



# Penetrating Iron Rod Wound of the Lumbar Spine Causing Cauda Equina Syndrome in a Child: Case Report and Review of the Literature

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## Abstract

The authors report the case of a 10-year-old child who was admitted to the emergency room with a penetrating lumbar spinal injury caused by an iron rod, which occurred accidentally during a recreational activity. The clinical presentation was a ponytail syndrome with paraparesis and cerebrospinal fluid discharge from the lumbar penetration point of the iron rod. The lumbar X-ray and computed tomography (CT) scan performed in the emergency room revealed the iron rod penetrating the spinal canal through the lamina of the L3 vertebra on the left, requiring urgent surgical management, consisting of laminectomy of L3 allowing the removal of the iron rod and repair of the dura mater without any damage to the roots of the cauda equina. The evolution was favorable with complete motor recovery at 3 months follow-up.

## Keywords

- ▶ iron rod
- ▶ cauda equina
- ▶ lumbar spine
- ▶ penetrating wound
- ▶ child

## Introduction

Penetrating spinal wounds causing cauda equina syndrome (CES) are unusual in contrast to blunt trauma from motor vehicle accidents.<sup>1</sup> They are essentially of two types: gunshot wounds and stab wounds. Spinal gunshot wounds are more frequently described and are associated with a higher incidence of neurological damage. On the contrary, the prognosis is better for stab wounds where surgery plays a more important role.<sup>2</sup> Very few cases have been reported on the occurrence of CES following stab wounds. However, we did not find in the literature any cases of penetrating spinal wounds with iron rods causing CES, especially in children.

We report the case of a 10-year-old boy with CES due to a penetrating iron rod wound of the lumbar spine that occurred accidentally during a recreational activity and discuss its management.

## Observation

This is a 10-year-old boy with no particular history who was admitted to the emergency room with a motor deficit of the lower limbs and a hemorrhagic penetrating lumbar wound that had been evolving for 13 hours at the time of his admission and that occurred accidentally during a recreational activity.

The neurological examination revealed a flaccid paraparesis (estimated at 3/5 in both lower limbs on the Medical Research Council scale) without sensory or sphincter disorders (anal sphincter tonic to the touch and no loss or retention of urine). Local examination revealed a fixed iron rod, penetrating through the lumbar region (▶ **Fig. 1**) with the emission of clear rock water liquid through the wound.

Emergency radiography and computed tomography (CT) (▶ **Fig. 2**) revealed an iron rod penetrating the spinal canal

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**Fig. 1** Fixed iron rod penetrating through the lumbar region, left paraspinally.

through the lamina of the L3 vertebra on the left. The preoperative blood test revealed anemia with 6 g of hemoglobin requiring an emergency transfusion of OO+ rhesus iso group blood. The patient was then immediately taken to the operating room.

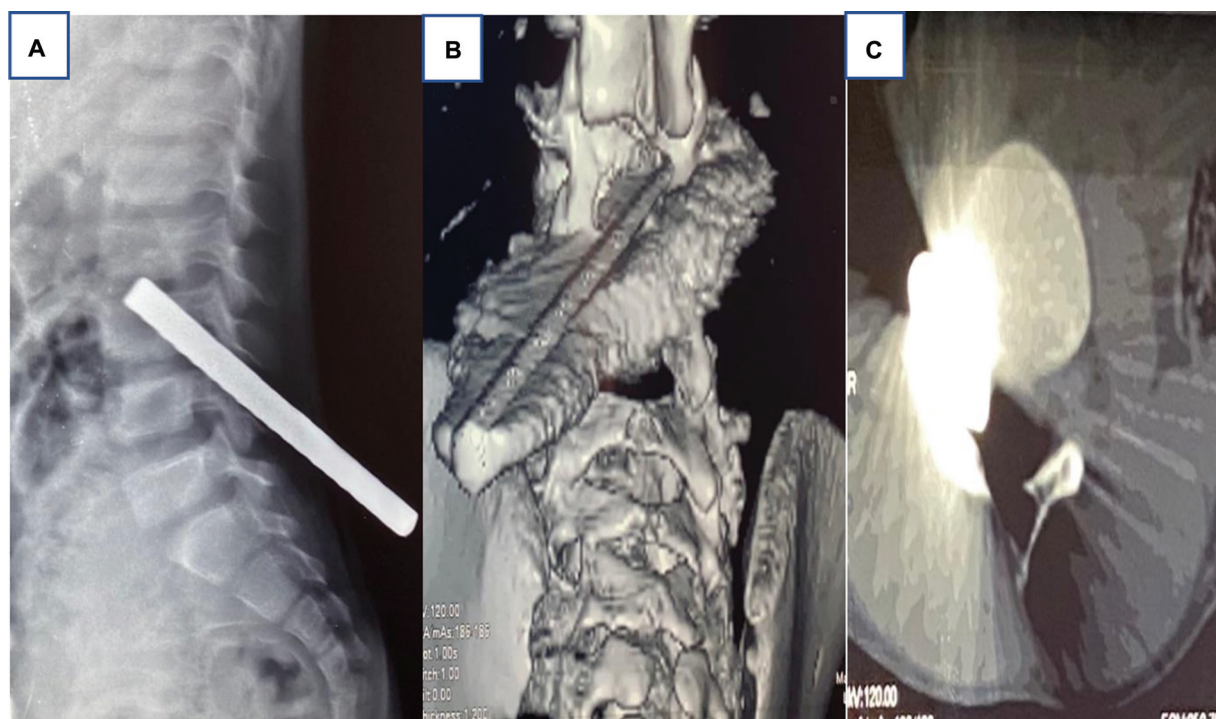
A classic posterior midline approach was used. Bilateral muscle disinsertion revealed the iron rod penetrating through the lamina of the L3 vertebra on the left. The iron rod was removed in the opposite direction of its entry trajectory after laminectomy of the L3 vertebra demonstrating a breach of the dura. The dura mater was suspended and intradural exploration did not reveal any macroscopic lesions of the cauda equina roots. After irrigation and debridement with isotonic saline, we pulled all free roots back into the dural sac and sutured it with nylon 4.0. Subsequently, the penetrating wound and surgical incision were closed in three layers (→ **Fig. 3**).

After surgery, the patient was subjected to a broad-spectrum parenteral antibiotic therapy made of third-generation cephalosporin (ceftriaxone 100 mg/kg/day) and imidazole (metronidazole 30 mg/kg/day) for 3 weeks with a stable evolution without obvious wound infection and symptom of cerebrospinal fluid leakage nor any complication with a postoperative lumbar CT scan performed at D + 3 showing the L3 laminectomy focus without any other particularities. He was subsequently referred to a rehabilitation facility.

At a 3-month follow-up, the patient showed complete recovery of his paralysis and healing of the penetrating wound and surgical incision. He was subsequently seen in consultation at 6 months and at 1 year of follow-up without any notable particularities.

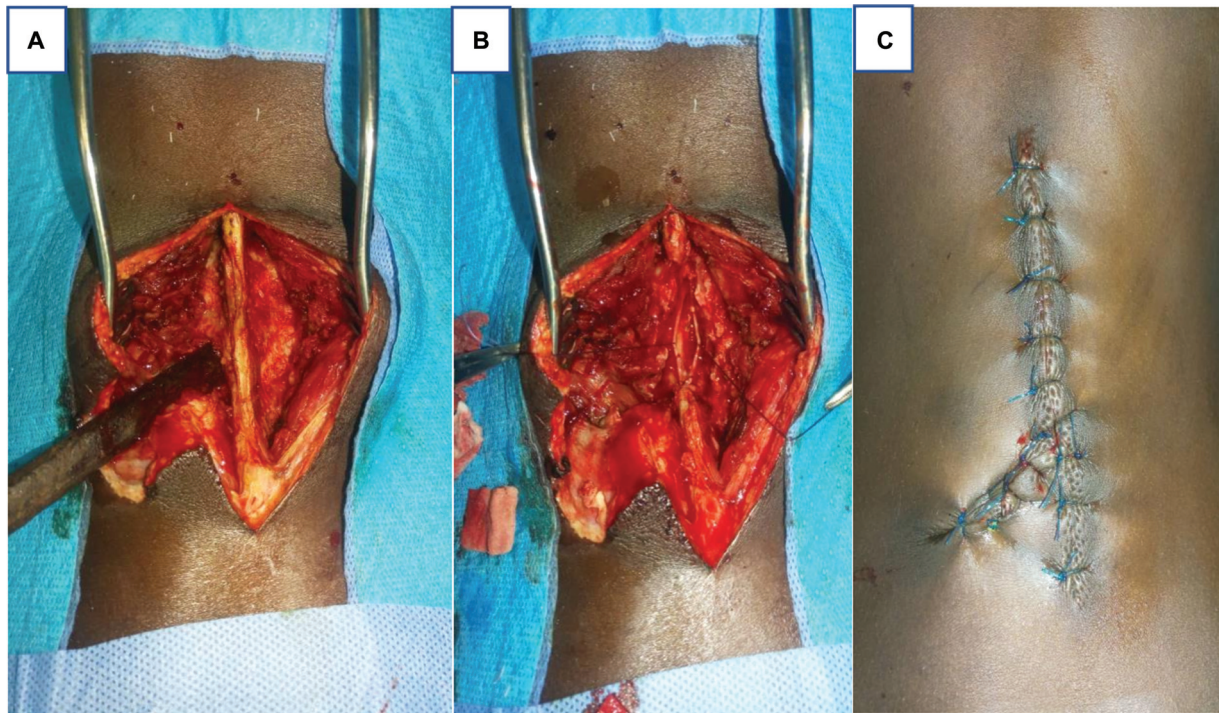
## Discussion

Spinal injuries are relatively uncommon in children. Pediatric spinal injuries account for 1 to 10% of all vertebromedullary injuries.<sup>3</sup>



**Fig. 2** (A) Profile X-ray of the lumbar spine. (B) Lumbar CT 3D reconstruction. (C) Lumbar CT axial section: iron rod penetrating the spinal canal through the lamina of the L3 vertebra on the left.





**Fig. 3** Intraoperative images. (A) Iron rod penetrating the spinal canal through the lamina of the L3 vertebra on the left. (B) Suspension of the dura for exploration of the cauda equina roots. (C) closure of the penetrating wound and surgical incision.

The most widely reported cause of penetrating spinal injury is gunshot wounds with relatively few case reports describing glass or stab wounds.<sup>1,2</sup> Foreign bodies of wood and metal have been reported to penetrate the spine.<sup>1,3</sup> However, to our knowledge, there are no reports in the literature of penetrating lumbar spinal iron rod injuries in children with or without the development of CES.

Penetrating injuries in children result from violence with firearms, knives, and play objects (including air guns and sharp-tipped toys), and from falls on sharp objects (especially glass and some toys).<sup>3</sup> Very few studies have been undertaken regarding the management of penetrating medullary cone and ponytail injuries.<sup>3</sup>

CES is a complex neurological disorder with a myriad of symptoms such as low back pain, unilateral or bilateral leg pain, paresthesias and weakness, perineal anesthesia, sphincter incontinence, and other less common symptoms.<sup>4</sup> Traumatic cauda equina injuries most commonly cause sudden and acute neurological deterioration. During the initial emergency evaluation, care should be taken to recognize lower extremity sensitive and motor deficits.<sup>1</sup> CT and magnetic resonance imaging (MRI), as well as an electrophysiological workup, allow an accurate diagnosis in the acute phase.<sup>4</sup> However, due to the low availability and high cost of MRI and electrophysiological assessment in our socioeconomic context, the lesion assessment of our patient was established on X-ray and CT scan, which were sufficient for surgical planning. A precise clinical examination and a thorough analysis of the preoperative imaging are mandatory to define upstream the objectives of the surgery.<sup>1</sup>

Treatment principles for penetrating injuries include irrigation and debridement, suturing of the wound, and administration of antibiotics as soon as possible.<sup>5</sup> In cases of penetrating foreign body injuries to the cauda equina, many previous reports recommend urgent surgery to perform decompression by removing foreign bodies, bone fragments, or blood clots; debridement; repair of the dura mater to prevent persistent infection and stop cerebrospinal fluid (CSF) leakage; and spinal stabilization in cases of destabilizing injuries.<sup>1,3,5</sup>

In terms of prognosis, neurological recovery after cauda equina injury is unpredictable and may be influenced by several factors, such as the age of the patient, the severity of the primary injury, and the earliness of management.<sup>1</sup>

Our patient presented a rapid and complete resolution of the lower limbs motor deficit. This could be explained in our opinion by the absence of macroscopic lesions of the ponytail roots objectified intraoperatively and that the neurological symptoms would be related to a compression effect of the ponytail roots by the iron rod. Hence, the interest of an early decompression in these penetrating traumas.

## Conclusion

To our knowledge, this is the first reported case of a penetrating iron rod injury to the ponytail in a child. An emergency neurosurgical procedure is always a challenge in such a setting. Neuronal decompression and foreign body removal must be performed to prevent neurological deterioration, infection and possible CSF leakage. However, many of these accidents can be avoided by monitoring children during sports and play activities.

**Authors' Contributions**

All authors have read and approved the final version of the manuscript. R.M.I. and L.F.B. conceptualized the article. M. M.N., Y.C., H.G.A., D.W., M.F. and M.C.B. gathered the data. All the authors revised the article and approved the final draft of the article that was submitted. F.M. and M.C.B. provided guidance toward the completion of the article.

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None.

**Conflict of Interest**

None declared.

**References**

- 1 Pal D, Timothy J, Marks P. Penetrating spinal injury with wooden fragments causing cauda equina syndrome: case report and literature review. *Eur Spine J* 2006;15(suppl 5):574–577
- 2 Steinmetz , Michael P, Krishnaney , et al. Penetrating spinal injuries. *Neurosurg Q* 2004;14(04):217–223
- 3 Piqueras C, Martínez-Lage JF, Almagro MJ, Ros De San Pedro J, Torres Tortosa P, Herrera A. Cauda equina-penetrating injury in a child. Case report. *J Neurosurg* 2006;104(4, Suppl)279–281
- 4 Tedesco-Marchese A, Teixeira MJ, de Araújo AS Jr, Fazzito MM, Lepski G. Microsurgical reconstruction of the cauda equina after traumatic transecting injury. *Acta Neurochir (Wien)* 2014;156(07):1341–1344
- 5 Mikami Y, Tasaki A, Morita W, Kuroda E, Hoshikawa Y. Penetrating injury to the cauda equina: a case report and review of the literature. *J Spinal Disord Tech* 2012;25(01):64–67