



Awake reduction of hangman's fracture: An era of dexmedetomidine

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ABSTRACT

Hangman's fracture is a kind of unstable cervical spine injury which should be treated promptly to avoid life threatening consequences. Advanced neurological monitoring is essential during surgical intervention. Resource limited setting, where advanced monitors like SSEP and MEP are not available makes it challenging to assess proper reduction of cervical spine without neurological compromise. Dexmedetomidine proved to be very useful drug to assess the neurological status intra operatively by awake sedation.

Introduction

Cervical spine trauma may have devastating consequences. Cervical spine injuries occur in 2–5 % of blunt trauma and hangman's fracture constitute 20 % of acute axis fractures. Hangman's fracture (traumatic spondylolisthesis of the axis) is a type of cervical spine injury that classically results from hyperextension/distraction of the upper cervical spine, causing the axis to break symmetrically across its pedicles or lateral masses and may involve the body of the vertebrae. Anesthetic challenges in managing Hangman's fracture are due to immobilization of neck with cervical collar and specialized neurological monitoring for sensory and motor function. Maintenance of stable hemodynamics, normocarbia and optimal positioning are other considerations to be kept under close vigilance while managing these patients.

Case report

A 43 year male patient with a history of road side accident presented with brief loss of consciousness not associated with vomiting or bleed. Patient did not have any co-morbidities and was a truck driver by occupation. Major complaint was severe chest and neck pain without any neurological deficit. Further investigations revealed subdural haemorrhage, minimal right sided pleural effusion and cervical spine fracture dislocation at C2-C3 level with grade IIa hangman's fracture with anterolisthesis of C2 vertebra over C3 and postero-superior corner of C3 indenting spinal cord. Patient was managed conservatively for pleural effusion. Surgery was planned for cervical fracture (Fig. 1).

Disease condition, treatment options and the risks involved were explained and patient was prepared for surgical fixation of fracture. Pre-operative assessment was carried out and required investigations were obtained. Immobilization of cervical spine was maintained with neck collar in peri-operative period. In view of restricted neck movements intubation was planned using intubating LMA. In the operation theatre all standard monitors and intravenous line were secured. Patient was pre-medicated with intravenous

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inj. Midazolam 1 mg and inj. Fentanyl 2 µg/kg. Induction was done by inj. Propofol 2µg/kg plane of intubation was maintained with sevoflurane and oxygen. Patient was intubated with Intubating LMA size 4 and 7.5 mm ID endotracheal tube was inserted and fixed at 22 cm at angle of mouth. Patient was put on Pressure Support mode of ventilation. Sevoflurane was stopped. Patient was maintained on oxygen, nitrous oxide and Dexmedetomidine infusion at 0.5–0.7 µg/kg/h. After 3 min, patient was arousable but sedated. Closed reduction of cervical spine was attempted and patient was observed for realignment of cervical vertebrae using C arm. After adequate reduction was achieved, neck was fixed by surgeon with traction. A complete sensory and motor examination was carried out by surgeon and validated by anaesthesiologist. Sensory and motor deficits were ruled out and sevoflurane was restarted. Atracurium 0.5 mg/kg was administered and patient was maintained with sevoflurane, oxygen and nitrous oxide. Dexmedetomidine infusion was stopped. Open reduction and internal fixation was carried out and patient was extubated after conclusion of surgery.

Discussion

Role of Dexmedetomidine, a selective α_2 adrenoceptor agonist acts on pontine locus coeruleus and causes hyperpolarization and



Fig. 1. X-Ray cervical spine showing Hangman's fracture.

suppression of neurons. It is relatively more cardiostable compared to clonidine and it has a favourable effect on intracranial pressure. Its role is well established in awake craniotomies but its role in closed reduction of cervical spine is still unexplored [1]. We used this drug for closed reduction of Hangman's fracture because of unavailability of SSEP and MEP monitors. We found it very useful in monitoring for sensory and motor deficits in real time.

In cervical spine trauma our goal is to prevent or minimize secondary injury to the nervous system and improve the outcome of procedures. Surgical intervention is usually performed in unstable cervical spine fracture or when there is a possible risk of instability later on. Hangman Type II and III fractures with significant dislocation are almost always treated surgically [2]. In Hangman's fracture Type II and IIA with severe vertebral body and pedicle displacement, intraoperative difficulties arise during the approximation of posterior elements to the C2 vertebral body, which is tilted, angulated and dislocated. These are considered difficult to treat with direct pedicle or pars screws as they had severe forward tilting and angulation in the C2 vertebral body [3,4]. To overcome these intraoperative difficulties closed reduction was attempted under awake sedation with dexmedetomidine in a controlled manner after securing airway. Patient was following commands which helped in assessing neurological deficit as a result of reduction and traction. After the vertebral tilt and angulation were corrected with closed reduction, it was stabilized in same patient with traction [5,6]. Sevoflurane was started with inj Atracurium as neuromuscular blocker and internal stabilization was carried out with screws. Patient was successfully extubated after conclusion of surgery. Hence dexmedetomidine is useful choice especially in centers with paucity of continuous neurological monitoring intraoperatively.

Conclusion

Dexmedetomidine is a useful drug with its many faces still to be explored. It can prove to be useful in resource limited setting in cases of trauma requiring neurosurgical intervention.

CRedit authorship contribution statement

Monica Chhikara: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Davender Chahal:** Writing – original draft, Investigation.

Declaration of competing interest

It is certified that authors have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

References

- [1] B.G. Kallapur, R. Bhosale, Use of dexmedetomidine infusion in anaesthesia for awake craniotomy, *Indian J. Anaesth.* 56 (4) (2012 Jul) 413–415, <https://doi.org/10.4103/0019-5049.100854>. PMID: 23087472; PMCID: PMC3469928.
- [2] X. Li, L. Dai, H. Lu, X. Chen, A systematic review of the management of hangman's fractures, *Eur. Spine J.* 15 (3) (2006) 257–269.
- [3] J. Turtle, A. Kantor, N.T. Spina, J.C. France, B.D. Lawrence, Hangman's fracture, *Clin. Spine Surg.* 33 (9) (2020 Nov) 345–354, <https://doi.org/10.1097/BSD.0000000000001093>. PMID: 33044269.
- [4] H. Murphy, G.D. Schroeder, W.J. Shi, C.K. Kepler, M.F. Kurd, A.N. Fleischman, F. Kandziora, J.R. Chapman, L.M. Benneker, A.R. Vaccaro, Management of hangman's fractures: a systematic review, *J. Orthop. Trauma* 31 (Suppl. 4) (2017 Sep) S90–S95, <https://doi.org/10.1097/BOT.0000000000000952>. PMID: 2881688.
- [5] A. Goel, A. Hawaldar, A. Shah, S. Bhambere, A. Lunawat, M. Singh, M. Baldha, N. Sudarshan, Hangman's fracture: a clinical review based on surgical treatment of 15 cases, *Neurosurg. Rev.* 45 (1) (2022 Feb) 595–606, <https://doi.org/10.1007/s10143-021-01556-8>. Epub 2021 May 31. PMID: 34059978.
- [6] S. Prost, C. Barrey, B. Blondel, S. Fuentes, L. Barresi, B. Nicot, V. Challier, M. Lleu, J. Godard, P. Kouyoumdjian, N. Lonjon, P. Marinho, E. Freitas, S. Schuller, J. Allia, J. Berthiller, Y.P. Charles, French Society for Spine Surgery (SFCR), Hangman's fracture: management strategy and healing rate in a prospective multi-centre observational study of 34 patients, *Orthop. Traumatol. Surg. Res.* 105 (4) (2019 Jun) 703–707, <https://doi.org/10.1016/j.otsr.2019.03.009>. Epub 2019 Apr 17. PMID: 31005699.