

Case Report

Retained Lumbar Intradural Bullet Fragment with Neurological Recovery after Delayed Removal of Bullet: Case Report and Literature Review

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INTRODUCTION

Although, worldwide, there is an increase in research reports on retained bullet fragments in the spinal canal, this is the first such incidence seen and managed in our environment. Despite the increased number of reports on retained bullet fragments in the spinal canal, expert opinions remain uncertain regarding the treatment of such injuries.^[1-4] Evidence in the literature suggests that spinal fractures due to civilian gunshot wound (GSW) are likely to be stable and may not need surgical intervention.^[1,5] However, surgery may be indicated in the presence of worsening neurological status, unresolved cerebrospinal fluid (CSF) leakage, migration of intradural bullets, and for the relief of compression of neural tissues due to a retained bullet fragment, bone piece, intervertebral disc material, or hematoma.^[1,5] Generally, cauda equina injuries have a better outcome after surgery.^[5] When indicated, surgery involves identification of the anatomical location of the

ABSTRACT

Civilian gunshot wound (GSW) to the spine is expected to increase in our environment due to the recent surge in violence and firearm attacks in the society either by herdsmen, bandits, unknown gunmen, or from exchange of gun fire with security personnel in response to insecurity issues. The management of GSW in the spine remains controversial, with no clear recommendations for surgical intervention by spine surgeons. In light of this, we report a case of civilian GSW to the lumbar spine in a 47-year-old female with resultant immediate paraplegia. Neuroradiological studies revealed a large bullet lodged in the left L2/3 spinal canal. There was a 4-week wait for consent for surgery to be obtained, with no improvement in motor function during the period. She underwent laminectomy and duratomy with removal of the bullet. Motor function returned 3 weeks after the surgery, and she was discharged home 8 weeks after the surgery, actively mobilizing on a Zimmer frame. The case report demonstrates the beneficial role of surgical intervention in properly selected patients, with resultant satisfactory functional neurological recovery.

KEYWORDS: *Gunshot wound, intradural bullet, laminectomy, lumbar spine, paraplegia*

bullet fragment and the surrounding structures, as well as the patient's preoperative neurological status from the time of injury to the time of surgical intervention.^[1] We report a case of a retained lumbar intradural bullet fragment in a neurologically compromised patient who had surgical removal of the bullet 4 weeks after the GSW and who recovered motor functions postoperatively despite the delay in surgical intervention.

CASE REPORT


A 47-year-old female was admitted to a health facility on account of her inability to move her lower limbs following a gunshot injury. She was a passenger in a vehicle that was attacked by gunmen on her way back

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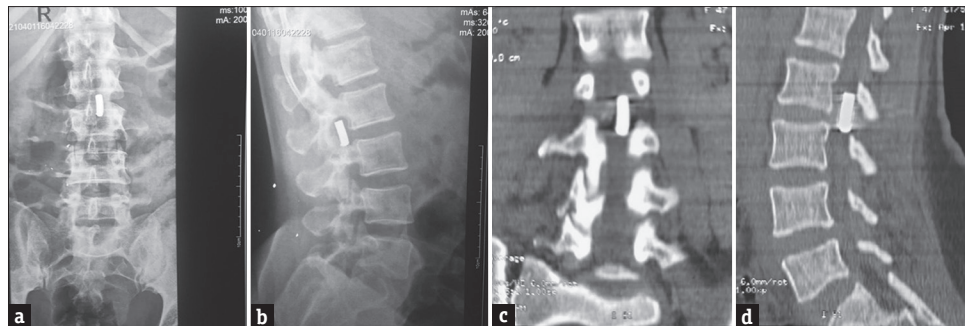


Figure 1: (a) Anterior-posterior lumbosacral spine x-ray of patient at presentation showing a left-sided L2/3 bullet. (b) Lateral lumbosacral spine x-ray of patient at presentation showing a bullet lodged at the L2/3 neural foramen. (c) A coronal lumbosacral spine CT scan of the patient on admission showing a left-sided L2/3 bullet. (d) Sagittal lumbosacral spine CT scan of the patient on admission showing a bullet in the spinal canal at L2/3

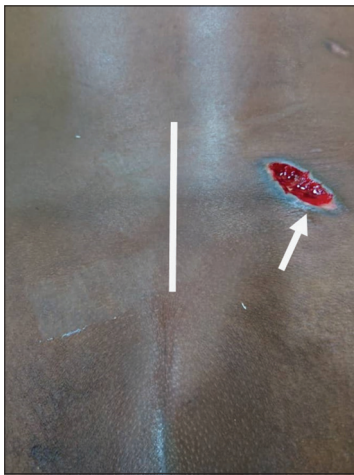


Figure 2: Entry wound (arrow) at posterior right paramedian region at the level of the posterior iliac crest. White line to mark the midline down to the lumbosacral junction

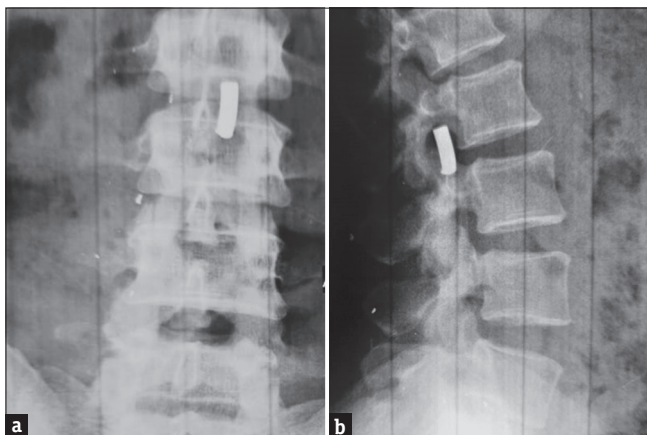


Figure 3: (a and b): Anterior posterior and lateral lumbosacral spine x-ray of patient on day of surgical procedure showing bullet at L2/3 with no evidence of bullet migration

from shopping. She discovered that she wasn't able to move her lower limbs and was subsequently pulled out of the vehicle. She was immediately taken to a nearby health facility, where she was resuscitated and received first aid care before being referral to an Orthopedic Hospital. On presentation at the Orthopedic hospital,

she was conscious with normal vital signs. She was noted to have powers of grade 0/5 in both lower limbs and a sensory level of L3. Lumbosacral spine x-ray and computed tomography (CT) scan were performed and revealed a large bullet lodged at L2/3 [Figure 1a-d] with a few shrapnel in the surrounding soft tissues. Neurosurgical consultation was requested through the WhatsApp upload of the images, and surgical removal of the bullet was offered. However, consent for surgery was obtained about 4 weeks after the injury. A physical neurosurgical evaluation was performed on the day of the surgery. On neurological examination, she was paraplegic with presence of normal sensations to touch and pain down to L3 bilaterally but reduced sensory perceptions down to S1 bilaterally. Proprioception was present at the toes bilaterally. Examination of the back revealed a granulating posterior right paramedian gunshot wound at the level of the posterior iliac crest [Figure 2], but no exit wound was seen. She had urethral catheter *in situ* from the referral hospital and, therefore, was uncertain about urinary continence. There was preservation of anal sphincteric tone. She had a repeat lumbosacral spine x-ray performed the same day and prior to the commencement of surgery as part of the surgical planning to rule out any possible migration of the bullet. The repeat x-ray revealed a pellet of bullet in the lumbar spine at L2/3 interspace on the left side with no evidence of bullet migration [Figure 3a and 3b] when compared to the first x-ray performed at the presentation 4 weeks earlier. She underwent laminectomy and duratomy with the removal of the bullet [Figure 4b]. Intra-operative findings revealed evidence of a transected nerve root at the right L2/3 neural foramen with a dural tear at the adjoining right lateral dural wall. However, there was no obvious CSF leakage in the surgical field. There was a retained bullet in the left L2/3 intradural space [Figure 4a], but no obvious intradural nerve root transection. Post-operatively, she made progressive improvements in neurological function, with the return of motor function observed 3 weeks after the

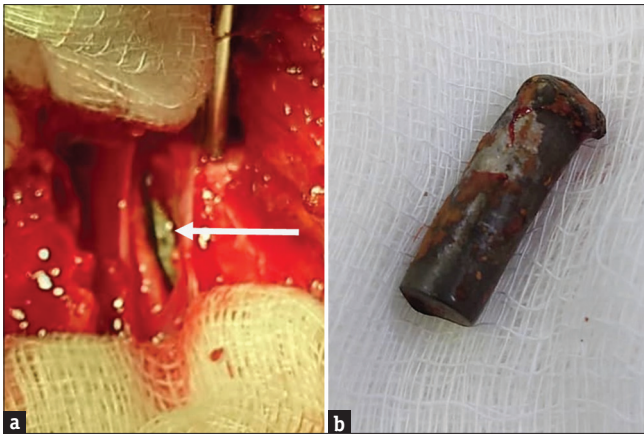


Figure 4: (a and b) Intraoperative image of the bullet in its intradural location before removal, deep in the left side (arrow), and the extracted bullet on a gauze

surgery. She was weaned off urethral catheterization and discharged home 8 weeks post-operatively, able to actively mobilize with a walking frame and advised on neuro-rehabilitation. She returned for review 11 months after discharge, much improved in her motor function but still on a walking frame. The motor power bilaterally in the hips were 4/5, knee extension 4/5, knee flexion 3/5, dorsi/plantar flexion 3/5. She was advised to continue with neurorehabilitation.

DISCUSSION

In civilian gunshot injuries, 13–17% of GSW affect the spine, with the thoracic spine being the most common site of injury to the spine.^[5,6] In urban centers, half of all spinal cord (SC) injuries results from penetrating GSW with complete SC injury accounting for 70% in cervical GSW and incomplete injury also accounting for 70% in lumbosacral GSW.^[6] Although penetrating GSW to the spine with no neurological deficit in motor function even in cases with intraspinal bullet location have been reported,^[2,7] penetrating GSW to the spine from high velocity bullet leads to severe or permanent neurological deficit in the vast majority of cases.^[2,8] Neurological deficit results from damages in neural structures, and these damages depend on the physical properties and the direct impact of the bullet or fragments, the pressure shock waves, and temporary cavitation.^[2,9] Neural injuries may result from SC transection or contusion, compression of neural elements by hematoma, bone and/or foreign bodies, damage to SC vasculature, and spinal instability.^[2,6] And although neurological damage may be complete or incomplete, both types of injuries can show improvement with surgical treatment in motor power of the lower limbs.^[10] The thoracic spine is the most commonly affected spine region with the most risk of complete neurological deficit from civilian

GSW,^[2] but, in general, the lumbar spine is the most affected spine region in gunshot spinal injury.^[2,11] In an epidemiological study of combat casualties (explosions and gunshot injuries combined) resulting in spinal injuries, the lumbar spine rated as the most involved spine region, followed by the thoracic spine and the cervical spine.^[2,11] And the presence of bullet fragments in the spinal canal has been recognized as a significant predictor of neurological injury.^[2,12] The presented case sustained injury to the lumbar spine from civilian gunshot injury, from unknown gun men; a recent public issue in our environment that is becoming widespread and hence more spinal injuries may be a consequence of such attacks. The bullet traversed through the right side of the lower back and lodged in the spinal canal on the left side between L2 and L3. There was a complete loss of motor function (paraplegia) in the lower limbs and reduced sensation to pain below the level of injury. To identify the location of the bullet and/or any damage to the spine, a lumbar x-ray is helpful, whereas a better evaluation of the nature of damage to the affected vertebrae will require a CT scan.^[2,13] Also, a CT scan and a CT myelogram are very helpful in surgical planning.^[10]

There is no general consensus on the optimal treatment for spinal intracanal bullets; hence, individualizing treatment based on clinical and radiological findings is highly recommended.^[2] A review article on GSW to the spine by Bono and Heary^[14] recommended that surgical decompression and/or bullet removal is justified in patients who are neurologically intact but with evidence of lead intoxication, intracanal bullet or new onset neurological deficit. They further recommended that for patients with complete and incomplete neurological deficits at the cervical and thoracic levels, surgical decompression is of minimal benefit and may increase the incidence of complication than in patients managed non-surgically. Also, motor recovery has been reported to be better after removal of a bullet retained in the spinal canal than in those treated non-surgically.^[14] This is similar to the outcome in our presented case, where the patient had a good recovery of motor function after the bullet was surgically removed. A peculiar observation is the recovery of motor function in our patient even after the 4-week delay before surgical intervention. Similar good outcomes in motor function after delayed surgical intervention were reported by Scott *et al.*^[15] and Harsha and Thomas^[10] in their case reports. Harsha and Thomas^[10] explored and surgically removed ballistic fragments 3 months after penetrating missile injury to the cauda equina and had recovery of motor function. The neurological deficits may be due to secondary mass effect, compression, and stenosis at the level of the retained bullet or fragment, and surgical removal of the

compressive object, even after some delays, is highly recommended in selected patients.^[10,15]

CONCLUSION

The incidence of firearms-related violent crime is rising in our environment, and so we may be presented with more cases of gunshot injuries to the spine. It is hoped that some of the principles highlighted in the presented case may be utilized to guide the management of gunshot spine injuries. Although early intervention is always recommended in the management of spine injuries, delayed surgical intervention may be beneficial and should be considered in selected patients.

Patient consent

Appropriate patient consent was obtained from the patient for permission to publish the case and the included images. The patient understood that her name and initials would not be published, and due efforts were made to conceal the identity, but anonymity cannot be guaranteed.

Abbreviations

GSW, gunshot wound; CSF, cerebrospinal fluid; CT, computed tomography.

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Conflicts of interest

There are no conflicts of interest.

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