Management of a traumatic atlanto-occipital and atlanto-axial subluxation with fracture of dens

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Keywords: Atlanto occipital subluxation; atlanto occipital dislocation; atlanto axial subluxation; Goel and Harms technique

Introduction

Atlanto-occipital subluxation of more than 2 mm indicates a loss of major occipitocervical stabilizers. [1, 2] Occipitocervical dislocation is associated with a fatal brain stem injury leading to cardiac and respiratory arrest. Most authors advocate occipitocervical fusion, for which various methods have been described viz. Gallie fusion, Brooks-Jenkins fusion, Sonntag posterior C1-C2 technique, C1-2 trans-articular screw technique, Goel's technique modified by Harm and plate-screw - rod construct.

We treated this patient with occipital plate linked by rods to lateral mass screw of axis vertebra and atlas vertebra to connecting rod by circlage wire in association with bone graft.

Case report

A 14 year old, mentally challenged female came to the emergency department of MBS Hospital, Kota (RAJ), with a history of fall from stairs. On examination, she was found to have right upper and lower limb paraplegia (MRC grade 0). Babinski's sign, well sustained clonus, exaggerated knee & ankle jerk were evident on right side. Initial radiographs revealed atlanto-axial subluxation with no visualisation of the dens. Non contast computerised tomographic scan (NCCT) of the cervical spine (Figure. 1 and 2) revealed an atlanto-axial and atlanto-occipital subluxation with displaced Type 2 fracture of the dens. Magnetic resonance imaging (MRI) revealed compression at C 1 – C 2 level.

Figure 1. Magnetic resonance image showing fracture dislocation of the dens

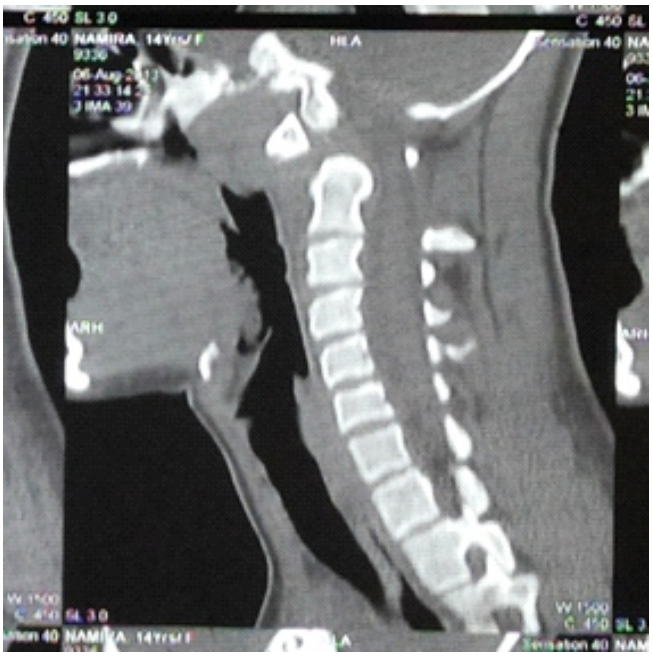

Figure 2. Magnetic resonance image showing subluxation of atlas bone

Surgical technique: Original plan for the surgery was to fix the occiput, C1 & C2 in reduced position by Goel's Technique modified by Harm. [3] Two poly axial 3.5 mm pedicle screw were fixed in th the C2 vertebra. C1

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lateral mass screws were being put but due to excessive bleeding from C1 - C2 epidural space patient developed hypotensive shock and developed premature ventricular contractions and this step was abandoned. A 'T plate' was fixed to the occiput and connected to C2 pedicle screws by a connecting rod. A sub laminar 20 gauge circlage wire was passed below the centre of posterior arch of the C1 and tightened to cross link bar between two connecting rods and bone graft was placed (Figure. 3).

Discussion

Oda et al[4] studied the biomechanics of five different occipitocervical fixation constructs in cadaveric spines, and found that screw fixation from the occiput to the pedicle of C2 was the strongest. Transarticular screws afforded greater stability than hooks and wires. The use of wires relies on the integrity of the posterior elements and is associated with a risk of injuring the dura when they are passed through the occipital burr holes or under the lamina of the spine. The siting of transarticular screws is technically demanding. Currently, the best method to achieve atlanto-axial fixation is the technique first described by Goel and popularised by Harms. [3] We would expect our construct to function biomechanically in much the same way as Oda's occipitoaxial pedicle screw fixation, but with the loss of cervical rotation.

Figure 3. Occipito-cervical cross linkage

References

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Key points:

- Stabilisation of the occiput to cervical spine was found to be strongest with pedicle screw fixation in cadaveric spines.
- Transarticular screws provided greater stability than hooks and wires.
- The downside to this technique is the loss of cervical rotation.