CASE REPORT

Management of hyper-flexion injury-related teardrop fracture in an adolescent

Monish Maharaj,^{1,2} Kevin Phan,³ Ralph J Mobbs⁴

¹Faculty of Medicine, University of New South Wales, Sydney, New South Wales, Australia

²NeuroSpine Clinic, Prince of Wales Private Hospital, Sydney, New South Wales, Australia

³NeuroSpine Clinic, Randwick, New South Wales, Australia

⁴Prince of Wales Hospital, Sydney, New South Wales, Australia

Correspondence to
Dr Ralph J Mobbs,
ralphmobbs@hotmail.com

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SUMMARY

We present a case of a flexion teardrop fracture managed surgically with anterior stabilisation and fusion between the affected vertebral body to its posteriorly adjacent level. A 14-year-old girl presented with severe neck pain following a fall from a bunk bed. MRI investigation showed signs of axial loading and hyper-flexion yielding a teardrop fracture at the body of the C5 vertebra. Using a novel technique, the patient was treated surgically with an anterior fusion of the C5-C6 vertebra. Her 12-month follow-up demonstrated full functional ability.

BACKGROUND

Lower teardrop fractures are often flexion related in origin with the C5 vertebra being the most prevalent. This is potentially due to the stress concentrations on the level as a result of an anatomically formed lordotic angle. Though such injuries may be debilitating and severe in nature, the posterior components of the joint are intact. The current accepted method of management throughout the literature is anterior plate stabilisation and fusion with both adjacent vertebrae, occasionally with complete removal of the level of the fracture—though limited literature is available.

In this case, a non-traditional method of management was followed, as only one adjacent segment was fused. Anterior screw fixation was implemented through the fractured volume, aiding in attachment.

CASE PRESENTATION

A 14-year-old girl presented with severe neck pain following a fall off a bunk bed. History revealed an injury that was hyper-flexed in nature with stress-induced axial loading.

No other symptoms or signs were noted. There were no other relevant findings reported during history-taking.

On examination, the patient demonstrated full power in all myotomes, with no loss of sensation. Reflexes were symmetric. There were no signs of neurological compromise. No other significant symptoms were noted.

INVESTIGATIONS

Lateral radiographs of the cervical spine were performed, which allowed visualisation of the fracture site and fragment body.

MRI of the spine (figure 1) was conducted, demonstrating a triangular fragment body at the C5 level. There was sign of anteroinferior descent,

though the fragment had not completely detached. There was no compression noted and no displacement of the C5 vertebral body apparent. The rest of the joint apparatus was intact.

Routine X-ray of the thoracic and lumbar spine was performed. There were no remarkable findings.

DIFFERENTIAL DIAGNOSIS

Flexion-related spinal fractures associated with cervical spine trauma result in different types of fractures based on both the movement during injury and the condition of the spinal apparatus. Imaging is critical in diagnosis on the basis of visualising stress points, dislocation and sites of compression and neurological injury.

Bearing this in mind, a purely flexion-related trauma may yield fractures demonstrating a wedge pattern, flexion teardrop, anterior subluxation, bilateral facet dislocation or clay shoveller fracture. In this particular case, the patient's radiological features were consistent with a flexion teardrop fracture.

TREATMENT

Surgical management was indicated to repair the damaged vertebral body, and to prevent neurological and vascular complications due to the fragment. In the operating theatre, a single-level fusion was performed between the damaged C5 vertebral body and the C6 body. Anterior screw placement allowed the surgeon (RM) to directly join the damaged C5 fragment to the body (figure 2).

Figure 1 Preoperative MRI illustrating teardrop fracture at C5 level.

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Figure 2 Artistic impression of surgical technique. (A) Loading during injury. (B) Teardrop fracture. (C) Surgical approach. (D) Fusion between fractured segment and adjacent level.

OUTCOME AND FOLLOW-UP

The patient recovered rapidly with no postoperative complication noted. Figure 3 illustrates the C5/5 fusion 1 month following the operation. The patient was followed up at 3 and 12 months (figure 4), with full range of motion and no ongoing issues.

DISCUSSION

As identified by Kim *et al*,¹ cervical flexion teardrop fractures occur predominantly at the C5 level and may result in potentially devastating neurological outcomes. Other characteristic features include posterior displacement of the upper column, backward displacement of the fracture fragment and widening of the surrounding interlaminar/interspinous/joint spaces.

Importantly, some patients, such as the girl in this case, may present with intact neurological status. Hence radiographic features and interpretation are imperative to correct diagnosis and case management.¹ Surgical management involving anterior

Figure 3 Postoperative anterior and lateral radiographs illustrating C5/6 anterior fusion at 1-month follow-up.

Figure 4 Postoperative lateral radiograph and CT image illustrating C5/6 anterior fusion at 12-month follow-up.

cervical plating has been demonstrated to be superior and effective, with very good outcomes and minimal complications.^{2 3} Goals for such a procedure, as in other traumatic cervical injuries, include: improving functional ability, minimising residual pain, reduction in neurological deficit and prevention of further disability.⁴

Though conservative options, such as a halo thoracic vest implementation, are utilised in a few published cases, most are predominantly prior to the year 2000. More recently, a retrospective comparison study by Fisher *et al* (2002) demonstrated superior outcomes associated with invasive surgical management alone, including anterior cervical plating and corpectomy. The same study reported the most common approach to be a combination of vertebrectomy, anterior graft strut and disk plating, however, most of their cases involved some neurological compromise.³ Regardless, an anterior approach is widely accepted as the best technique in the management of lower cervical lesions.^{5 6}

Our case differs, as it is the first to implement single-level fusion and plating between the damaged body, and fusion with only one adjacent level. There are no cases available in the current global literature to have done so. Following surgical management, there were no signs of injury and no residual issues at 3- and 12-month follow-up. Radiological findings showed effective fusion between the C5 and C6 level with the separated C5 body fragment re-joined and restored.

Our findings raise the question surrounding the necessity of multilevel fusion and corpectomy in patients of similar presentation on the basis of positive outcomes noted throughout this case.

Learning points

- ▶ Teardrop fractures of the cervical spine may occur with or without neurological deficit and should be considered as a differential for neck pain of traumatic origin.
- ▶ Though fusion of adjacent vertebra, with occasional removal of the damaged segment, appears to be the gold standard, our case presentation shows a less aggressive approach to be relevant.
- ▶ Single level fusion, fixating the fractured fragment with the same screws, was found to be an effective modality of management.

Contributors MM and KP gathered the case information, constructed the report and formatted it for submission. RJM was the primary surgeon and consultant in charge of the case, and contributed to writing the report.

Competing interests None declared.

Patient consent Obtained.

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REFERENCES

- 1 Kim KS, Chen HH, Russel EJ, *et al.* Flexion teardrop fracture of the cervical spine: radiographic characteristics. *Am J Roentgenol* 1989;159:319–26.
- 2 Cabanela M, Ebersold M. Anterior plate stabilization for bursting teardrop fractures of the cervical spine. *Spine* 1988;13:888–91.
- 3 Fisher C, Dvorak M, Leith J, *et al.* Comparison of outcomes for unstable lower cervical flexion teardrop fractures managed with halo thoracic vest versus anterior corpectomy and plating. *Spine* 2002;27:160–6.
- 4 Aebi M. Surgical treatment of upper, middle and lower cervical injuries and non-unions by anterior procedures. *Eur Spine J* 2010;19(Suppl 1): S33–9.
- 5 Toh E, Nomura T, Watanabe M, *et al.* Surgical treatment for injuries of the middle and lower cervical spine. *Int Orthop* 2006;30, 54–8.
- 6 Kim HJ, Lee KY, Kim WC. Treatment outcome of cervical tear drop fracture. *Asian Spine J* 2009;3:73–9.

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