

Long-term Fistula Formation Due to Retained Bullet in Lumbar Spine after Gunshot Injury

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We here report a case of long-term fistula formation due to bullet retention for 30 years in the lumbar spine after a gunshot injury, and describe its treatment. A 62-year-old male visited our hospital due to pus-like discharge from his left flank. The discharge had been present for 30 years, since his recovery from an abdominal gunshot injury. A spine radiography showed radiopaque material in the body of the third lumbar vertebra. Foreign body was removed using an anterolateral retroperitoneal approach. The postoperative course was uneventful. The patient was discharged 7 days after the operation and was followed-up for 8 months, during which time, the fistula did not reoccur. A bullet retained long term in the vertebral body may cause obstinate osteomyelitis and fistula formation. A fistula caused by a foreign body in the spine can be effectively treated by surgical removal. [J Trauma Inj 2017; 30: 51-54]

Key Words: Gunshot, Spine, Bullet injury, Metal toxicity

I. Introduction

In western countries with little regulation of civilian firearms and in countries with civil wars, spinal cord injuries due to gunshot wounds are the third most frequent accidents following motor vehicle collisions and falling.⁽¹⁾ However, in other countries, foreign bodies, especially bullets, in the spine are not frequent medical occurrences. A previously published article discussing gunshot injuries focused mostly on acute management, but few articles exist discussing the long-term consequences and complications of injuries from bullets retained in the spine.⁽²⁾ We here report a case of long-term fistula formation due to retained bullet in the lumbar spine for 30 years, and describe its treatment.

II. Case Report

A 62-year-old male visited our hospital due to pus-like discharge from his left flank. The discharge had been present for 30 years, and had been worsen 7–8 months prior to visit. However more precise history about foreign body was not available by patient refusal at first visit.

A spine radiograph showed a 3.3×2.7×5.0 cm sized radiopaque foreign body impacted in the vertebral body of the third lumbar (L3) vertebra, spreading into the paravertebral space and the anterior aspect of L4 (Fig. 1A, B). A coronal T2-weighted magnetic resonance image (MRI) showed an irregular shaped signal-void mass lesion to L3 (Fig. 1C). The patient refused to explain the cause of the spinal radiopaque material.

First, an incision and fistulectomy were performed

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under local anesthesia, and a specimen was obtained for culture and microbiological identification. *E. coli* was isolated. The wound was irrigated intermittently, and the patient was prescribed intravenous antibiotics for 2 weeks, followed by oral antibiotics for 2 months. Slight improvements to wound discharge were observed. However, patient follow-up was lost for 5 years. The patient revisited our hospital with the same symptoms 5 years later. There was no significant interval change on lumbar radiography. Magnetic resonance fistulography was performed, which showed retained bullet with a fistula from the paravertebral space to the skin (Fig. 2A, B).

Preoperative CT scan showed that aorta was away from surgical corridor and there was sufficient gap between aorta and vertebral column in a distance of 11 mm. The extent of adhesion to great vessel around foreign body did not seem to be severe (Fig. 3). To eliminate the foreign body and the fistula tract, an anterolateral retroperitoneal surgical approach was scheduled under general anesthesia. Linear oblique incision was started from the fistula at the level of L3, the tract was traced from the skin to the vertebral body. Visceral structure including descending aorta was retracted gently. The path surrounding the tract to the vertebral body was severely adhered, and chronic

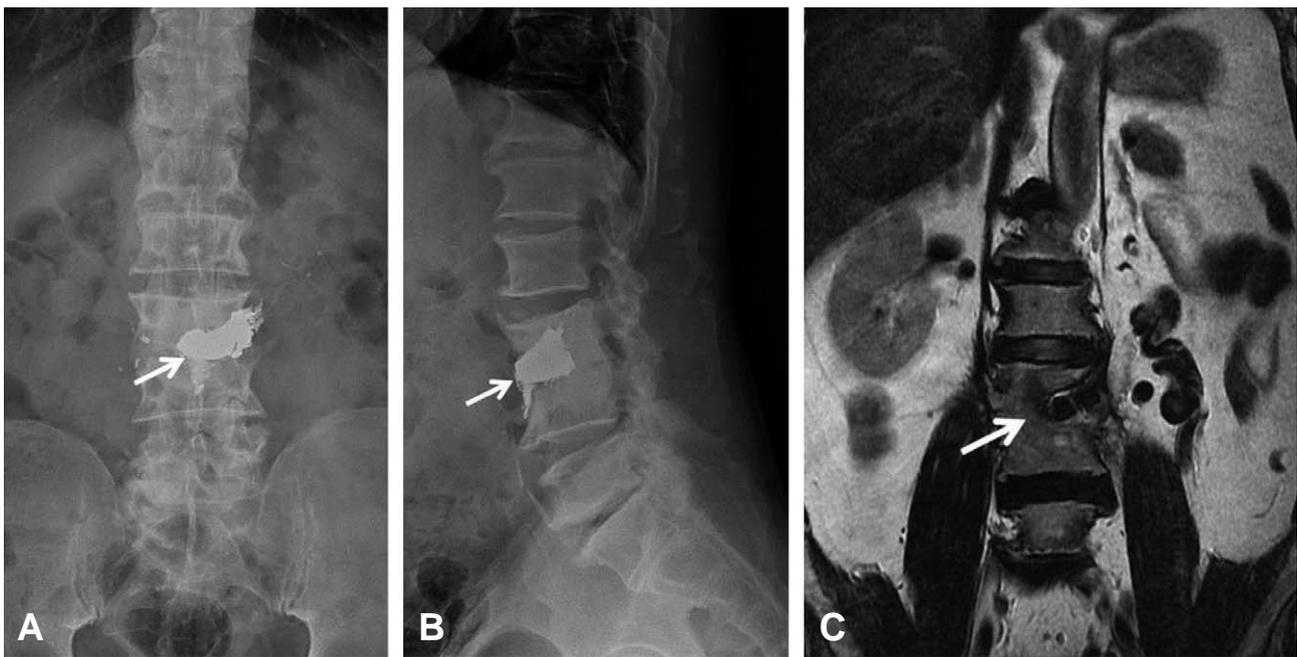


Fig. 1. (A, B) Spine radiograph showing a radiopaque foreign body (arrow) impacted in the L3 vertebra extending to the anterior aspect of L4. (C) Coronal T2-weighted MRI showing an elongated signal void mass lesion in the left side of L3.

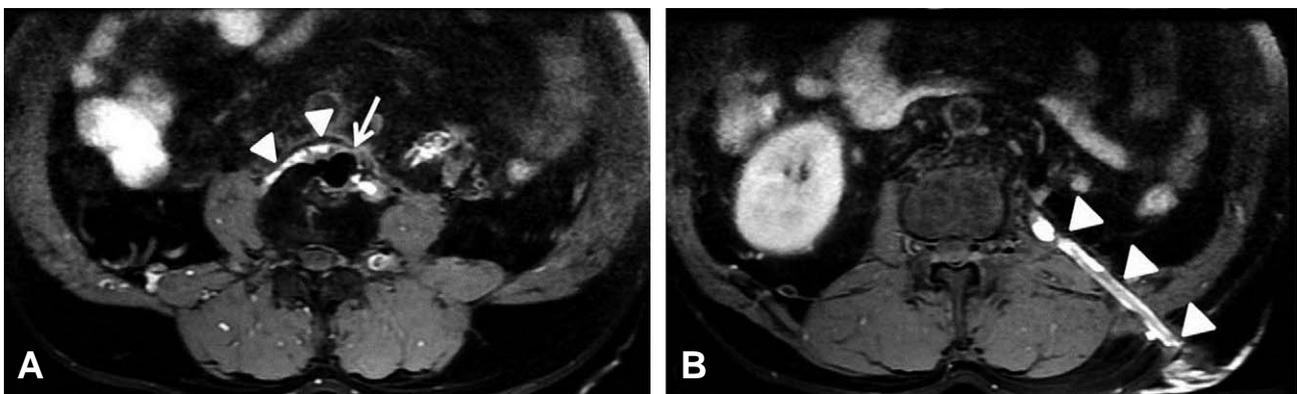


Fig. 2. (A, B) After diluted MR contrast materials was injected into fistula, axial T1-weighted MR fistulography showing a definite fistula from the paravertebral space to the skin (arrowheads) and retained bullet (large arrow).

inflammation was observed (Fig. 4A).

The radiopaque section thought to be an infected area was filled with a grey-white colored substance that had a mixed consistency of friable and hard metallic parts (Fig. 4B, C). The foreign body was removed through minimal corpectomy lest it causes spinal instability. The pathologic result reported that the removed



Fig. 3. Preoperative CT scan shows extensive metal artifact caused by metallic foreign body (arrow) at the L3 but great vessel were located away from surgical corridor.

material was a non-specific metallic foreign body. After operation, patient explained about foreign body. During his military service, he was involved small revolt. After several gunshots on his abdomen, he had got operation of bullet removal including partial colectomy and nephrectomy at military hospital.

The postoperative course was uneventful, and the wound healed successfully. The patient was discharged 7 days after the operation, and was followed-up for 8 months, during which time, the fistula, vertebral instability and pain did not reoccur.

III. Discussion

Of all traumatic spinal cord injuries due to gunshots, 13–17% are of accidental cause.(3) It is not difficult to detect a metallic bullet in a radiograph of the spine; however, radiologists from countries with strict gun laws may not be familiar with imaging findings of a bullet. Furthermore, an increasing number of vertebroplasty procedures may result in physicians' misinterpreting bullet fragments as bone cement inserted in the spine, which can result in delaying the optimal management for patients with a spinal injury caused by a bullet. Furthermore, in case of the original shape of foreign body was disintegrated or combined with

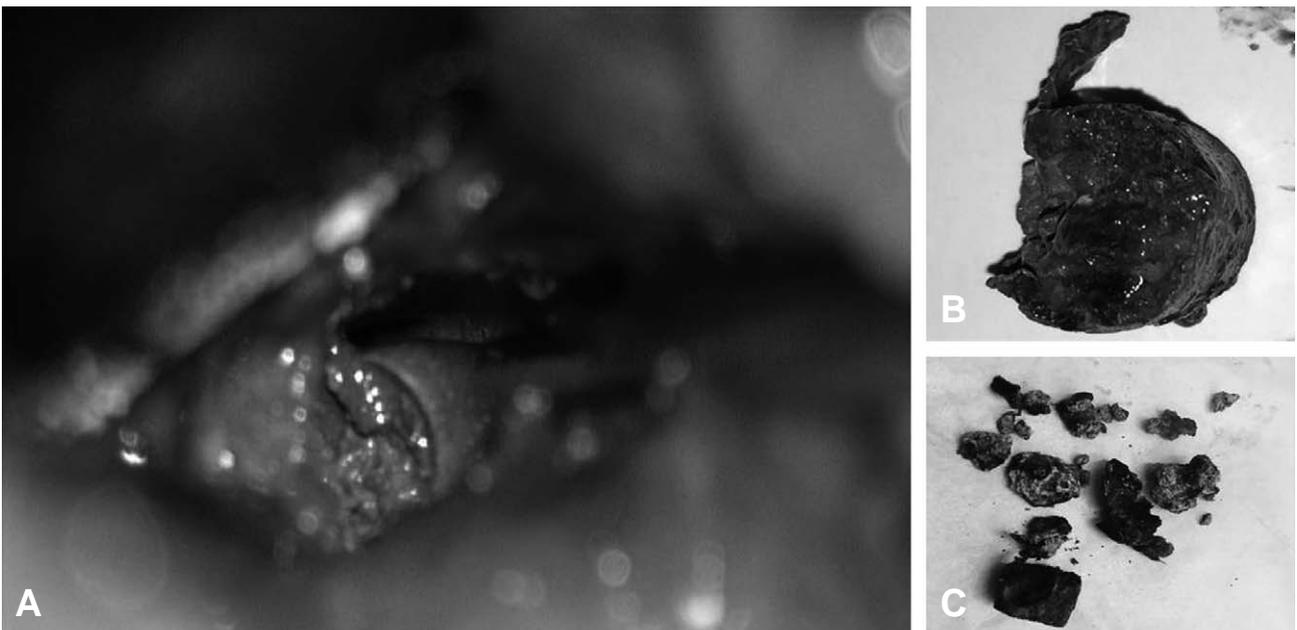


Fig. 4. (A) Intraoperative microscope photo shows fistula tract was severely adhered, and chronic inflammation was observed. (B, C) Intraoperative photos shows the grey colored foreign body with cylindrical-shape of mixed consistency and additional debris were found.

granulation pocket, it is more difficult to identify.(4)

The most common complication of a foreign body in the sub-acute phase is infection; osteomyelitis may occur, as well as: life-threatening bacterial meningitis due to an ascending infection.(5) Moreover, the consequences of long-standing retained foreign bodies may differ by case based on the composition of the foreign body. Biocompatible or inert foreign bodies do not usually result in problematic reactions but bullet components, including lead and copper, may create various problems.(6) Indeed, long-term lead toxicity, known as plumbism, results from the effects of lead at a cellular level and includes inhibition of neurotransmitter release, competition with calcium, and dysregulation of cellular metabolism.(7) Patients may present with microcytic hypochromic anemia, chronic renal failure, abdominal pain, anorexia, neuropathy, lethargy, encephalopathy, and behavior changes.(8) Bullet fragments in an articular capsule commonly cause systemic toxicity because synovial fluid dissolves lead.(1)

Copper, on the other hand, produces toxic effects through direct tissue contact by interacting with carboxylic acids, amides, and amines, ultimately resulting in protein degradation.(9,10) Copper also produces neurolysis, myelinolysis, and other local tissue necrosis.(11) Fortunately, the current case did not show these signs and symptoms.

Surgical indications of delayed systemic complications include gradual neurological changes, spinal instability, persistent cerebral spinal fluid leak, and infection.(12) In these cases, the purpose of surgery is to increase recovery and minimize complications associated with neurological dysfunction.(13) Fortunately, in our case, the foreign body did not penetrate the spinal canal or dural sac; thus, no neurological complications occurred, and the patient survived the initial injury. However, a long-standing fistula developed. Although the patient did not present with systemic toxicity, surgery was necessary to remove the foreign body and resolve the obstinate fistula.

The surgical approach employed depends on the location of the foreign body. If the foreign body is near the dorsal aspect of the spinal canal, a dorsal laminectomy can be performed; however, if the foreign body is located on the ventral aspect of the spinal canal,

an anterolateral approach and corpectomy are preferred.(1) In our case, we used a retroperitoneal approach, as the bullet was located anterior to the vertebral body in the lower lumbar area.

In conclusion, long-term retained bullets in the vertebral body may cause obstinate osteomyelitis and fistula formation. Fistulas caused by retained foreign bodies in the spine can be effectively treated by surgical removal.

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