



Sequential reduction in type III Hangman's fracture- A novel C3 body sparing technique

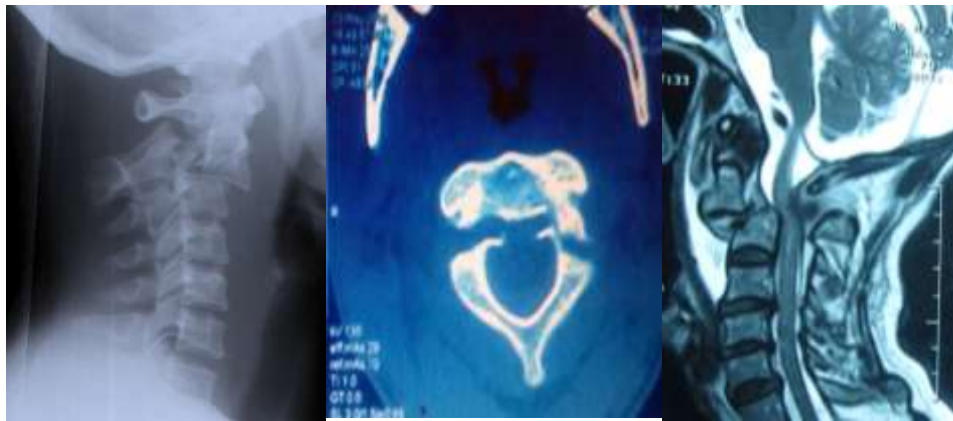
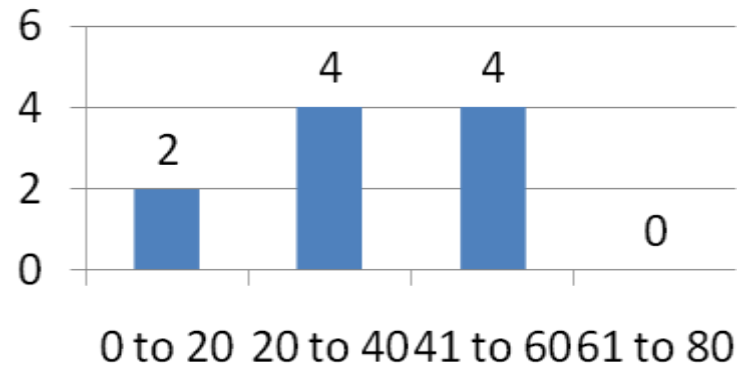
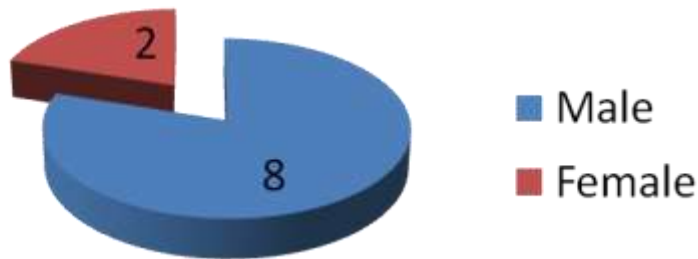
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Demography

Study period: 2006- 2018
Total no of hang man fractures:39
No of Type III fractures 10

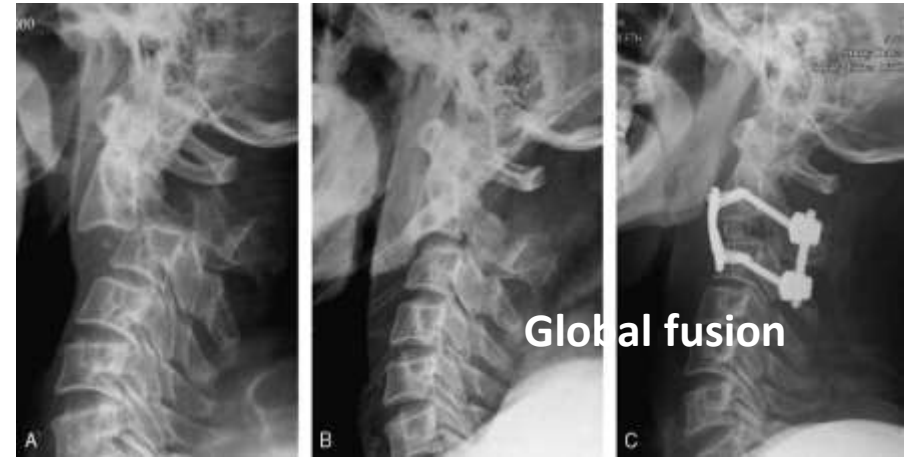


Typical Type III fracture

1. Displacement >50%
2. Angulation >11
3. Facetal injury
4. C3 body compression over cord

Literature on surgery for hangman's fractures

Type I - collar
Type II & IIa- anterior C2-3
★ pars screw
posterior C2C3
Type III- C3 corpectomy
global fusion



Global fusion

Global fusion

Ref.5. Zhanghai Li et al.

Halo invariably fails to maintain reduction in unstable fractures



★ Pars screw not indicated If fracture gap is wide

C3 corpectomy

Ref.6 Wang et al..

Surgical procedure

- ❖ Position: supine on traction
- ❖ Approach: high cervical approach
- ❖ C2-3 and C3-4 discectomy
- ❖ Select appropriate plate
- ❖ Sequentially reduce the fracture
- ❖ Closure
- ❖ Blood loss negligible
- ❖ Morbidity nil
- ❖ Mortality nil



Positioning



Discectomy with graft

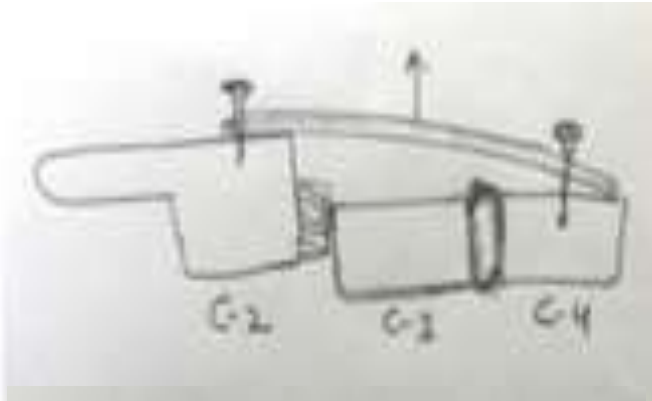


Appropriate plate

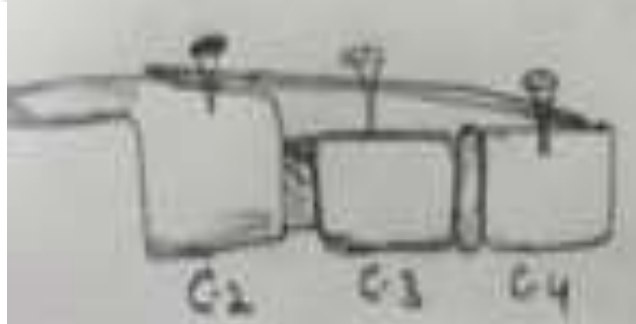
Temporary pins prior to sequential reduction in C2 and C4

Sequential tightening

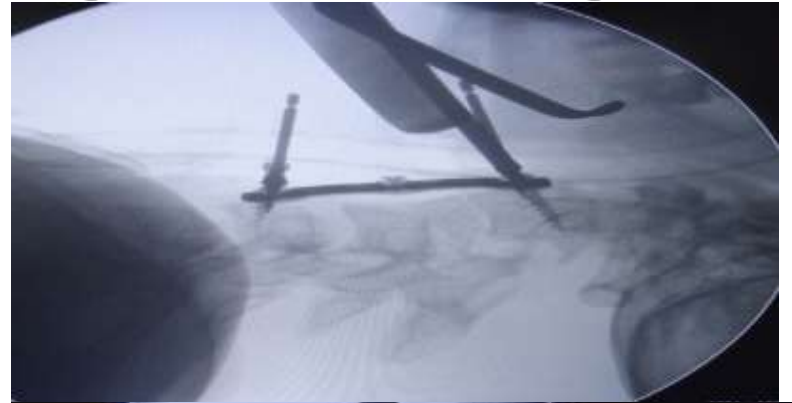
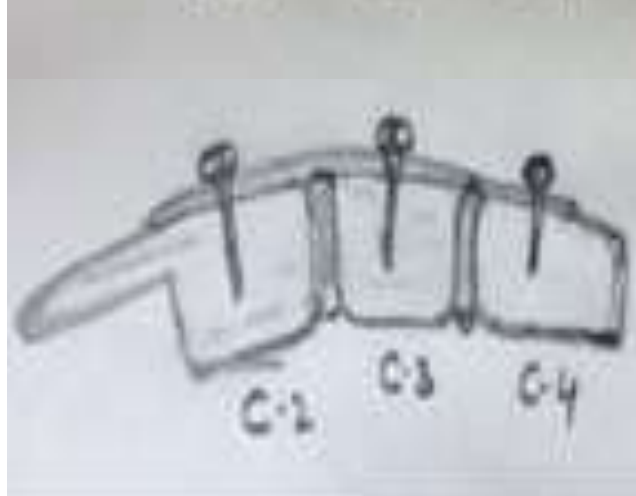
Step
I



Step
II



Step
III



Restoration of Lordosis & fracture healing (during followup)



Results

- ❖ Duration of surgery 2 hrs.
- ❖ Blood loss negligible.
- ❖ Follow up 6months to 7 years.
- ❖ No hardware failure.
- ❖ No post op immobilization (halo or collar).
- ❖ Fusion rates 100 percent.
- ❖ Neck disability negligible.
- ❖ Return to work an average of 13 days.

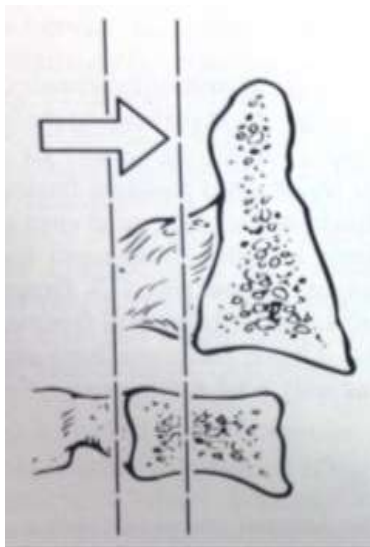
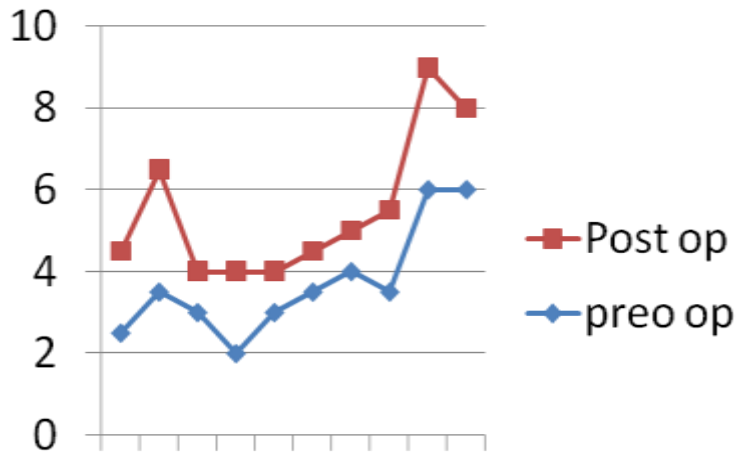
Angulation & Rotation

| Patient no. | SL | Post injury | | Post traction | | Post fixation | |
|-------------|----|-------------|-----|---------------|-----|---------------|-----|
| | | d 1 | r 1 | d 2 | r 2 | d 3 | r 3 |
| 1 | | 2.5 | -5 | 7.5 | -20 | 2.0 | -4 |
| 2 | | 3.5 | 1 | -2.0 | 12 | 3.0 | -7 |
| 3 | | 4.0 | -20 | 2.0 | -10 | 1.0 | 1.0 |
| 4 | | 2.0 | -80 | 2.0 | -13 | 2.0 | 2.0 |
| 5 | | 3.0 | 10 | 4.0 | 11 | 1.0 | 1.0 |
| 6 | | 3.5 | -10 | 3.0 | -8 | 2.0 | 1.0 |
| 7 | | 4.0 | -12 | 3.2 | -20 | 1.0 | 1.0 |
| 8 | | 3.5 | -8 | 1.6 | -6 | 2.0 | 2.0 |
| 9 | | 6.0 | -30 | 4.0 | -10 | 1.0 | -3 |
| 10 | | 5.8 | 1 | 4.2 | 1 | 2 | 1.0 |

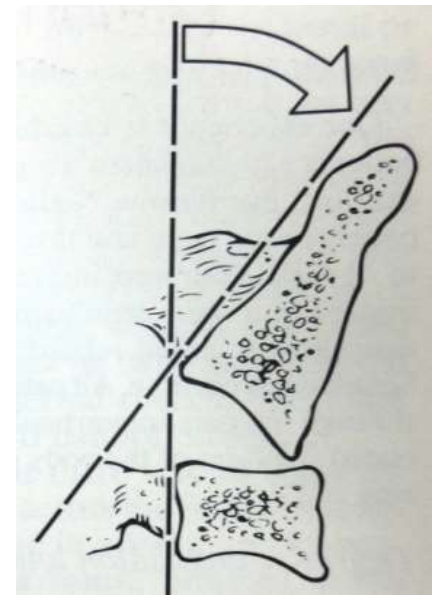
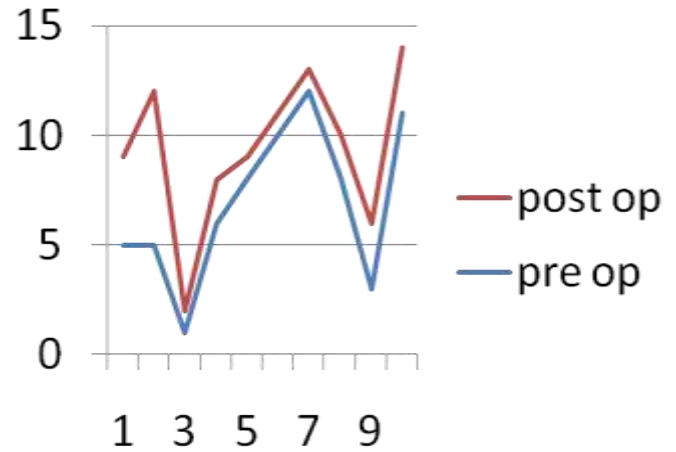
d1- displacement at presentation
d2 displacement on traction
d3- displacement at post surgery

r1- angulation at presentation
r2 angulation on traction
r3- angulation at post surgery

Displacement



rotation



Disadvantages of posterior approach

- ❖ Prone position complications
- ❖ . Extensive muscle dissection.
- ❖ . Chance of vertebral artery injury
- ❖ . Inaccessibility to anterior pathology
- ❖ No adequate place for graft.
- ❖ rotation loss if C1 is included. C2 pars can not be used when fracture gap is more than 3.5mm

Conclusions

- ❖ Direct access to the disc pathology.
- ❖ Maintains rotation of the CV junction as C1 is spared.
- ❖ Has good fusion area for graft(C2-3).
- ❖ Maintains lordosis.
- ❖ No muscle dissection
- ❖ Obviates need for prone position
- ❖ Minimal dissection and negligible blood loss.

References

1. Haughton S. On hanging, considered from a mechanical and physiological point of view. *Philos Mag J Sci.* 1866; 32:23-34.
2. Schneider RC, Livingston KE, Cave AJE. "Hangman's fracture" of the cervical spine. *J Neurosurg* .1965;22: 141-154.
3. Wood-Jones F. The ideal lesion produced by judicial hanging. *Lancet*1913;1:53-54.
4. Josten C. Die traumatische Spondylolisthese des Axis. *Orthopade*.1999;28(5):394-400.
5. Zhanghai Li, Fengning L, Shuxun H, Yantao Z, Ningfang M, Tiesheng H, Jianguang T. Anterior discectomy/corpectomy and fusion with internal fixation for the treatment of unstable hangman's fractures: a retrospective study of 38 cases. *J Neurosurg Spine* 2015;22:387-393
6. Wang C, Ma H et al . Anterior C3 corpectomy for complex \hangman's fractures. *Int Orthop.* 2013 Jan;37(1):89-93

None of the authors has any potential conflicts of interest.