

Craniovertebral Junction Lesions and Single Stage Anterior Decompression Followed by Posterior Fusion

IJAZ HUSSAIN WADD, ASIF SHABIR, SEFROZ ANSARI
ABDULLAH, KHAWAR ANWAR, RIZWAN MASOOD BUTT
Department of Neurosurgery, Lahore General Hospital, Lahore

ABSTRACT

Objective: To assess the outcome of transoral microsurgical excision of anterior placed craniovertebral junction (CVJ) lesions excision followed by posterior craniocervical stabilization.

Study Design: Quasi Experimental study.

Setting: Department of neurosurgery PINS/Lahore General Hospital, Lahore.

Duration: May 2017 to August 2018.

Inclusion Criteria: Male and Female patients of 12-65 yrs of age with compressive lesion at the ventral aspect of craniovertebral junction.

Exclusion Criteria: Lateral and posterolateral lesions, lesion below C2 vertebral body, patient unfit for anaesthesia and surgery.

Material and Methods: 12 consecutive patients coming in OPD and emergency department of our unit and fulfilling the inclusion criteria were studied. All patients were prepared for the surgery and written informed consent taken from all our patients. The patients underwent anterior trans oral microsurgical excision of the tumour followed by posterior fixation. All patients were discharged on 10th post op day and followed for six months.

Results: Out of 12 patients (range 12–65 years); Rheumatoid arthritis in 1 patient, tumor in 5 patients or trauma in 4 case and basilar invaginations in 2 patients. All my patients had headache (cranial and/or high-cervical pain), 73% of patients presented with quadriparesis, and 29% presented with basal cranial nerves involvements. Anterior decompression followed by posterior craniocervical fixations was done in all patients in same sitting. Out of 5 patients having severe neurological deficits preoperatively 3 improved. The remaining 7 patients have mild to moderate neurological deficits improved gradually throughout the follow-up periods to independent level. Among complications mortality in 1 patient and morbidity in the form of dural tear, CSF leak and infection in 2 patient). Craniocervical instability was seen in one patients after 3 months of surgery.

Conclusion: A good surgery with proper decompression at the craniovertebral junction is technically difficult procedure and demands expertise. It needs proper preoperative planning and investigations and adequate decompression and stabilization with proper implants.

Keywords: Craniocervical junction, Transoral decompression, Occipitocervical fixation.

INTRODUCTION

Pathologies at anterior aspect of foramen magnum presents with unique signs and symptoms and surgery is a big challenge for a neuro surgeon at

craniovertebral junction. The Neoplastic, degenerative, or inflammatory lesions can occurs at this complex area that can cause compression of the cervicomedullary junction and cranial nerves with

significant neurological deficit and craniocervical instability both preoperative and postoperative. The neurosurgical treatment needed at this complex area is microscopic or endoscopic decompression decompression craniocervical fixations under flouro guided. The best approach at this area is transoral because it provides midline access with better orientation of the craniovertebral junction anatomy especially for extradural lesions like chordomas, chondrosarcomas, giant cell tumors, and rheumatoid or degenerative pannus.¹ Specially with trans oral atlantoaxial internal fixation with plate.^{2,3} To avoid any life threatening complication at this area its necessary to know the proper 3D bony, neural and vascular anatomy at this level. Stulík et al reported a fatal VA injury during surgery. Transoral approach can be done in many pathologies at craniovertebral junction like congenital malformation (basilar invagination), extradural tumor, craniovertebral trauma, chronic inflammatory diseases.^{5,6} The transoral approach is used to decompress the cervicomedullary junction with preservation of neurovascular structures.⁷⁻⁹ Preoperative evaluation to check atlantoaxial mobility is done with dynamic X-ray and open mouth odontoid view. MRI craniocervical junction plane and contrast was done to see the proper extent of lesion and neural tissue compression and 3D-CT scan craniocervical junction was done to see the bony anatomy and its involvement by pathology and to plan postoperative fixation. The microsurgical indications at this complex area are extradural tumors, compressing pannus of rheumatoid arthritis and nonreducible compression fracture and congenital malformation like basilar invaginations.

Reporting surgical technique and its results and complications of surgical procedure was done on 12 patients. The purpose of my study was to evaluate microsurgical anterior decompression followed by postereior craniocervical fixation in a single sitting.

Recent advances at this area are extended endonasal endoscopic approach^{10,11} and endoscopic transcervical approach.¹²

MATERIAL AND METHODS

This study was conducted at department of neurosurgery Lahore General Hospital Lahore from May 2017 to July 2018. Total 12 patients of both sexes with age from 12-65 of patient included. All patients with anteriorly placed extradural lesions causing compression over neural tissue at cervicomedullary

junction were included. Radiographic imaging, pre and postoperative clinical status of the patients were retrospectively checked. Two patients presented basilar invagination, 1 patients having rheumatoid arthritis pannus, 5 patients having extradural neoplastic lesions and 4 patients with traumatic fracture dislocations at craniocervical junction. The mean presenting age was 43.45 years (range 12–65 years); with six males and six female patients.

All patients presented with regional pain with radiation towards occipital area. 9 patients presents with different grades of quadriparesis. 3 patients presented with dysphagia and dysarthria due to basil cranial nerves involvements. Most of patients were symptomatic from six months to maximum range of 4 years duration.

To asses the stability at craniovertebral junction flexion extension X rays were done and CT Scan craniocervical junction with three dimensional reconstruction was done and properly assessed preoperatively and discussed with radiologist. To asses ligamentous stability MRI craniocervical junction was done and properly studied. MRI cervical spine plane and contrast was done to see extent of tumours and flow voids in tumour and normal flow of vertebral artery and neural tissue compression at craniovertebral junction. The indications for surgery were: extradural tumors, rheumatoid arthritis pannus, traumatic irreducible fracture or invaginations with compression. Microsurgical transoral approach was done in all cases followed by posterior fixation.

Data Collection and Analysis

All patients meeting the inclusion criteria were enrolled in my study. The informed consent taken. Demographic data like name, age, sex and address was obtained and entered into a performa. No ethical issue was involved in the study. MRI and high resolution CT Scan cranio-cervical junction with 3D reconstruction were properly evaluated. Postoperatively all patients stayed in the ICU and discharged on 10th postoperative day. All patients followed for six months.

Data was analysed using SPSS version 22. Variable of interest was improvement in neurological status, craniocervical stabilization and post op complications. Qualitative data like sex was presented as frequency distribution and quantitative data like age as mean and standard deviations. P value less than 0.05 taken as significant.

RESULTS

12 patients were studied after admission through outpatient department and emergency. Microsurgical anterior decompression and posterior fixation was done in all patient after proper preoperative planning and preparing the patient and explaining all pros and cons of surgery. The patients from 12-65 yrs ages and both sexes were studied. The pathologies studied were Rheumatoid arthritis, neoplastic, traumatic and congenital lesions. Headache was present in all 12 patients, 9 patients (75%) with quadriparesis, and 3 patients (25%) with lower cranial nerve deficits. Microsurgical transoral anterior decompression was done in all cases with posterior cranio-cervical fixations. As 5 patients were quadripallegic and severe neurological deficits preoperatively, 3 (60%) improved. All other patients improved throughout the follow-up to independent level. Perioperative mortality was in one (8.01%) patient and surgical morbidity in 2 cases in the form of dural tear, CSF leak and infection. Craniocervical instability was seen in one patient postoperatively.

DISCUSSION

In Craniovertebral junction lesions the posterior approaches are successful in reducible lesions like basilar invagination and trauma.¹³ With better understanding of anatomy and dynamic at craniovertebral junction and better investigations facility to determine the site of pathology, transoral approach is Gold standard for such lesion with addition of posterior fixation.¹⁴ Ventrally and ventrolaterally located lesions, lateral approaches are possible but they are more extensive with more risk to neurovascular structures so they are better for more invasive tumours involving the lateral structures.¹⁵

We have done all cases of transoral decompression under general anaesthesia and broad spectrum antibiotic coverage. No preoperative tracheostomy was done in any patient. For patients with more extensive lesions especially extending more rostrally, soft palate split was done with very few complication of soft palate wound dehiscence.¹⁶ Proper three dimensional anatomical knowledge and proper evaluation of pathology both clinically and on radiology at this area is crucial for appropriate approach and to avoid complications.⁶ Some other approaches that can be used in this area are; open-door maxillotomy approach, the transoral-translabiomandibular approach, the transoral bilateral sagittal split

mandibular osteotomy approach and the mandibular swing-transcervical approach.¹⁷

As no preoperative diagnostic modality is available to determine the chances of instability and extent of odontoid resection, so we go for posterior fusion in all cases as most of authors doing it.¹⁸ To minimize postoperative instability and to early mobilize the patients we have done both anterior decompression and craniocervical fixation in same sitting instead of two stage surgery with excellent results and minimum complications. Thorough anatomy of craniovertebral junction and C1 vertebrae and its both arches and letter masses are keenly studied to reduce cranial settling.¹⁹

CONCLUSIONS

Transoral decompression of craniocervical junction followed by posterior fixation under same anaesthesia is safe and effective procedure with minimum morbidity of surgery and anaesthesia. Thorough evaluation of 3D surgical anatomy at craniovertebral junction ,transoral approach can be tailored according to respective anatomy. It has got best results in expert hands.

Address for Correspondence:

Dr. Ijaz Hussain Wadd

Department of Neurosurgery

Lahore General Hospital, Lahore

Email: nsijazwadd@yahoo.com

REFERENCES

1. Ammirati M, Bernardo A. Management of skull base chordoma. *Crit Rev Neurosurg.* 1999; 9: 63–69.
2. Kandziora F Pflugmacher R Ludwig K Duda G Mittlmeier T Haas N P Biomechanical comparison of four anterior atlantoaxial plate systems. *J Neurosurg.* 2002; (96) 3, (Suppl): 313–320.
3. Yin Q, Ai F, Zhang K. et al. Irreducible anterior atlantoaxial dislocation: one-stage treatment with a transoralatlantoaxial reduction plate fixation and fusion. Report of 5 cases and review of the literature. *Spine (Phila Pa 1976).* 2005; 30 (13): E375–381.
4. Stulík J Vyskocil T Sebesta P Kryl J. Harms technique of C1-C2 fixation with polyaxial screws and rods[in Czech]. *Acta Chir Orthop Traumatol Cech.* 2005; 72: 122–27.
5. Hadley MN, Spetzler RF, Sonntag VKH. The transoral approach to the superior cervical spine. A review of 53 cases of extradural cervicomedullary compression. *J*

- Neurosurg. 1989; 71: 16–23.
Doi: 10.3171/jns.1989.71.1.0016.
6. Pásztor E, Vajda J, Piffkó P, Horváth M, Gádor I. Transoral surgery for craniocervical space-occupying processes. *J Neurosurg.* 1984; 60: 276–281.
Doi: 10.3171/jns.1984.60.2.0276.
 7. Perrini P, Benedetto N, Di Lorenzo N. The transoral approaches to the craniovertebral junction malformations: surgical strategies and results in a series of 34 consecutive patients. *Neurosurgery*, 2008.
 8. Spetzler RF, Dickman CA, Sonntag VKH. The transoral approach to the anterior cervical spine. *Contemp Neurosurg.* 1991; 13: 1–6.
 9. Di Lorenzo N, Fortuna A, Guidetti B. Craniovertebral junction malformations. Clinoradiological findings, long-term results and surgical indications in 63 cases. *J Neurosurg.* 1982; 57: 603–608.
Doi: 10.3171/jns.1982.57.5.0603.
 10. Kassam A, Abla A, Snyderman C, Carrau R, Spiro R. An endoscopic transnasal odontoidectomy to treat cervicomedullary compression with basilar invagination. *Oper Tech Neurosurg.* 2005; 8: 198–204.
 11. Messina A, Bruno M C, Decq P, et al. Pure endoscopic endonasal odontoidectomy: anatomical study. *Neurosurg Rev.* 2007; 30: 189–194. Discussion 194.
 12. Wolinsky J P, Sciubba D M, Suk I, Gokaslan Z L. Endoscopic image-guided odontoidectomy for decompression of basilar invagination via a standard anterior cervical approach: technical note. *J Neurosurg Spine*, 2007; 6: 184–191.
 13. Di Lorenzo N. Craniocervical junction malformation treated by transoral approach. A survey of 25 cases with emphasis on postoperative instability and outcome. *Acta Neurochir (Wien)*, 1992; 118 (11): 2–116.
 14. Crockard HA, Calder I, Ransford AO. One-stage transoral decompression and posterior fixation in rheumatoid atlanto-axial subluxation. *J Bone Joint Surg Br.* 1990; 72: 682–685.
 15. Al-Mefty O, Borba LA, Aoki N, Angtuaco E, Pait G. The transcondylar approach to extradural nonneoplastic lesions of the craniovertebral junction. *J Neurosurg.* 1996; 84: 1–6.
 16. Balasingam V, Anderson GJ, Gross ND, Cheng CM, Noguchi A, Dogan A, McMenomey SO, Delashaw JB, Andersen PE. Anatomical analysis of transoral surgical approaches to the clivus. *J Neurosurg.* 2006; 105: 301–308. Doi: 10.3171/jns.2006.105.2.301.
 17. Crockard HA. Transoral surgery some lessons learned. *Br J Neurosurg.* 1995; 9: 283–293.
Doi: 10.1080/02688699550041304.
 18. Dickman CA, Locantro J, Fessler RG. The influence of odontoid resection on stability of the craniovertebral junction. *J Neurosurg.* 1992; 77: 525–530.
Doi: 10.3171/jns.1992.77.4.0525.
 19. Naderi S, Crawford NR, Melton MS, Sonntag VK, Dickman CA. Biomechanical analysis of cranial settling after transoral odontoidectomy. *Neurosurg Focus*, 1999; 6 (6): Article 7.

AUTHORS DATA

Name	Post	Institution	E-mail	Role of Authors
Dr. Ijaz Hussain Wadd,		Department of Neurosurgery, PGMI / AMC and Lahore General Hospital, Lahore	nsijazwadd@yahoo.com	Paper Writing
Dr. Asif Shabir				Data Collection
Dr. Sefroz Ansari				Literature Search
Dr. Abdullah				Statistical Analysis
Dr. Khawar Anwar				Data collection and Typing
Prof. Rizwan Masood Butt	Professor			

Date of Submission: 15-7-2018

Date of Printing: 30-9-2018