

Hangman's Fracture of the Cervical Spine: A Prospective Study

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Abstract

Introduction: Hangman's fracture is the second most common fracture of all the C2 vertebral fractures. It has been observed, which accounts for 55% of cervical fractures. They form 23–25% of (C2) axis fractures.

Materials and Methods: All Type II and IIa hangman's fractures operated were included in this study. Twelve patients (eight men and four women) between 20 and 60 years of age diagnosed with unstable hangman's fracture, treated, and followed up in our department were included in the study. Ten patients were injured in road traffic accidents, and two were injured due to falls from height.

Results: The total number of patients included in the study was 12, the age range from 20 to 60 years; male-to-female ratio is 8:4. All patients presented with neck pain. In Type II and IIa cases, the anterior approach was made in ten cases, where the reduction was achieved with traction. In anterior cases, the reduction was maintained after fixation.

Conclusion: The anterior approach with primary internal stabilization is the appropriate option for unstable Type II, Type IIa hangman's fracture in cases was preoperative reduction that could be achieved. Using the anterior approach with the primary internal fixation of these fractures, solid fusion was achieved in all cases.

Key words: Fixation, Fracture, Fusion, Unstable

INTRODUCTION

The first and second cervical vertebrae differ, anatomically and functionally, from the remainder of the cervical spine. Half the rotation in the cervical spine takes place in the atlantoaxial joint, and a large part of the movement in the sagittal and frontal plane in the joints between the occipital bone, atlas, and axis. Hangman's fracture is a term described for bilateral pars fracture of C2.^[1] In 1965, Schneider *et al.*^[2] coined the term "hangman's fracture." Hangman's fracture, the second most common fracture of the second cervical vertebra, has been observed, which accounts for 4–7% of cervical fractures, and they form 23–25% of (C2) axis fractures.^[3] All these fractures are classified according to

the various patterns of translation and angulation of the C2 over C3. Life-threatening sequel in hangman's fractures is rare because the vertebral canal is sufficiently wide at this level and the fragments tend to separate, thereby often decompressing the spinal canal. Management of the hangman's fractures is controversial. Most of the hangman's fractures are treated conservatively.^[4] If surgery is indicated, an anterior approach using a C2/C3 graft and plate fusion is usually preferred.^[5] Treatment is aimed at near-normal cervical alignment. In this study, the authors studied the surgical outcomes in ten cases of hangman's fractures treated by anterior approaches.

MATERIALS AND METHODS

All Type II and IIa of hangman's fractures operated were included in this study. Twelve patients (eight men and four women) in a total of 20–60 years of age diagnosed with unstable hangman's fracture, treated and followed up in our department are included in the study. Ten patients were injured in accidents by vehicle, and two were

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injured due to falls from height. Clinical and radiological evaluation was done. X-ray parameters measured were the translation of C2 over C3 and C2–C3 angulation. CT cervical spine was done to look for other associated fractures; the MRI-C spine was done to see the cord compression, disc fragmentation, and ligaments injury. Hangman's fractures were classified according to the Levine-Edwards classification; preoperatively, all patients were put on cervical traction of 2 kg. A high cervical extra-pharyngeal approach in all 12 patients, cervical discectomy, and autologous bone fusion of C2–C3 with a titanium plate were performed.

RESULTS

The total number of patients included in the study was 12, the age range from 20 to 60 years; male-to-female ratio is 8:4. All patients presented with neck pain. The patient was classified according to Type 2–8 cases [Figure 1] and four cases of Type IIa [Figure 2]. C2–C3 average



Figure 1: Type II hangman's fracture



Figure 2: Type IIa hangman's fracture

angle in Type II is 9.5°; the angle in Type IIa is 13°. All patients were treated with the anterior approach in Type II and IIa cases anterior approach in ten cases, where the reduction was achieved with traction, in anterior cases, reduction was maintained after fixation [Figure 3]. Type of fracture pre-operative angle translation distance surgery type 2 9.5° 4 mm anterior fusion (8) Type 2 A 13° 3 mm anterior fusion (4).

Type of fracture	Pre-operative angle	Translation distance	Surgery
Type II	9.5°	4 mm	Anterior fusion (8)
Type IIa	13°	3 mm	Anterior fusion (4)

All cases were followed for an average period of 1 year and noticed to have bony fusion and sagittal alignment. Neck pain subsided in all ten patients, which was present preoperatively. Patients recovered well after surgery, and no complications were noted.

No bone graft or plate screws complications were observed in any of the cases during the follow-up period.

DISCUSSION

Hangman's fracture also named as C2–C3 traumatic spondylolisthesis accounts for 4–7% of all cervical fractures and 25–30% of axis fractures. About 50–70% of the axis traumatic lesions are due to motor vehicle accidents, and 10–40% are due to falls from height.^[6,7]

Management

Levine and Edward Type II and Type IIa hangman's fractures have been considered unstable due to translation and angulation of C2–C3.^[8] The treatment for unstable hangman's fracture is still controversial.



Figure 3: C2–C3 anterior cervical discectomy and fusion

Most cases of hangman's fractures responded to conservative treatment comprised mild skeletal traction and external immobilization in a halo brace. Surgery is only necessary under certain conditions.^[9]

Conservative

Patients were managed conservatively by various authors with halo immobilization; the literature revealed that the union rates of conservative treatments were nearly 100% in Type I, 60% in Type II, 45% in Type IIa, and 35% in Type III.^[10]

Incomplete reduction of C2–C3 results in kyphosis, persisting neck pain in 60% of cases,^[8] and decreased range of motion if angulation is more than 10.^[6]

Indeed, accurate fracture reduction and realignment of C2–3 were seldom achieved with conservative treatment in unstable hangman's fractures.

Surgical Management

Failures and complications associated with conservative treatment can be addressed through surgical treatment.

Surgery is recommended if radiological controls demonstrate an increasing anterior displacement at the C2–3 level despite rigid immobilization. Further conditions necessitating surgical therapy include the dislocated Type IIa fractures (angulation $>11^\circ$ and anterior translation >3 mm); in exceptional cases of dislocated Type II fractures (anterior translation >3 mm), and Type III hangman's fractures.^[8] Lesions combined with a traumatic C2–3 disc herniation compromising the spinal cord and established non-unions may also require surgery.^[10,11]

Surgically treated patients with Type II and IIa require collar for 4 weeks postoperatively, however conservatively treated patient require Halo-vest for 3 months. Hence, the surgical treatment is beneficial over conservative therapy in terms of early ambulation.^[1]

Surgery

Anterior, posterior, and combined approaches are employed to treat hangman's fractures.

Among the different posterior approaches, direct repair of the pars fracture has the advantage of preserving motion of the axis. Unfortunately, direct pars repair does not address instability at the disc and cord compression. Hence, when cord compression was noted, it is advised to make an anterior approach.^[1,12,13]

CONCLUSION

The anterior approach with primary internal stabilization is an appropriate option for unstable Type II, Type IIa hangman's fracture in cases was preoperative reduction that could be achieved. Using the anterior approach with the primary internal fixation of these fractures, solid fusion was achieved in all cases.

REFERENCES

1. Termansen N. Hangman's fracture. *Acta Orthop Scand* 1974;45:529-39.
2. Schneider R, Livingston K, Cave A, Hamilton G. Hangman's fracture of the cervical spine. *J Neurosurg* 1965;22:141-54.
3. Hadley M, Dickman C, Browner C, Sonntag V. Acute axis fractures: A review of 229 cases. *J Neurosurg* 1989;71:642-7.
4. Ludwig S, Kramer D, Vaccaro A, Albert T. Transpedicle screw fixation of the cervical spine. *Clin Orthop Relat Res* 1999;359:77-88.
5. Taller S, Suchomel P, Lukáš R, Beran J. CT-guided internal fixation of a hangman's fracture. *Eur Spine J* 2000;9:393-7.
6. Levine A, Edwards C. The management of traumatic spondylolisthesis of the axis. *J Bone Joint Surg Am* 1985;67:217-26.
7. Cornish B. Traumatic spondylolisthesis of the axis. *J Bone Joint Surg Br* 1968;50:31-43.
8. Li X, Dai L, Lu H, Chen X. A systematic review of the management of hangman's fractures. *Eur Spine J* 2005;15:257-69.
9. Samaha C, Lazennec J, Laporte C, Saillant G. Hangman's fracture: The relationship between asymmetry and instability. *J Bone Joint Surg Br* 2000;82:1046-52.
10. Boulosa J, Colli B, Carlotti C Jr., Tanaka K, Santos M. Surgical management of axis' traumatic spondylolisthesis (Hangman's fracture). *Arq Neuropsiquiatr* 2004;62:821-6.
11. Verheggen R, Jansen J. Hangman's fracture: Arguments in favor of surgical therapy for Type II and III according to Edwards and Levine. *Surg Neurol* 1998;49:253-62.
12. Tuite G, Papadopoulos S, Sonntag V. Caspar plate fixation for the treatment of complex hangman's fractures. *Neurosurgery* 1992;30:761-4.
13. Müller E, Wick M, Muhr G. Traumatic spondylolisthesis of the axis: Treatment rationale based on the stability of the different fracture types. *Eur Spine J* 2000;9:123-8.

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