

CASE REPORT

## Complete fracture of the lamina of the sixth cervical vertebra with hemiplegia: a case report

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### Abstract

**Introduction** We report the rare case of a 27-year-old man who presented a right sided complete hemiplegia after a neck trauma due to a road traffic accident.

**Materials and methods** Computed tomography revealed a complete fracture of the C6 lamina including a partial fracture of the right articular process with complete rotation of the fragment into the spinal canal with a major compression of the right side of the cord. The patient was operated urgently and underwent posterior approach for C6 arch removal followed by a C6C7 anterior fusion as T2 weighted magnetic resonance imaging revealed a completely torn C6C7 disc with a hematoma under the posterior longitudinal ligament associated with an increased cord signal. Patient could walk normally 6 weeks after the accident. At 2 years follow-up, he recovered full sensation of his right body but had a residual intrinsic muscle weakness in his right hand.

**Conclusion** This is the first paper, in the literature, to describe a complete laminar fracture at the cervical spine level with hemiplegia. Early surgical intervention probably provides the better neurological outcome.

**Keywords** Cervical trauma · Complete laminar fracture · Hemiplegia

### Case report

A 27-year-old man presented a neck trauma after a road accident occurring around midnight; he was involved in a head-on collision while he was driving his pick-up, not wearing his seat-belt but there was no alcohol context. The initial medical assessment made by the emergency team found a man with a normal consciousness associated to a severe neck pain with complete hemiplegia of the right side. No other injuries were noted. The patient was intubated and transported immediately to our hospital for further evaluation and investigations. A full body CT scan was performed and ruled out fractures of the limbs and head injury; the cervical spine showed a complete fracture of the C6 lamina including a partial fracture of the right articular process with complete sliding and rotation of the fragment into the spinal canal with a contact between its right side and the posterior wall of the vertebral body of C6 and a major compression of the right side of the cord (Fig. 1), explaining the right sided symptoms of the patient. No other bony lesions of the cervical spine were noted.

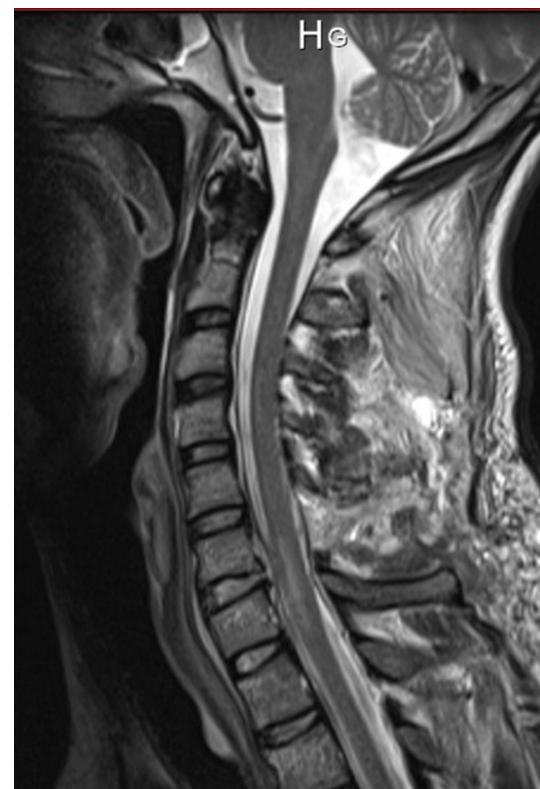
The patient was taken to the operating room for an emergency surgery approximately 3 h after the accident. Patient was positioned in a prone position and a posterior approach was performed. The posterior arch of C6 was found completely mobile with its right side completely twisted into the canal, the fragment was removed completely in an “en bloc” fashion and showed an intact dura with no tear or cerebrospinal fluid leakage. A small medial part fracture of the right superior articular process of C7 could be seen, but no fixation was performed at that stage. Patient was extubated postoperatively and medical examination after the surgery showed paresthesia on the right forearm and right leg with altered sensation for temperature on the left leg (which confirm an initial

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**Fig. 1** Computed tomography scan showing complete lamina fracture of C6 with complete shift to the right side of the spinal cord



**Fig. 2** MRI showing an increased cord signal on T2 weighted images with a hematoma behind the C6C7 disc

Brown-Séquard syndrome at the time of accident); motor exam revealed an improvement of the neurological symptoms with a remaining partial deficit of the right hand intrinsic muscles and finger flexors (3/5), and right quadriceps and ankle extensors (3/5). A postoperative MRI was done to assess the spinal cord, discs and ligaments damage, it revealed a completely torn C6C7 disc with a ruptured annulus and a hematoma under the posterior longitudinal ligament associated with an increased cord signal on T2 weighted images (Fig. 2). The C5C6 disc seemed intact. Therefore, a second surgery was performed to stabilize the C6C7 level 3 days after the accident. Patient was positioned in a supine position and an anterior prevascular approach was performed, it revealed a completely torn C6C7 disc with high instability, the C5C6 disc was intact and tested by a discography that showed no leakage of the contrast medium. The C6C7 level was blocked with a cage filled with autologous bone graft from the iliac crest and a plate (Fig. 3). The patient had to wear a rigid collar for 2 months. 2 weeks after the accident, he left for a rehabilitation center to continue the physiotherapy, he could stand up and walk normally at 6 weeks with a remaining minor deficit of the right hand intrinsic muscles, no bladder or bowel disturbance were noted, and his sensation fully recovered. The patient was followed up regularly, and seen 2 years after the accident; the recovery was



**Fig. 3** Lateral X-ray after C6C7 anterior fusion

satisfactory with a normal gait pattern, and an almost normal motor function of his right upper extremity. In fact, the residual intrinsic muscle weakness in his right hand remained. The early surgical intervention probably provided the better neurological outcome.

## Discussion

This paper describes a rare case of hemiplegia caused by a cervical trauma. The complete laminar fracture of C6 with canal intrusion of the fragment on the right side caused a complete neurological deficit of the right upper and lower limbs.

Isolated laminar fractures are rare [1–7], but similar injury to the one of our patient was described 3 times in the literature, but in all these cases, the fracture of the lamina was not complete, and was rather an invagination of the laminae due to a greenstick fracture.

The paper by Makan [6] described a trauma of the neck that was the result of a direct hit, with an incomplete laminar fracture of C5 with spinal canal encroachment, causing a right hemiparesis. The patient underwent a laminectomy without fusion, and recovered with residual intrinsic muscles weakness of the right hand. In the paper by De Barros Filho [4], a quadriplegia was described after an incomplete laminar fracture of C6. The patient underwent a posterior laminectomy with fusion, with partial recovery. Hähnle [5] described a traumatic invagination of the fourth and fifth cervical laminae with acute hemiparesis, open reduction, and internal fixation with wires was performed with full neurological recovery at 6 weeks. Table 1 summarizes the aforementioned laminar fracture reports.

Compared to the previously mentioned papers, the originality of our case is that the laminar fracture was complete, on both sides of the lamina, with maximum rotation of the fragment inside the canal making it touching

the posterior wall of the vertebral body and compressing the spinal cord completely on its right side.

As the patient had a full consciousness when the trauma occurred, he related, after the surgical procedures, that he remembered during the accident having a hyper rotation of his head to the left side and trying to contract all his muscles to protect himself. This rotation mechanism of the trauma explains why the lamina fragment was rotated and the C6C7 disc torn with a small fracture of the articular process only on the right side, uniarticular fracture is a classical consequence of rotation mechanism [8]. Regarding the fracture of the lamina itself, its mechanism is probably due to a hyperextension with axial compression [1]; the association with the head rotation was the reason for this rare fracture.

In this kind of spinal cord injury, prognosis will be mainly related to the timing of the surgical decompression. Fehlings [9] recommends urgent decompression of bilateral cervical dislocation in a patient with neurologic deterioration, surgery within 24 h may reduce length of intensive care unit stay and post-injury medical complications. The latter observation was showed by another study [10] where early intervention was associated with shorter length of stay and reduced pulmonary complications. Also, urgent intervention helps minimize the secondary damage caused by compression of the spinal cord after trauma [11]. In an animal model study, Carlson [12] showed that the degree of reperfusion hyperemia after decompression was inversely proportional to the duration of spinal cord compression and proportional to electrophysiologic recovery.

Our patient underwent urgent decompression approximately 3 h after the accident, which probably played an important role in the prompt neurological recovery and good global clinical result.

This is the first paper, in the literature, to describe a complete laminar fracture at the cervical spine level with hemiplegia. The hyper rotation with hyperextension mechanisms caused a complete laminar fracture of C6 with

**Table 1** Epidemiological data in the literature for cervical laminar fractures

	Laminar fracture type	Level	Injury mechanism	Neurological symptoms	Treatment	Surgical outcome
De Barros Filho [4]	Incomplete	C6	Extension/compression	Quadriplegia	Laminectomy, posterior fusion	Partial recovery with remaining paralysis of the left lower limb
Makan [6]	Incomplete	C5	Hyperextension	Hemiparesis	Laminectomy, no fusion	Full recovery with residual intrinsic muscle weakness in the hand
Hähnle [5]	Incomplete	C4/ C5	Hyperextension/compression	Hemiparesis	Open reduction and fixation with wires	Full recovery
Present study	Complete	C6	Hyperextension/compression/ rotation	Hemiplegia	Laminectomy, anterior fusion	Full recovery with residual intrinsic muscle weakness in the right hand

canal intrusion of the fragment on the right side causing a complete neurological deficit of the right upper and lower limbs.

**Conflict of interest** There are no conflict of interest for this case report.

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