

## Experiences with per Oral Transpharyngeal Odontoid Excision in Craniovertebral Anomaly

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Atlanto-axial dislocation, basilar invagination and Axial dislocation (tandem dislocation) causes compression of cervico-medullary junction region. The compressive element is situated anteriorly. In large number of patients with AA dislocation, the degree of compression may be minimal to moderate, and a few weeks of effective skull traction, or just extension of neck, reduces the dislocation. Many of these patients make significant recovery from the neurological deficits while on traction. The operative treatment in these patients would involve posterior fusion or lateral mass fusion as described by Dr. Gajendra Sinh.

In case of basilar invagination or AA dislocation where the displacement fails to reduce after traction, the anterior compression on spinal cord persists. We consider patients to have irreducible lesions, when skull traction for 3 weeks becomes ineffective in reducing the dislocation. Such patients would benefit by excision of the odontoid and other compressive elements. With this philosophy we have performed peroral transpharyngeal odontoid excision in 16 patients, with congenital craniovertebral anomaly.

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### Clinical and radiological features

All sixteen patients had neurological deficits. There were 5 children below the age of 14 years. Three patients had gross deficits and were not able to walk even with assistance. Two of them were confined to bed for several years with contractures. There was one child with features of mongolism and gross atlanto-axial dislocation. Significant weakness of limbs was present in all patients. Two patients had very poor respiratory reserve. Lower cranial nerves involvement was present in two and one of them had basilar invagination.

Radiological investigations performed were mostly plain x-rays, tomograms and flexion extension studies of craniovertebral junction. Only three had myelogram and none had CT scan. Except one patient with normal odontoid and basilar invagination, all others had significant atlantoxial dislocation with or without axial dislocation (tandem dislocation).

Radiographs were repeated after 3 weeks of traction in every patient to ascertain the degree of reduction. Mild to moderate neurological improvement was observed in seven patients, despite insignificant radiological improvement of dislocation.

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### Preoperative preparations

While on traction, adequate care was taken to improve the nutritional status. Throat and nasal swabs were cultured and patients were treated with appropriate antibiotics. We have covered all patients with pre and post operative broad spectrum antibiotics, even if the throat swab did not grow any pathogen. Patients were advised breathing exercises and physiotherapy was given to the extremities.

All the patients were operated in supine position, with skull traction. Preanaesthesia tracheostomy was performed in patients earlier in this series. Tracheostomy was maintained as long as it was required postoperatively. Later on we were able to manage with oral intubation only, without any tracheostomy, having secured the tube to a side by a stitch. The Boyle-Davies mouth gag was put in place. Initially we did split the palate in midline to gain proper access. Having encountered problem in palate healing we reserve this procedure in patients where basilar invagination is significant. The palate could very well be retracted upwards by stitches taken out through each nostril.

In some of the earlier patients we made an inverted 'U' shaped incision over the posterior pharyngeal wall. This limited the cranial extension of incision. Of late we have resolved to midline longitudinal posterior pharyngeal wall incision which gives adequate exposure. The incision is deepened till the prevertebral the muscle layer. The pharyngeal wall and the muscles are retracted by stitches taken through and brought out through each side of cheek. This provides good retraction at the depth.

Usually there is significant fibrous soft tissue interposed between odontoid, body of axis and anterior arch of atlas. These need to be excised along with the anterior arch of atlas to expose ventral aspect of C2 body and odontoid. At this stage we take a translateral X-ray to identify the portion to be excised.

Long instruments and a highspeed drill, diamond drill bits, are essential. The desired part of axis and odontoid are carefully drilled. We have found the aid of operating microscope to be beneficial for this part of operation. After excising the odontoid and its base one visualises the thick glistening transverse ligament. The tip of odontoid with large number of ligament attachments poses maximum difficulty in its excision. It is necessary to cut the ligaments with suitable sharp instruments. All care is taken to avoid a dural tear. We have had dural tear in three cases. It was not possible to repair the dural defect by suturing. After excision of bony elements, one sees the prolapsing of soft tissue into the operating field. To confirm the degree of excision we perform check x'rays.

The posterior pharyngeal wall is stitched in two layers with chromic catgut. The palate if incised, is sutured in two layers.

We have continued skull traction post operatively in all patients except in the patients of basilar invagination.

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## Results and discussion

The Table 1 depicts the analysis of results during post operative period and follow up. Six patients had mild deterioration in grade of quadriplegia and most of them recovered within subsequent week of operation. The deterioration is considered due to insult to the cord at the cranio vertebral junction during surgery. However the deterioration as such did not significantly contribute to the subsequent morbidity or mortality.

*Table 1*

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Six patients died during the hospital stay. We are aware that this number is rather too high. The analysis of patients who expired is provided in Table 2

*Table 2*

*Table 2*

Two of the patients who expired were confined to bed, for several years before operation. One of them had significant contractures of all the limbs and had poor respiratory reserve. Probably such patients are high risks for any surgical procedure, not only transoral operation and we could have avoided the operation in them. It has been difficult to wean off respirator from patients who have had preoperative respiratory insufficiency and often other complications of being on respirator for days vitiates the entire outlook. A mongol child had to be kept on respirator post operatively and the expired on 8th post operative day. Infection was the cause of death in three patients. Two of them had severe meningitis and both the patients had dural care tear with CSF leak during operation. Both these patients expired. Hence great care has to be taken to avoid dural tear. We propose to keep such patients on continuous lumbar CSF drainage in future, during post operative period.

One patient died due to post operative instability unfortunately. This was the patient who had not maintained on skull traction after operation. He had basilar invagination and we thought such patients who have good facet joints may not need maintenance traction. He had no post-operative neurological deterioration and on the 3rd day suddenly became quadriplegic and dyspnoeic. The dislocation was detected, but corrective efforts were futile.

Two patients were discharged from the hospital with improvement and were lost for follow-up. Eight patients are followed up and all of them have improved significantly and have maintained the improvement. We have not noticed any significant dislocation in flexion extension X-ray studies in these patients on follow-up.

We now believe that patients with long duration of gross neurological deficits and those with poor respiratory reserve are high risk patients for transoral surgery. Probably irreversible neural damage has already occurred and they may not tolerate the operation well. Post operative traction should be applied in all patients who undergo transoral excision till the time one can perform flexion extension studies to ascertain if there is mobility and dislocation and whether a posterior fusion is necessary. Tracheostomy and palate splitting are rarely necessary and can be avoided in most of the patients. We have no experience in lateral mass fusion through transoral approach, though we are aware of the report of Dr. Chatterji of Calcutta. Peroperative motor evoked potential monitoring may be beneficial in warning the surgeon of inadvertent pressure on cord during operation, and help in reducing the morbidity.