

Firearm bullet settling into the lumbar spinal canal without causing neurological deficit: A report of two cases

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Abstract

Background: Uncertainty still exists regarding the treatment of the patients presenting with gunshot wounds to the spine. Neurological insults, cerebrospinal fluid fistula, infection, lead or copper toxicity, migration of bullets, and spinal instability are included among the common challenging issues.

Case Description: An 18-year-old woman was admitted with low back pain following a gunshot injury five days ago. She was neurologically intact. Radiological examinations showed that a bullet was settled in L4-5 disc space. The bullet was removed with a unilateral L4-5 partial hemilaminectomy and discectomy from the left side. The second case was of a 29-year-old man admitted with radiating leg pain on the right side following a gunshot injury from his left side of lower back four months ago. He had only positive straight leg raising test. Radiological studies showed two bullets, one was in the psoas muscle on the left side and the other was in spinal canal that had caused a burst fracture of the L5 vertebra. Following L5 laminectomy and bilateral L5-S1 facetectomy, the bullet was removed from the spinal canal and L5-S1 transpedicular posterior stabilization was performed. The postoperative period of both patients was unremarkable.

Conclusion: Bullet settling into the lumbar spinal canal without causing neurological deficit may require surgical intervention. Removal of bullets provided not only pain relief in both the cases but also prevented future complications such as migration of the bullets, plumbism, and neuropathic pain and instability.

Key Words: Bullet, gunshot, penetrating spinal injury, retained bullet, spine, spine trauma

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INTRODUCTION

Ambrose Pare described a penetrating spinal cord injury caused by a gunshot for the first time in 1557.^[9] Since then, many combat-related or civilian gunshot injuries to the spine have been reported; however, uncertainty still exists for the treatment of such patients.^[12] The level of the spine primarily determines the severity of the neurological deficit and outcome.^[13] Neurological insults, cerebrospinal fluid (CSF) fistula, infection, lead or copper toxicity, migration of bullets, and spinal instability

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are included among the common challenges. Presence of CSF fistula or progressive neurological worsening correlated with radiological compression of neural elements on radiological studies are regarded as absolute indicators for surgery.^[12] Treatment of the spine injuries with missile should be chosen based on the nature of the injury.^[10] Bullet in the intervertebral disc space and/or existing spinal instability require reconstruction and stabilization using instrumentation and fusion.

In this study, two cases of a gunshot wound in which the bullets lodged in the lumbar spine without any neurological injury are reported.

CASE REPORTS

Case report 1

An 18-year-old woman was admitted with low back pain following a gunshot injury to the back in the Libyan combat five days ago. During physical examination, an entry wound in her posterior left flank was detected. She had pain around the bullet entry zone and in the low back. Her examination was completely normal. Radiological studies revealed a bullet in the left side of the L4-5 disc space [Figure 1]. During operation, a unilateral L4-5 partial hemilaminectomy and discectomy from the left side and removal of the bullet was performed. The bullet was completely embedded into the disc space and partly destroyed the posterior-inferior end plate of the L4 vertebra; otherwise, the other structures of the spine were anatomically intact; no dural tear and/or neural injury was identified. The bullet entry wound in the back of the patient was also repaired during the same session by a surgeon without any complication. Her postoperative period was unremarkable, and she was free from pain originating from the low back.

Case report 2

A 29-year-old man was admitted with radiating leg pain on his right side following a gunshot injury from his back in the Libyan combat four months ago. His neurological examination was completely normal except a positive straight leg raising test on the right side. Radiological

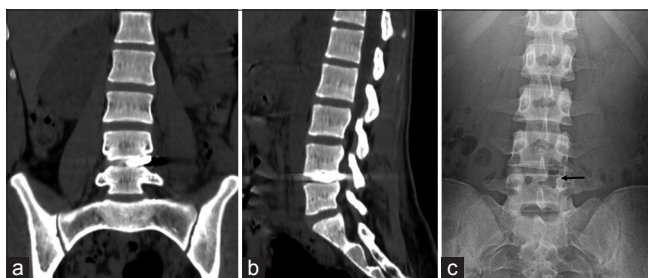


Figure 1: The bullet lodged at L4-5 disk space in coronal (a) and sagittal (b) CT scan, and postoperative a unilateral L4-5 partial hemilaminectomy defect (black arrow) on the left side (c) after removal of bullet

studies showed two bullets, one was in the psoas muscle on the left side and the other was in the spinal canal that had caused a burst fracture of the L5 vertebra [Figure 2]. A congenital L5 lamina defect in the midline was also seen in plain anteroposterior radiograph. He underwent a spinal operation. Following L5 laminectomy and bilateral L5-S1 facetectomy, the bullet was removed from the spinal canal and L5-S1 transpedicular posterior stabilization was performed. There was neither neural nor dural injury. His right leg pain disappeared immediately following operation.

DISCUSSION

We present two referred cases of combat-related gunshot injury of the spine in the Libyan conflict. In civilian practice, incidence of gunshot wounds to spine accounts 13–17% of all gunshot injuries.^[15] Similarly, the incidence of spinal injuries from gunshot were found to be 10 and 17% for the Afghanistan and Iraq war, respectively.^[16]

Penetrating gunshot injuries to the spine with high caliber bullets have mostly permanent neurological defects. The degree of neural and mechanical damage depends upon the physical properties and the direct impact of the bullet, the pressure shock waves, and the temporary cavitation.^[8] The degree of transection and contusion of the spinal cord, compression of neural elements by hematoma, bone and/or foreign body fragments, disruption of the spinal cord vasculature, and spinal instability are possible from extension of the injury.^[15] Missile settling in the disc space may provoke pain and neurological deficit by causing injury in nucleus pulposus and annulus.^[5,14] The first case reported here presented with only low back pain apart from the bullet



Figure 2: The bullet (arrow head) in spinal canal with L5 corpus fracture (arrow) in axial CT scan (a), the bullets lodged in spinal canal and the congenital lamina defect just medial to the bullet at S1 level and the bullet lodged in psoas muscle on left side in plain anteroposterior radiography (b), L4-S1 posterior stabilization seen in postoperative lateral plain anteroposterior radiography (c)

entry site and the second case presented with only right leg pain.

Thoracic region is the most commonly affected area^[17] with most risk of complete injury^[4] for civilian gunshot wounds. In an epidemiological investigation involving combat casualties and including explosions and gunshot injury, Schoenfeld *et al.*^[16] reported that the most involved area was the lumbar spine, followed by thoracic and cervical spine. The presence of intracanalicular bullet fragments was accepted as an important predictor of neurological injury.^[6] Both of the presented cases suffered from injury to the lumbar area and had bullet in the spinal canal without any neurological deficit.

Plain films can be used for determining the existence and/or level of the bullet and/or damage of the spine.^[3] For determining the integrity of spine in means of vertebral body, spinal canal, facets and alignment, and better localization computed tomography in axial, coronal, and sagittal planes should be sought.^[12]

There is still controversy for optimal treatment for bullets lodged in the spinal canal. The treatment modalities for such patients need to be managed individually. The treatment strategies—bullet removal from lumbar disc space and bullet removal from spinal canal and stabilization—were decided after detailed evaluation of each patient in view of clinical and radiological findings.

Klimo *et al.*^[12] reported that there is no need to perform exploratory surgery for removal of bullet or fragments in order to reduce infection and prevent lead or copper toxicity. The authors suggested laminectomy in patients with cervical injury who demonstrated compressive pathology as well as in patients with incomplete neurological deficit, and instrumentation if the injury deemed unstable. In a recent series involving civilians, Bumpass *et al.*^[4] concluded the surgical indication as post-gunshot spinal infections and persistent CSF leaks. They pointed that injury caused by a small-caliber bullet to the spine infrequently destabilizes the spine, even if all the three columns are impacted. Bono and Heary^[3] recommended the removal of the bullet that was located in the spinal canal between T12-L5, and instrumentation for unstable cases in all levels. Some authors suggested surgery for the cases showing migration^[1] and toxicity^[13] or the cases with bullets in the disc space.^[5,7] The bullet may show cranial migration in the spinal canal depending on the position of the victim; it may cause a change in neurological status and pain due to mechanical reactions.^[1] Even though it is rare, the bullet fragment primarily located within an intervertebral disc space may cause plumbism^[2] and back pain.^[5] Reactive tissue formation and compression due to the retained bullet can cause progressive neuropathic pain.^[11]

Such studies help in the accumulation of scientific data. Studies reported regarding wartime spinal gunshot injuries are limited, and it seems there is no ethical and scientific way of conducting prospective, double blind clinical studies in the near future. Indeed, it should not to be; humanity must find a way of living without this kind of conflict.

CONCLUSION

Bullet settling into the lumbar spinal canal without causing neurological deficit may require surgical intervention. In the presented study, removal of bullets provided not only pain relief in both the cases but also prevented future possible complications such as migration of the bullets, plumbism, and neuropathic pain and instability problems. The problem reported here is caused by one of the most important issues of our world, the war economy. There is a direct relationship between war economy and people with gunshot spine injuries. If we would spend our energy for construction of a better world to live in peace, this paper would not exist.

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Conflicts of interest

There are no conflicts of interest.

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