CASE REPORT

Case Report: A case report of unstable Hangman fracture in an eighty year old male [version 1; referees: 2 approved with reservations, 1 not approved]

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Abstract
Herein we discuss a rare variant of hangman's fracture in an eighty year old male presenting without any neurological deficits. We performed X-ray and magnetic resonance imaging (MRI) of the cervical spine to confirm the diagnosis. The patient was placed on a cervical traction which showed good reduction. We performed posterior occipitocervical fusion with bone graft fusion followed by early mobilization. A postoperative scan showed good reduction and purchase of the screws. This case highlights the importance of choosing the correct therapeutic attitude for the management of the geriatric population especially in those who do not have any significant co-morbid conditions.
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Competing interests: No competing interests.

Introduction
Rigid immobilization alone is sufficient for most cases of hangman’s fracture (traumatic spondylolitisis of C2) classified as Effendi type I and some of type II. Effendi type III fractures are very rare and invariably have neurological deficits because of impingement due to the facet dislocation on the spinal cord posteriorly. Fracture instability is the presence of complete disruption of the annular and/or posterior ligament with forward and/or rotatory vertebral body slip of axis. Surgical stabilization and rigid immobilization together is recommended in such cases, such as Levine-Edwards type IIa and III fractures. Here we discuss the management of an unstable type III hangman’s fracture in an aged patient without any neurological deficits. Most doctors choose traction and prolonged immobilization in a halo vest due to associated medical comorbidities and the anesthetic risks involved in this group. However there is a high risk of nonunion, instability, persistent pain and a need for a prolonged period of halo immobilization. Since our patient had a good Karnofsky performance score, we opted for only posterior fusion so as to minimize the anesthetic risk involved with both anterior and posterior approaches. However, we chose a long segment occipitocervical screw and graft fusion so as to aid the healing process in the aged bone.

Case report
An 80 year old man from the Tarai region of Nepal was brought to emergency with the chief complaint of falling from a swing after being pushed by his grandson 2 days prior. He complained of pain at the nape of his neck. Neurological examination did not reveal any features of radiculomyelopathy. The patient was placed in a cervical collar and an urgent X-ray of the cervical spine revealed presence of spondylolysis of the axis with significant translation and angulation (Figure 1). Magnetic resonance imaging (MRI) of the cervical spine revealed a type III hangman’s fracture with presence of pinching effect on the cord without any significant signal changes (Figure 2).

The patient was an ex-army serviceman and was in good health with good Karnofsky performance score. There was no significant

Figure 1. X-ray of the cervical spine showing Hangman’s fracture with significant translation and angulation.

Figure 2. MRI (T2 sequence) of the cervical spine revealing presence of pinching effect but no signal changes in the cord.
past medical or surgical illnesses. He had a habit of smoking mari-
juana previously. After explaining the disease condition, treatment
options and the risks involved the patient was placed on cervical
traction with a 6 kg load and was observed for features of realign-
ment. Stringent care was taken to observe for features of over dis-
traction. Because the fracture was an unstable type III variant, the
decision of surgical fixation was taken. However, routine screening
echocardiography revealed a cardiac ejection fraction of only 33%.
Therefore we decided to go for occipitocervical fusion so as to min-
imize the anesthetic risk imposed to the patient from both anterior
and posterior approaches. Intra-operatively there was fracture of the
pars and the lamina of C2. Since there was no atlantoaxial disloca-
tion, we opted for occipital and C1 and C3 lateral mass fixation.
There is evidence of good results with short fixation of C1 and C3
only, but keeping in mind the risk of osteoporosis in this case, we
wanted further anchorage from occipital fusion as well. Since there
was good posterior realignment of the spinal lines after traction
(Figure 3) and intra-operatively, we choose the posterior approach
only to minimize the added risk of the anterior approach. Lateral
mass screws were placed in C1 and C3 (Figure 4 and Figure 5).
Bone graft harvested from iliac bone was placed in the C1 and
C2 inter-space to further enhance the fusion process. The patient
was started on dexamethasone (8 mg intravenously and then rap-
idly tapered off in the following 2 days). The patient was safely
extubated. Neurological examination was normal. The patient was
in complete bed rest for a week and then mobilized with support.
A CT spine check after one week revealed good screw purchase
(Figure 6) and good reduction of fracture segment (Figure 7). The
patient was restricted to light weight bearing and was advised to
keep the cervical collar for at least 6 weeks. The patient was started
on calcium supplementation (tablet calcium 500 mg orally every 12
hours. The patient followed up in the outpatient department after
1.5 months walking on his own without any deficits.
Discussion

“Hangman’s fracture”, first coined by Schneider et al. in 1965 results from hyperextension of the upper cervical spine. There is fracture of the lateral mass and the pedicle of the axis with simultaneous disruption of the anterior longitudinal ligament allowing C2-C3 listhesis. Traumatic hangman’s fracture, in contrast to the judicial hangman’s fracture, is caused from extension and compression of the upper cervical spine with rare cord injury.

The most widely used classification for hangman’s fractures was firstly described by Effendi et al. and later modified by Levine et al.. Anterior approaches include anterior cervical disectomy and graft fusion; posterior approaches include lateral mass, pedicle or transarticular screw placement.

Anterior disectomy and screw plate fixation is an effective, but not very popular technique due to difficulty in exposing the C2-C3 region and the elimination of C2-C3 rotation. Direct screw fixation of C2 pars adds to the risk of injury to the vertebral artery and also there is the need for complete manual reduction of the fracture intra-operatively.

Fusion of lateral masses of C1 and C3 for hangman’s fractures minimizes risk of vertebral artery injury and displacement of fractured segments into the canal. The efficacy of this approach has been validated in a biomechanical study by Chittiboina et al.

This study hereby highlights the importance of the treatment algorithm chosen for the management of unstable hangman’s fracture in geriatric patients. Patients with good Karnofsky performance score would benefit from long segment posterior fusion, rather than both anterior and posterior approaches which might increase the intra-operative risk. Managing such patients with a prolonged period of immobilization in a halo imposes a higher risk of nonunion.

Conclusion

Age alone should not determine a doctor’s approach to the treatment of geriatric patients. By taking only age into account when deciding on treatment, we risk compromising effective management in elderly patients. Karnofsky performance scale is one reliable marker that helps in making such treatment decisions.

Consent

Both written and verbal informed consent for publication of images and clinical data related to this case was sought and obtained from the son of the patient.

Author contributions

SM reviewed the literature, designed the study and formatted the paper. BB revised and edited the final format.

Competing interests

No competing interests.

Grant information

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References

Open Peer Review

Current Referee Status:  ✗  ?  ?

Version 1

George Wittenberg
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I think this is a well-written and interesting case report. As a single case report, it cannot be used to guide treatment. The outcome could have been different even though the authors suggest a very reasonable approach to the situation. I would agree with Dr. Ratan's comments, although I may be less of an expert on the surgical management of hangman's fracture. I think there would be a small benefit to medical knowledge to indexing this paper, as the management of this condition would likely be guided by both exam, radiological findings, and patient medical condition.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Competing Interests: No competing interests were disclosed.

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We have read with interest the case report “A case report of unstable Hangman fracture in an eighty year old male” by Munakomi et al. The authors need to be congratulated for highlighting their view in managing unstable Hangman fracture in the geriatric age group.

The patient in your report was put on traction with six kilogram loading. It is an accepted fact that patients with type 3 Hangman fracture should not be subjected to traction due to risk of “iatrogenic hanging”.

Secondly, the radiology images published do not point towards severe osteoporosis. A DEXA scan could have been more informative as the decision to do occipito-cervical fusion in Hangman fracture exposes the patient to severe motion restriction in an already spondylotic spine.
Finally, I presume C2-C3 anterior cervical discectomy and fixation with casper plates would have been preferable than to subjecting the patient with an ejection fraction of 33% to surgery in prone position.

We have read this submission. We believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

**Competing Interests:** No competing interests were disclosed.

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Referee Report 11 August 2015

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This report describes a case of a Hangman's fracture without associated neurological symptoms. There are several problems with this report that limit its usefulness and message,

First, a Hangman's fracture, which is defined as fractures of both pedicles or pars interarticularis of the C2 vertebra (axis), is not defined in the abstract. There is a classification protocol that has been developed by Levine and Edwards that is based on etiology and guides treatment, this is also not mentioned.

Second, neurological impairment is only seen in 25% of cases, so the absence of neurological symptoms is the rule not the exception as implied by this abstract.

I am not convinced that this case report adds significantly to our understanding of how to diagnose and treat Hangman's fracture.

I have read this submission. I believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

**Competing Interests:** No competing interests were disclosed.

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Author Response 11 Aug 2015

Sunil Munakomi,

Thank you for the report. We totally agree with your comments, but the purpose of our paper was to highlight the clinical importance of choosing the correct surgical management, barring the age factor, which do significantly play a major role in decision making in developing countries like ours. So, we wanted to highlight the importance of neurological status and the Karnofsky score in making such decisions in geriatric patients.

**Competing Interests:** No competing interests were disclosed.