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CASE REPORT

Treating Huge Tear-Drop Fracture of Axis With Trapezoidal Bone

A Case Report and Literature Review

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Study Design. Case report and review of relevant literature.
Objective. To discuss the surgical strategies and clinical outcome of managing huge tear drop fracture of axis.
Summary of Background Data. Teardrop fracture of axis is rarely seen, especially the huge type. The surgical technique is demanding because of the special anatomical structure and difficulty with bone grafting. Moreover, the surgical approach is controversial in the literature.
Methods. A 51-year-old male patient suffered from neck pain after falling from the bicycle, neck movement was limited with no neurological compromise. X-ray suggested huge tear-drop fracture of anterior-inferior corner of axis, narrowing of C2/3 intervertebral disc. Fusion with self-designed tricortical trape zoidal iliac bone was performed.
Results. Treating huge teardrop fracture of axis by anterior bone grafting with self-designed tricortical trapezoidal iliac bone is effective and stable. A 3-month follow-up showed fusion was achieved, upper cervical curvature was restored, and neck pain disappeared.
Conclusion. Self-designed tricortical trapezoidal iliac bone provided adequate fusion area of bone grafting, restoring the normal intervertebral height and cervical alignment, and the midterm outcome is satisfactory.
Key words: axis, bone fusion, bone graft, fusion, iliac, tear drop fracture, trapezoidal bone.
Level of Evidence: 5
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Schneider and Kahn[1] first described teardrop fracture of cervical spine in 1956, which was defined as the fracture of anterior-inferior corner of the vertebra.[1] But teardrop fracture of axis is rarely seen, only accounting for 1% to 3% of cervical fractures.[2] The mechanism of the injury is hyperextension or hyperflexion. Small teardrop fracture can be conservatively managed, but huge type still need surgery caused by intervertebral disc injury and instability. Because of the special anatomical structure of axis, removal of the fractured bone leads to local instability. Therefore, the surgical strategy is crucial to restore stability and cervical alignment.

CASE REPORT

A 51-year-old male patient suffered from neck pain after falling from the bicycle, neck movement was limited with no neurological compromise. X-ray showed huge teardrop fracture of anterior-inferior corner of axis, narrowing of C2/3 intervertebral disc. Magnetic resonance imaging revealed discontinuity of anterior-inferior cortex of axis; hyperintensity can be seen in C2/3 intervertebral disc and precervical soft tissue. Physical examination suggested neck pain and exacerbation in flexion and rotation. Philadelphia collar was used to immobilize the neck, and 2 days later, anterior discectomy and self-designed tricortical trapezoidal iliac bone grafting with instrumentation was performed uneventfully (Figure 1). Neck pain disappeared 1 week after surgery, and trapezoidal bone showed no signs of dislocation and achieved fusion at 3-month follow-up (Figure 2).

DISCUSSION

Most of researchers consider the mechanism of injury of axial teardrop fracture is hyperextension,[2–4] but others support the combination of hyperflexion and hyperextension.[5,6] To our knowledge, there have been a few reports about the treatment of axial tear-drop fracture (Table 1),[1,2,4,7–15] but the surgical experience is still lacking. It is controversial whether the patient needs surgery and which surgical approach is better according to different size and location of the fractured bone, different extent of intervertebral disc injury and local instability.

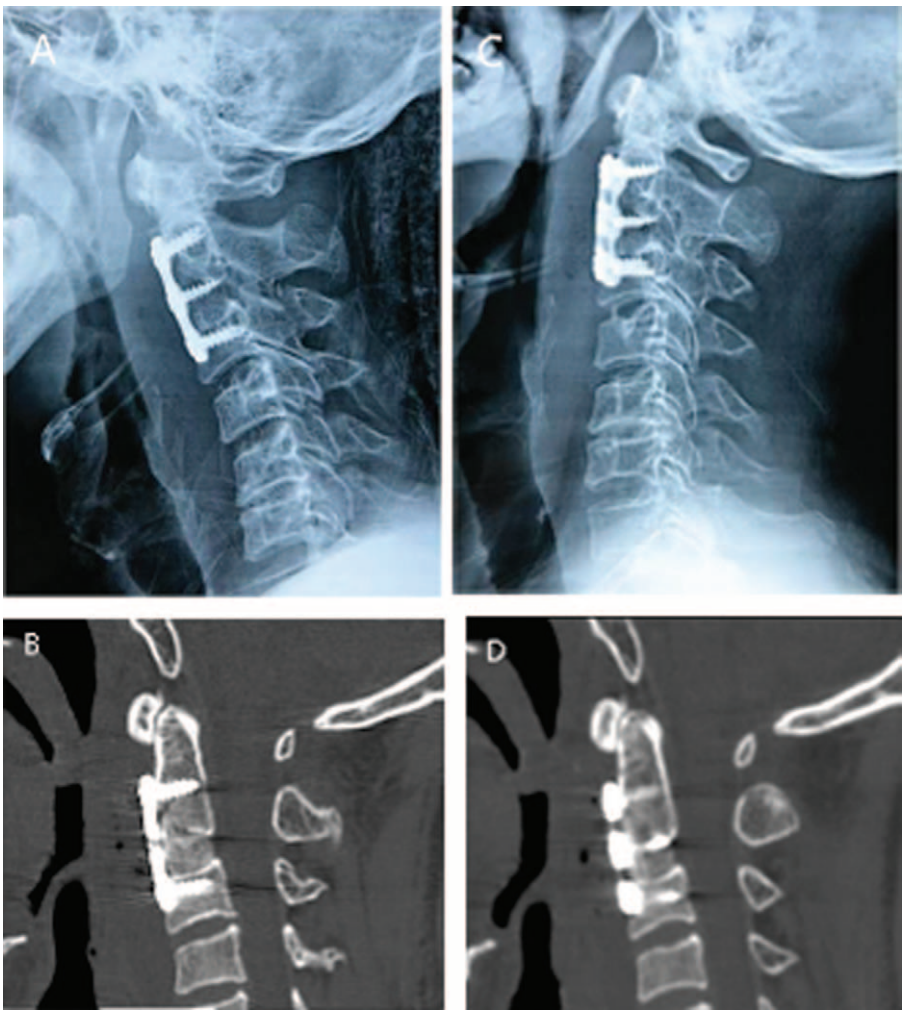

Figure 2. A, lateral X-ray of 1 week postoperation showed appropriate position of bone graft and instruments; B, CT of 1 week postoperation revealed proper position of bone graft and normal C/3 alignment; C, lateral X-ray of 3 month postoperation showed no dislocation of bone graft and instruments; D, CT of 1 week postoperation revealed fusion of C2/3.

approach is approved by some researchers because of less trauma and less neurological complications,[11] but more researchers are in favor of anterior approach because of reconstruction of anterior and middle column and restoration of intervertebral height.[7–9,12] However, what is the cutoff point between small and huge fracture is still obscure to decide and which approach leads to a better clinical outcome. Reliable bone grafting and fusion is important, but this technical problem has not been mentioned in the previous literature. Our case provided a possible strategy,

TABLE 1. Literature Review of Teardrop Fracture of Axis

Time	Authors	Journal	Mechanism of Injury	Management	Outcome
1956	Schneider *et al*[1]	The Journal of Bone and Joint Surgery	Hyperflexion	Distaction/surgery	Healed
1994	Korres *et al*[3]	European Spine Journal	Hyperextension	Conservative	Healed
2004	Vialle *et al*[4]	Revue de Chirurgie Orthopedique et Reparatrice de L'appareil Moteur	Hyperextension	Posterior approach	Healed
2011	Watanabe *et al*[14]	Spine	Hyperextension	Conservative	Healed
2013	Hu *et al*[15]	Journal of Spinal Disorders and Techniques	Hyperextension	Conservative/ anterior and posterior approach	Healed

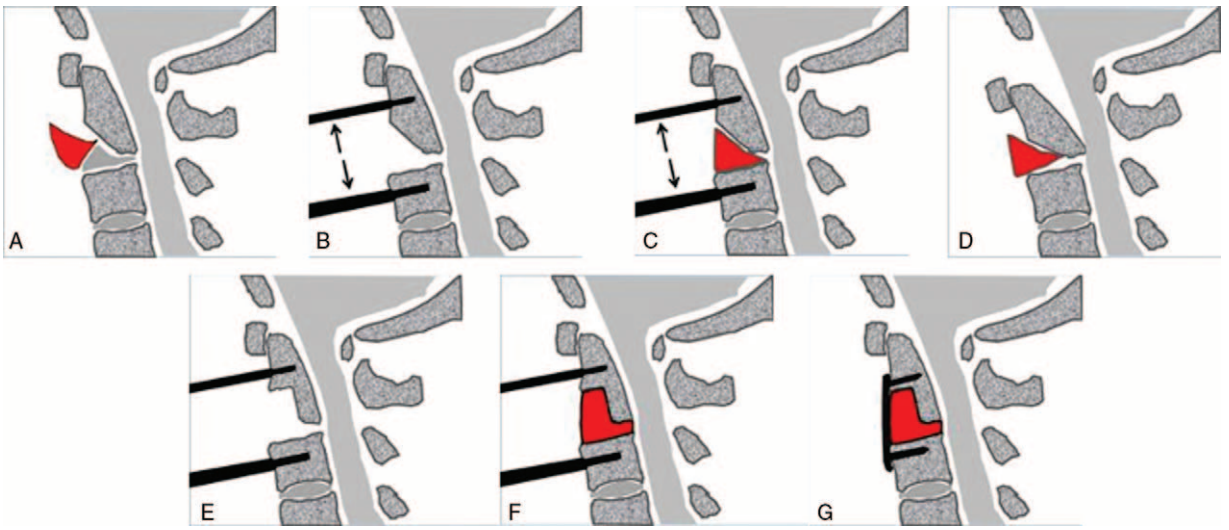

Figure 3. A, anterior dislocation of the huge fractured bone; B, removal of the injured disc and fractured bone after intervertebral distraction; C, if a wedge-shaped iliac bone is inserted; D, after removal of intervertebral distraction instrument, the wedge-shaped bone was squeezed out; E, burring of the grafting bed to a trapezoidal shape after intervertebral distraction; F, self-designed tricortical trapezoidal iliac bone was inserted and achieved perfect match; G, no dislocation of bone graft was found after removal of intervertebral distraction and then anterior cervical plate was instrumented.

but the practicability still needs to be confirmed with more cases.

CONCLUSION

Because of the special anatomical structure and difficulty with bone grafting in huge teardrop fracture of axis, surgical management is quite demanding. Self-designed tricortical trapezoidal iliac bone provided adequate fusion area of bone grafting, restoring the normal intervertebral height and cervical alignment, and the midterm outcome is satisfactory.

➢ Key Points

- ❑ Huge teardrop fracture destructs the anterior longitudinal ligament and intervertebral disc, leading to local instability.
- ❑ Anterior grafting and fusion reconstructs the anterior and middle column, stablizing C2 and C3.
- ❑ Self-designed trapezoidal bone provides large fusion area and restores the normal intervertebral height and upper cervical alignment.

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