

# Three-Level Sagittal Split Fracture of Cervical Spine—A Management Dilemma

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## Introduction

Sagittal split fractures of cervical vertebrae are quite uncommon and are caused by flexion distraction mechanism. They are inherently unstable fractures especially when associated with fracture of posterior elements. These fractures can result in significant cord injury. We present a case of a road traffic accident with sagittal split fracture of three consecutive cervical vertebrae with associated posterior element fractures.

A 51-year-old male patient presented to casualty of our hospital, a tertiary level trauma center after being airlifted from a hospital almost 1,000 km away. He was intubated and his Glasgow Coma Score was E3VtM6 with both pupils normal size and reacting to light. On examination, he had grade 0 power in all four limbs and sensation including the perianal sensations was absent below the level of injury. Bilateral plantars were upgoing. Cervical spine X-ray revealed normal alignment of cervical vertebrae. Computed tomography (CT) showed sagittal split fractures of C4, C5, and C6 vertebrae with no apparent canal compromise. There was fracture of the left lateral mass and the posterior elements of C4. The facet joint of C4 and C5 was distracted. There was also fracture of the left C1 lateral mass and C3 facet (► **Figs. 1–3**). The injury was classified as A4B2N4F2 as per the AO classification system. The injury was classified as A4B2N4F2 as per the AO classification system.<sup>1</sup> Subaxial spine injury classification and severity score came out to be 5 (C4–5 distraction injury with compromised integrity of discoligamentous complex with complete spinal cord injury).<sup>2</sup> As there was unstable fracture, decision was taken to stabilize the spine.

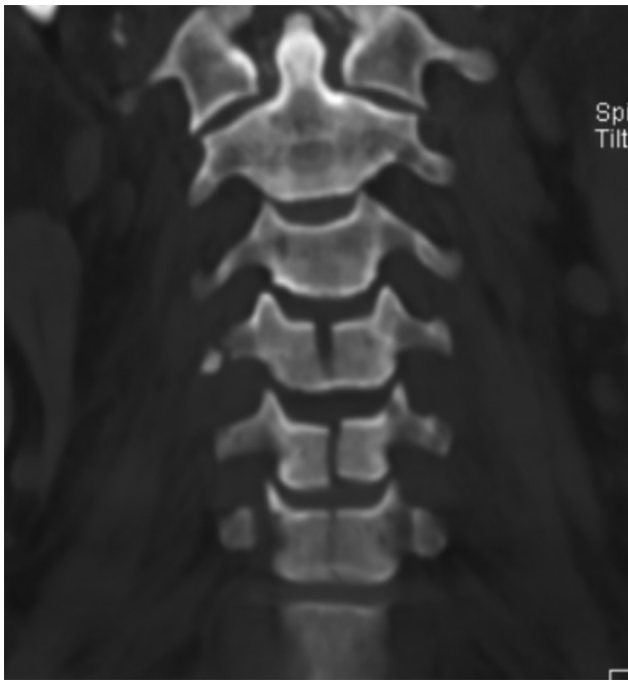
Midline incision was taken and dissection was done. Lateral mass screws were placed from C3 to C6 on both the sides. C1–C2 fixation was also done only on the right side as the patient's general condition was poor and the surgery had to be done in minimal possible time. Adequate decompression of the thecal sac was done. Then, both the vertical cords were connected with transverse connector at the level of C3–4 after compressing the two rods (► **Fig. 4**). Wound was closed

in layers after placement of a suction drain. Patient was shifted unreversed to the intensive care unit.

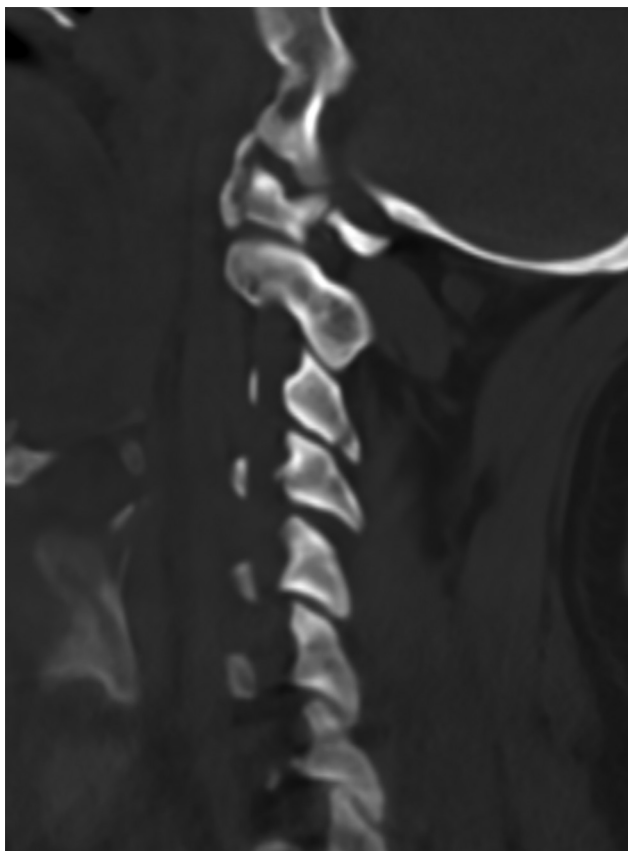
The mechanism of vertical sagittal fractures has been proposed to be “the chiseling action,” that is, the combination of vertical compression and flexion causes the anteroinferior border of the upper neighboring vertebra to impact against the anterosuperior border of the fractured vertebral body.<sup>3,4</sup> A vertical force is also said to be associated with flexion–extension and/or rotatory component. As most of sagittal fractures of vertebral bodies occur in association with other



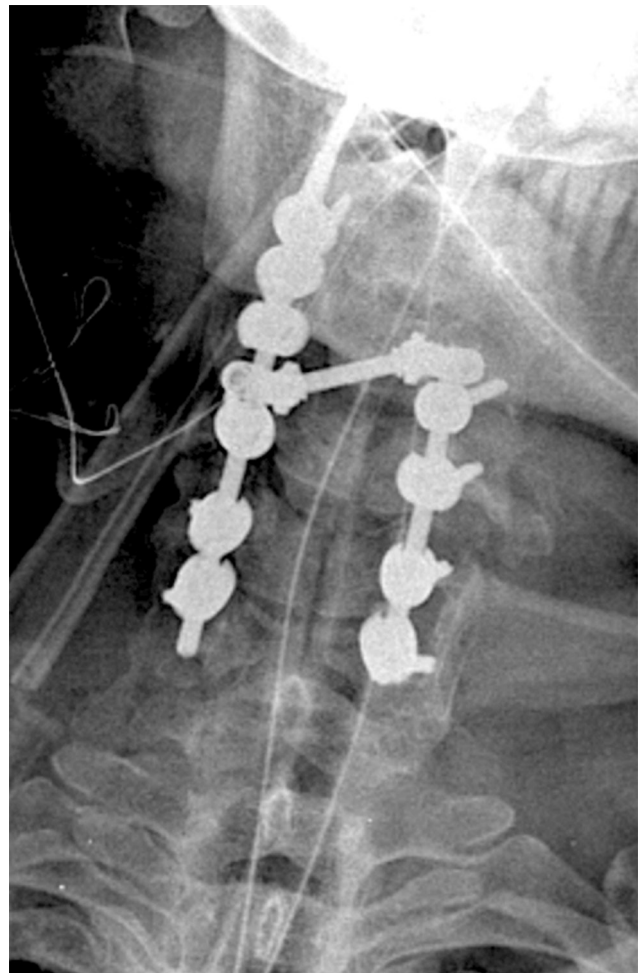
**Fig. 1** Noncontrast computed tomography (NCCT) cervical spine mid sagittal section showing the normal alignment of the cervical vertebral bodies.



**Fig. 2** Noncontrast computed tomography (NCCT) cervical spine coronal section showing the sagittal split fracture of C4 to C6 cervical vertebral bodies.



**Fig. 3** Noncontrast computed tomography (NCCT) cervical spine sagittal section at the level of facets showing C1 lateral mass fracture, C3 facet fracture, and C4-5 facet distraction injury.



**Fig. 4** Postoperative X-ray of the cervical spine showing a transverse connector put across both the rods.

fractures or dislocations, the existence of flexion force is suggested.<sup>5,6</sup> Thus, it can be deduced that the chiseling action is the most common mechanism of typical sagittal fractures. Sagittal fractures has been proposed to occur only when a vertical compressive force through the axis of the vertebral body is applied, with the superior and inferior endplates of the contiguous vertebrae exactly parallel.<sup>3</sup>

Sagittal fractures are not very common and only few case reports are there in literature describing the vertical sagittal fractures. A case of lower incidence might be due to the fact that these fractures are difficult to appreciate on plain X-rays, and CT or magnetic resonance imaging is required to make the diagnosis. Lee et al in their study found that sagittal split fractures constitute 3% (7/270 cases) of all cervical fractures.<sup>7</sup>

The choice of approach was between anterior approach and posterior approach. A long segment anterior approach to stabilize three cervical vertebrae in the absence of compression was not thought to be prudent. Although posterior lateral mass fixation alone will not provide the stability due to the presence of sagittal split at three consecutive levels, we thought of applying a transverse connector between the

two rods. We compressed the rods of each side and applied a transverse connector. We have used this technique in unstable Jefferson's fracture earlier but never in subaxial spine sagittal split fractures. Moreover, this technique of management of sagittal split fracture is not described in the literature either. It could be because of the fact that the sagittal split fracture are seen in association with burst fracture or other fracture in the adjacent vertebra, which discerns the management and isolated sagittal split fracture are rare and if present are usually managed conservatively. Usually, a plate can be placed at the level with sagittal split fracture after treating the more sinister fracture in the adjacent level. Our case was unique as there was only sagittal split fracture at three adjacent levels. We could appreciate the instability while exposing the posterior elements during surgery.

#### Conflicts of Interest

None declared.

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