



Verification of Spinal Cord Decompression by Pre and Post-operative Magnetic Resonance Imaging in Traumatic Sub-axial Spinal Cord Injuries

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Introduction

Evidence from Surgical Timing of Acute Spinal Cord Injury Study (STASCIS) was in favor of spinal cord decompression within 24 hours of trauma, however, the timing of decompression in SCI remains controvrslal. In the study designs documented by Fehlings et al, Papadopolous et al, Ng et al, Vaccaro et al, Vale et al and Tator et al, spinal cord compression following trauma needed to be documented by MRI. However, evidence indicates that in these major prospective investigatons spinal cord decompression i.e. re-established CSF pathways around the spinal cord was not verified by postoperative MRI. We questioned: can postoperative MRI be used as a supportive evidence for decompression of spinal cord following subaxial fractur dislocations?

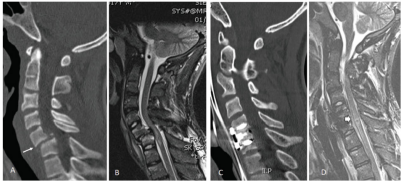
Methods

Pre- and post-op MRIs of 51 patients with cervical spinal cord injury were compared in order to document re-established CSF interface between spinal cord and dura following surgery.

Results

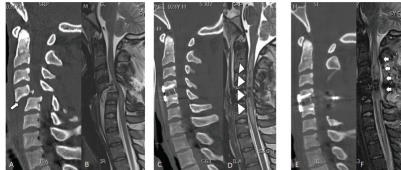
The mean age was 38.2, 48 subjects were male and MVCs, falls and sport injuries were seen in 46 patients. ASIA motor score was 16.7. AIS was A in 31, B in 15 and C in 5 patients. Morphology was distraction (Flexion distraction and extension distraction) in 34 and compression (flexion compression i.e. teardrop and vertical compression i.e. burst) in 17 patients. Intramedullary lesion (IML) volume of signal change on MRI was 1536.4 cubic millimeters. Traction was attempted in 23 (17 flexion distraction stages 2-5 and six compression injuries) with 70 percent success. Anterior discectomy or corpectomy was performed in 28 (55%) patients and laminectomy ± discectomy or corpectomy was performed in 23 (45%) patients. An anterior approach failed to provide a complete decompression of the spinal cord in 54% of cases, but an added laminectomy achieved full decompression in 86.4% of cases. From 11 demographic, clinical, and injury severity variables, only laminectomy correlated significantly with adequate surgical decompression (p < 0.002).

Figure 1



17-y-o male with a shallow dive and unilateral locked facet at C6/C7(plates A and B). AMS was 52 and AIS grade C. IML volume was 478 cubic millimeters. Postoperative MRI following reduction and ACDF indicates completely reestablished CSF pathways (plates C andD)

Figure 2



This 24-y-o man had a fall and sustained C4/5 bilateral locked facets. His AMS was 0, AIS A, SLIC score 9, mid-sagittal diameter 13.7 mm and intramedullary volume of T2 W Image 3773.3 cubic millimeters. In this patient primary reduction and c4/5 ACDF(plates C and D) were inadequate in decompressing the spinal cord and the patients needed additional laminectomy (plates E and F) in order to obtain full decompression of the subarachnoid space.

Figure 3



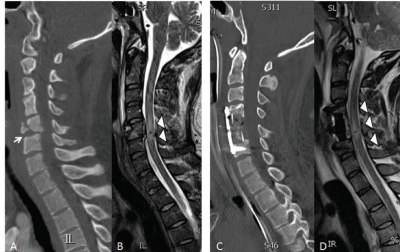
17-y-o man sustained a C5 teardrop fracture. His AMS was 12, AIS A, SLIC score 9, mid-sagittal diameter 13 mm and the volume of intramedullary lesion 1392 cubic millimeters. He had corpectomy of C5 which partially decompressed the spinal cord (plate C). The patient needed laminectomy for decompression (plates D and E).

Figure 4



After a fall this 48-y-o man sustained C6/C7 bilateral locked facets. His AMS was 12, AIS A, SLIC score 9, midsagittal diameter of cervical spine 13.9 mm and his IML volume 1681 cubic mm. He had 3 level laminectomy and posterior spinal fusion which decompressed his swollen spinal cord (Plates C,D and E).

Figre 5



After a shallow dive this 28yo man sustained a C5 teardrop fx. His AMS was 17 and AIS grade B. 8 hrs after admission he had corpectomy with satisfactory decoompression (plate D).

Conclusions

In subaxial cervical fracture dislocations, postoperative MRI can be used as a measure of decompression and re-establishment of CSF interface between spinal cord and dura. In addition inclusion of laminectomy (i.e. additional posterior decompression) in the surgical approach offered a significantly better chance of spinal cord decompression than pure realignment, discectomy or corpectomy with our without posterior fusion.

References

Fehlings et al PLoS ONE 7:e32037, 2012; Ng et al Neurosurgery focus 6:3,1999; Papadopoulos et al J Trauma 52:323, 2002; Tator et al J Neurosurg Spine 91:12, 1999; Vaccaro et al Spine 22:269, 1997; Vale et al J Neurosurg 87:239, 1997