tissues, muscle vessels, nerves, and organs in the penetrated area. It is an open injury with entrance and exit sites, usually accompanied by wounds to 1 or more tissues and organs. Because of the presence of complex anatomical structures in the injured area and the occurrence of random injuries, treatment and surgical procedures are difficult.²

Penetrating trauma may happen at construction sites and the scenes of traffic accidents. Injuries are frequently caused by falls from height. The materials that pass through can include glass, wooden sticks, and rebar. Rebar was the most common material based on our literature review. The 2 patients we treated had penetrating injuries caused by falling from a height.³ Penetrating trauma often happens at the abdomen and buttocks. There are also reports of penetrating wounds of the spine, the spinal canal, and those that occur from the perineum to the skull. Therefore, penetrating trauma requires cooperation between many subspecialists in the operating room, which highlights its complexity.

For penetrating trauma of the buttock or pelvis area, because the injured area is adjacent to the pelvis, abdomen, reproductive system, and urinary system, the diagnosis is more complicated, and it is necessary to determine whether injuries have occurred to the intestines, urethra, vagina, and blood vessels. A detailed physical examination is

necessitated after admission, including whether there is abdominal tenderness and rebound tenderness, blood on rectal examination, or a coagulation abnormality. Meanwhile, abdominal vascular ultrasound and a high-quality CT scan of the injury area must be conducted. In this way, the relationship between the channel of the penetrating object and the surrounding anatomical structures can be thoroughly understood, which provides a reference for surgery and disease assessment.⁴ Normally, exploratory laparotomy is necessary if an intestinal injury is suspected after admission.⁵

The surgical approach following penetrating trauma has a great impact on the treatment effects. Different factors should be considered, such as the anatomical structures of the injured area, the movement of the penetrating object, and the technique adopted by the surgeon. As we can see from previous literature, contrary to a traditional surgical approach, there is no standard surgical incision or approach because of uncertain injury sites, which necessitates the exposure of the penetrating object and the wound channel to the largest extent. A fistulotomy-type surgical incision is currently recognized as a surgical approach that exposes lesions to the largest extent.⁶

Both patients we treated had buttock injuries, and the penetrating rebar did not enter the abdominal cavity or pelvis. No apparent macrovascular, intestinal, or urinary system injury was found during the preoperative imaging or physical examination. A conventional incision may create difficulties in surgical positioning and intraoperative disinfection. Moreover, the exposure around the channel may damage the nerves, blood vessels, and abdominal organs of the corresponding areas. Simple removal of the rebar may result in retained foreign objects. Potential local bleeding, intestinal injury, and urinary system injury may be neglected. We found several similar cases reported in the literature. One case

involved penetrating trauma to the pelvic area reported by Hopp et al.,⁷ who adopted an extended inguinal hernia approach involving treatment from both the front and back. The other case involved penetrating trauma to the buttock reported by Zhang et al.,⁸ who adopted a regional extended incision, but corresponding abdominal exploratory surgery was not performed.

Spinal minimally invasive techniques have been developing rapidly around the world. Yeung et al.⁹ developed a coaxial endoscopic spine system (YESS) in 1997, which was followed by the thesys technology of Hoogland from Germany in 2002, the improved YESS technique, and percutaneous endoscopic interlaminar technology. Spine endoscopy has been widely adopted in treating spinal degenerative diseases, spinal infections, spinal tuberculosis, and other related diseases, and has yielded satisfactory results. As spinal endoscopy can provide microscopic observation and related operations in a single channel, it has also widely been applied to the treatment of related orthopedic diseases, such as tuberculosis and the removal of tips of ripped drain tubes.⁹ Penetrating injuries have a sinus tract of the injury, and the actual condition is unknown. During endoscopy-assisted treatment of penetrating trauma, we can directly see the injury in the sinus tract, and also perform hemostasis, foreign body removal, and exploration with the help of microscopic electrocautery, as well as single channel operating forceps, hooks, and related devices.

Postoperative wound management and the application of antibiotics are also important for infection and healing. Hopp et al.⁷ believed that it is difficult to reduce the risk of infection with the placement of drains and routine irrigation. We used antibiotics and short-term irrigation and drainage. Intermittent irrigation and drainage were conducted through the sinus.

Antibiotics were given for 5 to 7 days after the surgery. When choosing the irrigation tube, we adopted a triple-lumen catheter to mitigate blocks.

Nevertheless, there were also limitations of such a technology. If there is massive hemorrhage during a surgery, we usually pack with gauze to stop the bleeding, and immediately convert to an open surgery to probe and stop the bleeding. If intestinal injuries are found during a surgery, spinal endoscopy is also not applicable, and an open surgery is necessary to repair the intestines.

Conclusion

The preoperative evaluation and imaging are crucial for dealing with penetrating wounds to the buttock. If there is no injury to large blood vessels, intestines, or the urinary system, satisfactory results can be obtained with the application of spinal endoscopy to probe, irrigate, and identify foreign objects, when combined with hemostasis, postoperative short-term irrigation, and antibiotic use.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Ethics and consent statements

This study was conducted in accordance with the declaration of Helsinki and with approval from the Ethics Committee of Jiangxi Provincial People's Hospital Affiliated to Nanchang University (Ethics Committee reference number: 8187602147). Written informed consent was obtained from the patient.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ORCID iD

Yuan-Wei Zhang  <https://orcid.org/0000-0002-1026-833X>

References

1. Lunevicius R, Schulte K. Analytical review of 664 cases of penetrating buttock trauma. *World J Emerg Surg* 2011; 6: 33. DOI: 10.186/1749-7922-6-33.
2. Zhang M, He Q, Wang Y, et al. Combined penetrating trauma of the head, neck, chest, abdomen and scrotum caused by falling from a high altitude: a case report and literature review. *Int Emerg Nurs* 2019; 44: 1–7. DOI: 10.1016/j.ienj.2019.01.001.
3. Zhou Z, Song Y, Cai Q, et al. Penetrating injury of rectum and vertebral body by steel bar causing cauda equina syndrome. *Spine (Phila Pa 1976)* 2011; 36: E803–E807. DOI: 10.1097/BRS.0b013e3181fab574.
4. Koizumi T, Imamura N, Aruga N, et al. Successful treatment of penetrating chest injury caused by a crossbow. *Tokai J Exp Clin Med* 2014; 39: 64–68.
5. MacLeod J, Freiburger D, Lewis F, et al. What is the optimal observation time for a penetrating wound to the flank? *Am Surg* 2007; 73: 25–31.
6. Tannheimer M, Fischer D, Friemert B, et al. [Removal of a thoracic impaling agent without direct observation. The significance of pre-operative diagnosis]. *Unfallchirurg* 2005; 108: 241–245. DOI: 10.1007/s00113-004-0866-z.
7. Hopp SJ, Culemann U and Pohlemann T. Surgical management of pelvic penetrating trauma—case report and review of literature. *Injury* 2009; 40: 1115–1117. DOI: 10.1016/j.injury.2009.01.017.
8. Zhang P, Hu JM and Zhou DS. Surgical management of penetrating pelvic trauma: a case report and literature review. *Chin J Traumatol* 2012; 15: 364–366.
9. Gore S and Yeung A. The “inside out” transforaminal technique to treat lumbar spinal pain in an awake and aware patient under local anesthesia: results and a review of the literature. *Int J Spine Surg* 2014; 8: 178–190. DOI: 10.14444/1028.