Editor-in-Chief : Atul Goel (INDIA)
Open Access HTML Format
For entire Editorial Board visit : http://www.jcvjs.com/editorialboard.asp
Journal of Craniovertebral Junction and Spine

Editorial

Can foramen magnum decompression surgery become historical?

Atul Goel

Department of Neurosurgery, King Edward VII Memorial Hospital and Seth Gordhandas Sunderdas Medical College, Parel, Mumbai, Maharashtra, India

Corresponding author: Prof. Atul Goel, Department of Neurosurgery, King Edward VII Memorial Hospital and Seth Gordhandas Sunderdas Medical College, Parel, Mumbai - 400 012, Maharashtra, India. E-mail: atulgoel62@hotmail.com

Journal of Craniovertebral Junction and Spine 2015, 6:13

Foramen magnum decompression is a discrete, defined and popular neurosurgical operation and has several surgical indications. Essentially, foramen magnum decompression is done when the posterior fossa volume is considered to be smaller than normal and the contents are packed more tightly and the net result is compressive effects on the brainstem and resultant symptoms. The purpose of foramen magnum decompression is to increase the volume of the posterior cranial fossa. Foramen magnum decompression essentially involves wide removal of the suboccipital bone and 'lax' duroplasty using graft. A number of methods of foramen magnum decompression have been discussed in the literature. It may not be an exaggeration to say that every surgeon has his own set of preferences for conducting the operation and the number of types of variations in the operation may be equal to the number of surgeons performing the surgery. The extent of bone removal, nature of dural incision and the types of dural graft vary considerably.

The primary indication for foramen magnum decompression is the presence of Chiari malformation. The operation has been historically considered to be the primary and gold standard operation for this condition. Herniation of cerebellar tissue due to presence of larger cerebellar mass in a relatively smaller posterior cranial fossa has been an important hypothesis of pathogenesis of Chiari malformation. For Chiari malformations some surgeons advocate resection of the tonsils, arachnoidal dissection and when associated with syringomyelia, introduction of a tube inside the fourth ventricle or in the syrinx cavity through the obex. Over the years, the extent of bone, dural and neural dissection has been reduced. Most surgeons do not prefer to resect the tonsils. Isu *et al.,* recommended removal of only the outer dural wall.[1] Goel *et al.,* suggested that only bone removal is sufficient for foramen magnum decompression and dural incision and duroplasty is not necessary.[2] The discussion over the nature and extent of foramen magnum decompression surgery continues.

In the era where anterior surgery was indicated for anterior operation and posterior surgery for posterior compressive factors, foramen magnum decompression surgery gained popularity.[3,4] 'Fixed' atlantoaxial dislocations and basilar invagination have also been indications for foramen magnum decompression surgery. In this situation, the atlantoaxial joint was considered to be fixed, immobile or irreducible and anterior transoral or posterior foramen magnum decompressions have been popular methods of relieving the neural structures of compressive bone elements and cerebellar tonsils. The other issue that is discussed in this situation is the potential need for stabilization after the conduct of either anterior or posterior bone decompression.

Whilst foramen magnum decompression continues to be the primary surgery for Chiari malformation and selected cases with basilar invagination, its indication in the treatment of fixed atlantoaxial has essentially been abandoned. In the year 1965, Dastur reported cases with hematomyelia following foramen magnum decompression.[5] This article provided an opportunity to reconsider the need for this operation at-least in cases with fixed atlantoaxial dislocation.

Goel *et al.,* divided basilar invagination into two groups on the basis of presence or absence of Chiari malformation.[2] In Group 1 basilar invagination the odontoid process migrated superiorly and posteriorly and directly indented the cord. In

Access this article online
Quick Response Code:
Website: www.jcvjs.com
DOI: 10.4103/0974-8237.156037

this group, transoral surgery was recommended. Whilst in Group 2 cases, the posterior fossa volume reduction seemed to be the cause of tonsillar herniation and foramen magnum decompression surgery was recommended. The essential dictum was that the atlantoaxial joint in these cases was fixed and stabilization was either a non-issue or was considered due to the possible destabilization that was related to removal of odontoid process and related ligaments during decompression.

In the year 2004, Goel identified instability as a factor in a group (Group A) of basilar invagination.[6] The identification of the fact that the atlantoaxial joint in these cases was not fixed or fused, but was not only mobile but was abnormally mobile and more importantly, there was a possibility of manual reduction of the basilar invagination and craniovertebral realignment. This philosophical thought was the beginning of a new era in the treatment of basilar invagination. The era was of considering instability as a defining issue in cases with basilar invagination. The operation was now a 'posterior alone' for this group of patients and essentially involved atlantoaxial fixation and aimed at craniovertebral realignment. The operation avoided the need for bone decompression by transoral route. Transoral surgery slowly but surely is slipping into realm of history, as the popularity of stabilization of the atlantoaxial joint and attempts at reduction of basilar invagination are becoming popular.

Foramen magnum decompression was still considered to be the best form of treatment for Group B basilar invagination, wherein the atlantodental interval remained normal and instability was not considered to be an issue. However, as the experience in the subject has grown over the years, it was realized that instability is a defining factor for both groups A and B patients. Atlantoaxial stabilization thus formed the primary mode of treatment for all types of basilar invagination. The instability in these cases was focused at the atlantoaxial joint. Inclusion of occipital bone and subaxial bones in the fixation construct was neither indicated nor provided optimum stabilization to the region. The aim of surgery was arthrodesis. This hypothesis of instability being the pathogenetic factor in basilar invagination suggested the need for introduction of bone graft into the region to assist arthrodesis and excluded the need for removal of bone necessary for decompression of the foramen magnum.

Foramen magnum decompression has continued to be the mainstay in the treatment of Chiari malformation.[7-9] However, the recent hypothesis that Chiari malformation may be related to atlantoaxial instability has opened up a newer vista in the treatment.[10,11] Instability at the craniovertebral junction is generally identified on the basis of atlantodental interval. Identification of instability on the basis of facetal mal-alignment has introduced a fresh space for re-evaluation of the subject.[12] Instability of the atlantoaxial region may be present even when the facets are in alignment. The hypothesis suggests that atlantoaxial stabilization forms the basis of treatment for Chiari malformation. It also suggests that Chiari malformation mimics 'air-bag' of a car and is a Nature's protective formation that avoids pinching of the neural structures between bones.[11] Foramen magnum decompression may not be indicated even in cases with Chiari malformation. Although this hypothesis is still in its infancy and will need further support from other clinicians, it has certainly initiated a discussion on the issue. It does seem that foramen magnum decompression can become an operation of historical interest only.

REFERENCES

1. Isu T, Sasaki H, Takamura H, Kobayashi N. Foramen magnum decompression with removal of the outer layer of the dura as treatment for syringomyelia occurring with Chiari I malformation. Neurosurgery 1993;33:845-9.
2. Goel A, Bhatjiwale M, Desai K. Basilar invagination: A study based on 190 surgically treated cases. J Neurosurg 1998;88:962-8.
3. da Silva JA, dos Santos AA Jr, Melo LR, de Araujo AF, Regueira GP. Posterior fossa decompression with tonsillectomy in 104 cases of basilar impression, Chiari malformation and/or syringomyelia. Arq Neuropsiquiatr 2011;69:817-23.
4. Fenoy AJ, Menezes AH, Fenoy KA. Craniocervical junction fusions in patients with hindbrain herniation and syringohydromyelia. J Neurosurg Spine 2008;9:1-9.
5. Dastur DK, Wadia NH, Desai AD, Sinh G. Medullospinal compression due to atlanto-axial dislocation and sudden haematomyelia during decompression. Pathology, pathogenesis and clinical correlations. Brain 1965;88:897-924.
6. Goel A. Treatment of basilar invagination by atlantoaxial joint distraction and direct lateral mass fixation. J Neurosurg Spine 2004;1:281-6.
7. Batzdorf U, McArthur DL, Bentson JR. Surgical treatment of Chiari malformation with and without syringomyelia: Experience with 177 adult patients. J Neurosurg 2013;118:232-42.
8. Brockmeyer DL. The complex Chiari: Issues and management strategies. Neurol Sci 2011;32:S345-7.
9. Chiari H. UeberVerderbungen des Kleinhirns infolge von Hydrocephalie des Grossihirns. Dwochenschr 1891;17:1172-5.
10. Goel A. Is atlantoaxial instability the cause of Chiari malformation? Outcome analysis of 65 patients treated by atlantoaxial fixation. J Neurosurg Spine 2015;22:116-27.
11. Goel A. Is Chiari malformation nature's protective "air-bag"? Is its presence diagnostic of atlantoaxial instability? J Craniovertebr Junction Spine 2014;5:107-9.
12. Goel A. Facetal alignment: Basis of an alternative Goel's classification of basilar invagination. J Craniovertebr Junction Spine 2014;5:59-64.

How to cite this article: Goel A. Can foramen magnum decompression surgery become historical?. J Craniovert Jun Spine 2015;6:49-50.

Source of Support: Nil, **Conflict of Interest:** None declared.