

## CASE REPORT

# A Rare Spinal Injury

## *Gunshot Wound to The Odontoid Process*

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**Study Design.** Case report.

**Objective.** We present a 18-year-old male patient with gunshot injury through right scapular region with the bullet ending up and causing a fracture in the odontoid process.

**Summary of Background Data.** Odontoid fracture owing to gunshot wound is an extremely rare injury.

**Methods.** An 18-year-old male patient was brought to the emergency department with gunshot injury. x-Ray imaging showed retained bullet in the odontoid process. Computed tomography scan showed fracture of the odontoid and body of scapula consistent with the trajectory of the bullet. Owing to a normal neurological examination, conservative follow-up was decided and given a Philadelphia collar.

**Results.** At 2 years' follow-up, patient demonstrated limited axial rotation and flexion/extension. However, no pain and neurologic problem were observed.

**Conclusion.** Odontoid fracture owing to gunshot wound can be treated conservatively; emergency or elective surgical intervention was not necessary. In the follow-up, patient did not demonstrate any signs of neurological impairment or infection.

**Key words:** bullet, Cervical spine, collar, gunshot wound, Odontoid Fracture.

**Level of Evidence:** 5

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Vertebral and spinal cord injuries owing to firearms have a high rate of morbidity and mortality, and are most commonly seen in young males and account for approximately 20% of traumatic spinal

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injuries.<sup>1</sup> Cervical spine injuries, in turn comprise up to 20% to 30% of all vertebral gunshot wounds.<sup>2</sup>

Owing to close proximity to the spine and vertebral arteries, gunshot injuries of the cervical vertebra can be life-threatening.<sup>3</sup> We present an 18-year-old male patient with gunshot injury through the right scapular region with the bullet ending up and causing a fracture in the odontoid process with no neurological impairment. We aim to share our experience with this very rare and potentially devastating injury.

## CASE

### History

An 18-year-old male patient was brought to the emergency department with gunshot injury. Patient was shot from outside his car while running from the law enforcement.

### Physical Examination

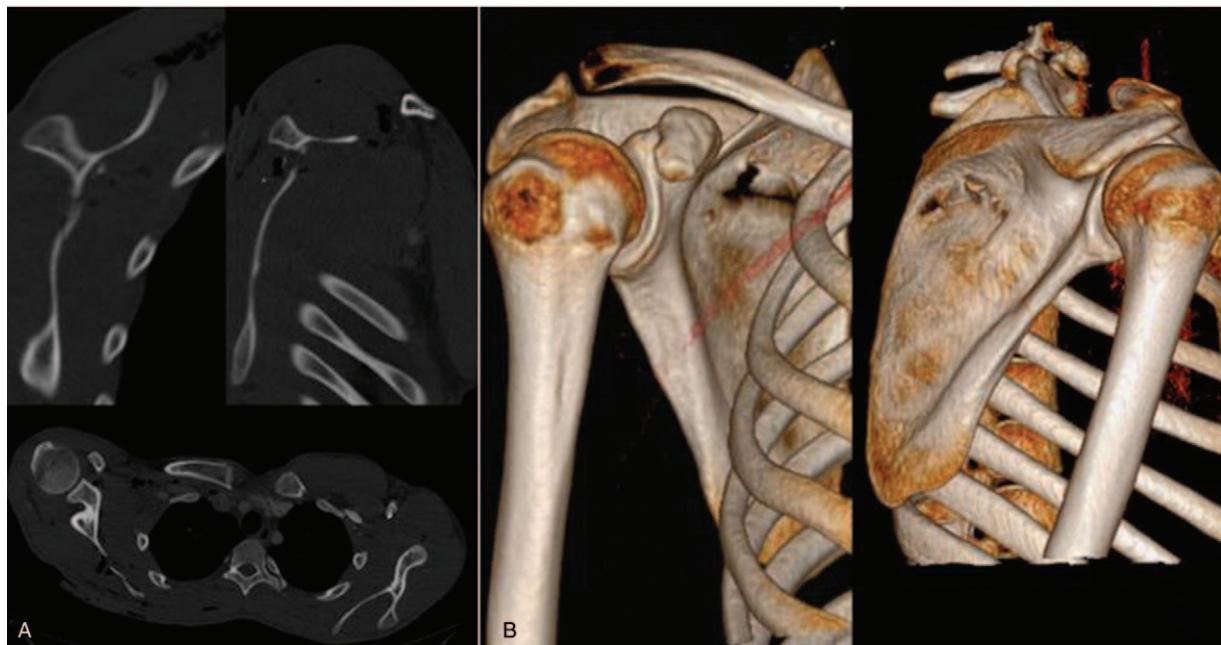
Patient's vitals were stable and in the normal range upon presentation. Physical examination revealed one entry hole in the lateral right thigh with a corresponding exit hole in the medial thigh and one entry hole in the right scapular region with no corresponding exit hole (Figure 1). No further injuries were found in the rest of the examination. The patient had no neurological or circulatory deficits.

### Radiological Examination

x-Ray imaging (Figure 2) showed retained bullet in the odontoid process. Computed tomography (CT) angiogram (Figure 3) showed a fracture of the scapular body and a fracture of the odontoid process consistent with the trajectory of the bullet. Vertebral arteries were not injured.

### Treatment

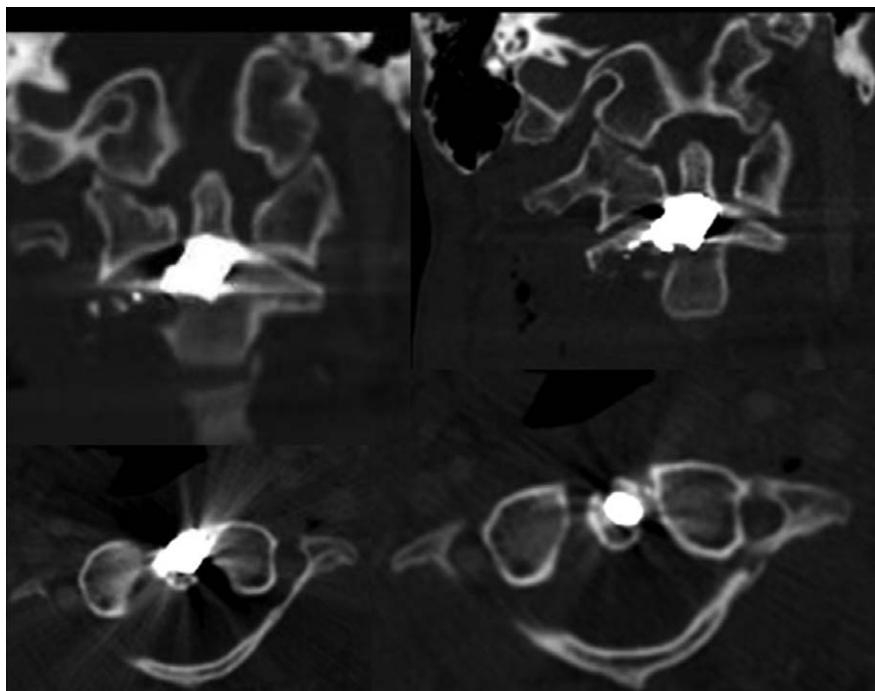
The patient was given a Philadelphia collar. Bullet entry and exit holes were debrided and left to secondary healing. The patient was admitted and started on 1st generation cephalosporin and aminoglycoside prophylaxis. Neurological examination was repeated in regular intervals after admission and was found to be stable. Owing to a normal neurological examination and possible catastrophic complications of an invasive procedure, conservative follow-up was decided after discussing with the patient and his relatives. Simple arm sling was prescribed for the scapular fracture.



**Figure 1.** Computer tomography shows scapular fracture owing to entry hole of bullet.



**Figure 2.** AP-Lateral cervical spine x-ray shows the bullet in the odontoid process.



**Figure 3.** Computer tomography showed the fracture of odontoid fracture owing to bullet.



**Figure 4.** Computer tomography shows healing of odontoid fracture and stability at second years follow-up.



**Figure 5.** (A) Lateral cervical x-ray examination in patient's full flexion at second year follow-up visit. (B) Lateral cervical x-ray examination. (C) Lateral cervical x-ray examination in patient's full extension. (D) Odontoid view (open mouth cervical view).

### Follow-up

At second-week follow-up simple arm sling was discontinued and range of motion exercises was started. The entry hole of bullets was healing without any problem. Patient was followed up for 12 weeks with a Philadelphia collar for odontoid fracture. Patient did not report any neck pain. Neurological examination was performed and found normal at each follow-up. At the end of 12 weeks, a control cervical CT was performed. The collar was discontinued. Neurological examination and infection markers (C-reactive protein and sedimentation rate) were normal.

At the 6 months' follow-up, patient was pain-free. x-Ray and CT scans demonstrated no signs of instability. Axial rotation and flexion/extension at the neck were limited with rotation at 30° to 40° on both sides, no extension, and 30° of flexion. Physical therapy was started to increase the range of motion.

### Final Visit

At 2 years' follow-up, x-ray and CT scans demonstrated no signs of instability (Figure 4). However, the patient demonstrated limited axial rotation and flexion/extension. Axial



**Figure 6.** Patient's cervical range of motion at second year follow-up visit.

rotation was 60° to both sides. Lateral flexion was 30° to both sides. Clinical examination revealed cervical flexion and extension ranges were limited to 50° and 15°, respectively (Figure 5A–D, Figure 6).

## DISCUSSION

There is currently no consensus on the surgical treatment of cervical firearm injuries. Complications of cervical gunshot wounds include vascular and neurological injuries, problems in fracture healing (*i.e.*, malunion and nonunion) and infection.<sup>4</sup> Injuries to the vertebral arteries can be potentially devastating.<sup>5</sup> Although emergency surgical intervention is not usually indicated, in some cases such as hemodynamic instability and excessive hematoma, delayed spinal cord decompression, stabilization, or debridement may be required.

Neurological injuries are also very common in cervical gunshot injuries.<sup>5</sup> Gunshot injuries to the vertebra may cause neurological injury through both direct and indirect means. Even in the absence of direct injury to the spine, the concussion caused by the bullet can cause neurological injury.<sup>3</sup> Infection is also a potential risk because of the injuries to the soft tissues.<sup>2</sup> In the absence of any neurological and vascular injury, removing the bullet is controversial. Although some authors suggest removing the bullet to

prevent possible but rare late infections and neurological deficits even years after the incident, it is generally assumed that if the patient is neurologically intact, removing the bullet is not in the best interest of the patient because of the fact that the void after the bullet or surgery itself may cause neurological deficit or other complications.<sup>6,7</sup> Whether removing the bullet is clinically meaningful in terms of toxicity or neurotoxicity is currently still debated.

In the absence of vascular and neurological injuries, the decision to operate gunshot fractures of the cervical spine is mostly decided on the type of fracture and the resulting instability in the spine. Nevertheless, instability is very rare and as such uncomplicated cervical gunshot injuries requiring surgical intervention are quite rare. In most cases, the cervical vertebrae were evaluated as stable in the literature.<sup>5</sup> Kupcha *et al*,<sup>2</sup> in their case series with 28 patients, reported that routine cervical dissection was not found to be helpful because none of the patients had unstable injuries. Medzon *et al*<sup>4</sup> have reported 81 patients with nonmilitary-type firearm injuries to head and neck with only 19 of them (23%) having vertebral fracture and only three requiring surgical stabilization. Mechanical instability is not common because of the fact that civilian-type gunshot injuries are usually low-energy injuries.

In our case, emergency or elective surgical intervention was not necessary. In the follow-up, the patient did not demonstrate any signs of neurological impairment or infection; however, loss of range of motion was a major complaint.

## ➤ Key Points

- Odontoid fracture owing to gunshot wound is an extremely rare injury.
- Odontoid fracture owing to gunshot wound can be treated conservatively.
- Loss of range of motion may be a complication of conservative treatment.

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