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Non-operative Management of C2 Vertebral Body Fracture: Case Series

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ABSTRACT

Fractures of the second cervical vertebra (C2) are the most common cervical spine injury. The most common C2 fracture is the odontoid fracture. The fracture of C2 vertebral body is one of the rare findings and is commonly classified as vertical coronal, vertical sagittal, and transverse subtypes by Benzel. Although treatment guidelines for other C2 fractures are clear, there is insufficient evidence to support treatment guidelines for C2 body fractures. We present four case series of C2 body fracture managed non-operatively with external orthoses.

KEYWORDS: Benzel, C2 body fracture, cervical orthoses,

INTRODUCTION

The complex anatomical characteristics of the atlantoaxial (C1–C2) complex allow the atlas (C1) to pivot on its articulation with the axis (C2) to provide rotational motion.[1,2] The dynamic bio-mechanism of kinetic energy transferred to this complex as well as the location of the axis contributes to variety of axis fractures.[1-4] Fractures of the axis are common, accounting for 17% - 27% of cervical spine injuries.[5–8] Such fractures are classically divided into 3 categories: odontoid process fracture, hangman fractures (traumatic spondylolisthesis), and miscellaneous (nonodontoid, nonhangman fractures).[1,5,9] These classification systems hardly address a smaller portion of axis fractures that involve the C2 body, region that lies below the odontoid process and between each pars-interarticularis.

Benzel devised a classification for fractures of the C2 body after assessment of 15 axis body fractures in 1994.[10] This classification system encompass three types of fracture.[10] (Fig.1) High-quality literature on the management of axis body fractures is sparse.[11-15]The conventional management of axis body fractures is immobilization with external orthoses.[13] Axis body fractures are less likely to compromise the spinal cord as they are minimally displaced and the spacious upper cervical spinal canal provides a degree of safety. Such fractures occur in well-vascularized cancellous bone, which increases the chances of early and proper healing.[13]

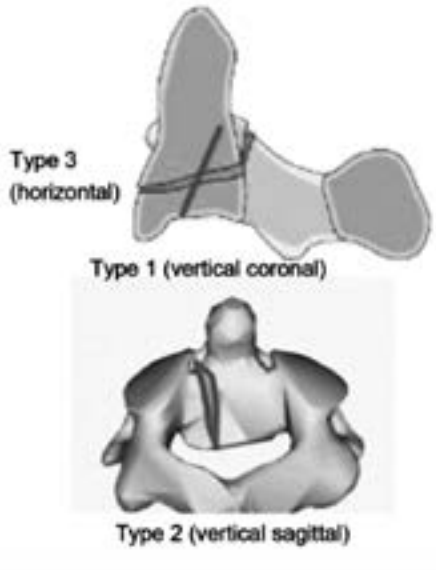


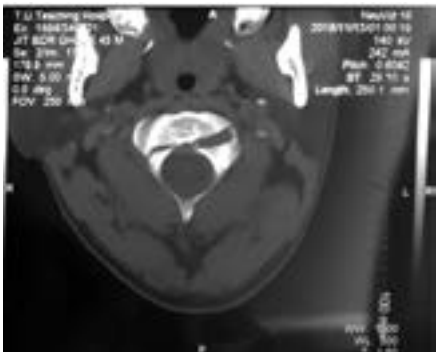
Fig. 1: A schematic illustration of C2 body fracture (Coronal type 1,Sagittal type 2 and Horizontal type 3)

We report four cases of fractures of the axis body and short-term result of management with external cervical orthoses.

Case series:

Case 1:

A 49 year old gentleman presented to emergency department with chief complaints of nape of neck pain after fall from motorcycle few hours back. The trauma management team did primary surveillance in the emergency room. On local examination of the cervical spine, there was localized swelling and tenderness over upper cervical region. Cervical spine range of motion was severely restricted. His neurological examination was normal in both upper and lower limbs. Antero-posterior and lateral cervical spine X-rays; cervical computed tomography (CT) scans with sagittal, coronal, and three-dimensional reconstruction was done. X ray and CT scan of cervical spine showed Benzel type 1 fracture of body of C2 vertebrae. (Fig.2) Patient was managed with Philadelphia cervical collar and pain medications(NSAIDs). Patient was advised to continue the Philadelphia cervical collar for 6 weeks and follow up in Orthopaedic spine out-patient department.



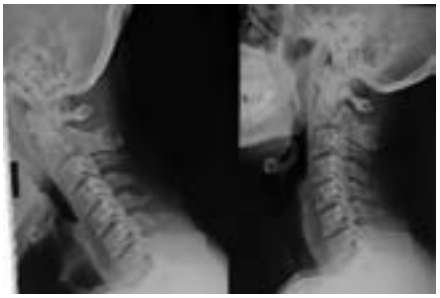


Fig.2: CT scan(A) & X ray (B) showing Benzel type 1 C2 body fracture.

At 6 weeks follow-up, patient was asymptomtic with normal cervical spine examination. X ray showed healed C2 vertebral body fracture. (Fig.3)

Fig.3: X ray showed healed C2 vertebral body fracture

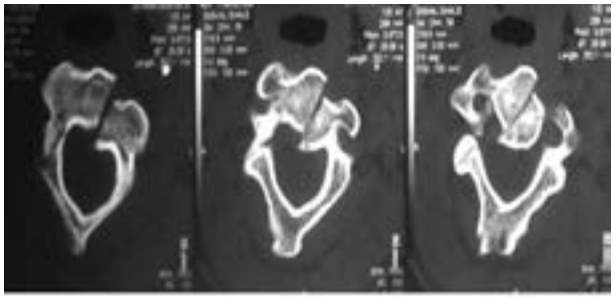
Case 2:

A 24 year old gentleman came to emergency department with history of road traffic accident 25 days back with chief complain of nape of neck pain. General examination of the patient was normal. On local examination, there was loss of cervical lordosis, range of motion of cervical spine was severely restricted and there was tenderness at upper cervical region. Neurological examinations of both upper and lower limbs were normal.

Plain radiograph was not clear. CT scan showed slightly displaced Benzel type 2 longitudinal fracture of body of C2 vertebrae.(Fig.4). Patient was managed non-operatively with Philadelphia cervical collar and pain medications (NSAIDs) on out-patient basis and was advised to follow up in orthopaedics spine OPD after 6 weeks. The patient was lost to follow-up. On telephonic conversation, the patient confirmed that he was

asymptomatic but refused to come for follow-up in our centre as he was asymptomatic and from remote place, and was on regular follow-up with local orthopaedic surgeon.

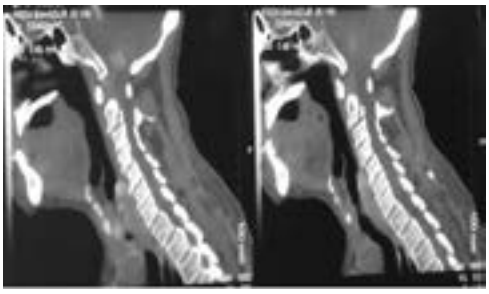
Fig.4: CT scan showing Benzel type 2 C2 body fracture.



Case 3:

A 85 year old gentleman came to our emergency department with history of fall from 3 metre height 6 days back with chief complain of neck pain. General examination was normal. On local examination, there was no deformity, range of motion of cervical spine was severerly restricted and there was tenderness at upper cervical region. Neurological examination of both upper and lower limbs was normal. X ray was not clear, but CT scan of cervical spine showed Benzel type 1 fracture of body of C2 vertebrae. (Fig.5)

Fig.5: X ray and CT scan : Benzel 1 C2 body fracture



Case 4:

A 65year old lady came to our emergency department with history of fall from standing height 3 days back with chief complain nape of neck pain. General examination was normal. On local examination, range of motion of cervical spine was severely restricted, and there was there was loss of lordosis and tenderness at upper cervical region. Neurological examination of both upper and lower limbs was normal. X ray was not clear but CT scan of cervical spine showed Beznel type 3 fracture of body of C2 vertebrae with lateral mass fracture on right side. (Fig.6)

Both patients were managed non-operatively with Sterno-Occipital-Mandibular-Immobilizer (SOMI) and pain medications. The osteoporosis was treated with calcium and Vitamin D supplementations and oral bisphosphonate on out-patient basis. Patients were advised to follow up on orthopaedics spine OPD after 6 weeks. Since both cases were referred from remote hospitals, they were followed up in their respective hospitals. On telephonic conversation, they removed orthoses at six weeks and the patients confirmed that they were asymptomatic but refused to come for follow-up as they were doing well carrying out all daily activities.

Fig.6: X ray and CT scan: Benzel type 3 C2 body fracture.

DISCUSSION

The unique anatomy and biomechanics of the second cervical vertebra (C2) contributes to variety of axis fractures.[1-4] Three types of C2 vertebra fractures are odontoid fractures, traumatic spondylolisthesis of the axis (hangman's fracture) and C2 body fracture.[5] 9C2 vertebra body fractures, commonly referred as miscellaneous 'non-odontoid non-hangman's axis fractures', are uncommon subgroup of axis fractures.[5-8, 10] There are two classification systems used for axis body fractures. The more commonly used one is given by Benzel[10] based on the orientation of fracture line, and classifies these fractures as coronal (type 1), sagittal (type 2), and transverse (type 3) fractures. Benzel determined the possible mechanism of injury as: extension with axial loading, hyperextension with axial loading, flexion and axial loading and flexion distraction.[10]A less used classification system by Fujimura has four subtypes: avulsion, burst, transverse, and sagittal.[11]

While the treatment protocols for other C2 fractures are well established in the literature, there is insufficient evidence to support treatment guidelines for C2 body fractures.[12-14] We treated four cases of C2 body fracture, two elderly and two young patients. Two cases had Benzel type 1, one case had type 2 and another had type 3 fractures. All of them were treated conservatively with external cervical immobilizer (Philadelphia and SOMI brace). After 6 weeks of external immobilization all cases had good functional outcome irrespective of their age and types of C2 fractures. Greene et al. recommended 8 to 12 weeks of halo vest or SOMI immobilization for patients with significant fractures of the vertebral body, pedicle or lateral masses and 6 weeks immobilization for less severe or more stable injuries.12 Out of 67 patients with C2 body fractures followed up by Green et al, only one patient (1.6%) underwent operative intervention for a non union.[12] In a retrospective study of 18 patients with type 1 and 2 C2 body fractures, German et al. showed complete radiological fusion at the time of the last follow- up, 8 years after injury with non-operative management with external orthoses.[13] Operative intervention is recommended for fractures associated with atlantoaxial instability, irreducible displaced superior articular facet fracture and spinal cord compression.[15] The surgical approaches used were posterior C1–C2 pedicle screw fixation and fusion, posterior C1–C3 screw fixation and fusion, and posterior C2 transpedicular lag screws.[15]

CONCLUSION

The results could suggest that in patients with pure C2 body fracture, non-operative management with external orthoses is a safe and efficacious option.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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