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The Posterior Approach for Congenital Atlanto Axial Dislocations with Special Reference to the use of Acrylic Fixation and Halo-pelvic Traction

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Since the first case of congenital altalto-axial dislocation (AAD) reported by Sir Charles Bell in 1830 [1], there have been numerous papers concerning the rediology, pathology and clinical presentations of these lesions. Professor Wadia [2], [3] pointed out that this group of congenital or spontaneous AAD's are a distinct group from the rest of the craniovertebral anomalies. Surprisingly most orthopaedic and neurosurgical tests have paid scant attention to the precise management of these lesions. Credit for one of the largest surgical series of cases must surely go to Professor Gajendra Sinh. His mediculously studies cases were summed up in the Presidential Oration of the Neurological Society of India a few years ago [5].

This abnormality may arise as a consequence of occipitalisation of the atlas, undue laxity of the alar ligaments of transverse ligaments or an abnormality of the odontoid like an os odontoideum. The congenital nature of the lesion is suggested by the size and form of the odontoid, its abnormal position and frequently associated congenital abnormalities [3], [6], [7], [8], [9]. In all fairness it is sometimes very difficult to differentiate traumatic from congenital lesion at this site. It is generally consider that an increase of space, greater than 3 mm in adults and 4.5 mm in children, between the anterior arch of the atlas and dens was abnormal. Neurological disturbances were invariably present if the distance between the posterior surface of the dens and anterior surface of the posterior arch of the atlas was less than 19mm [10]. This paper reviews our experiences with 60 consecutive patients treated, over 11 years from 1974 through 1985 among 66 patients which were encountered. During the same period 11 other patients with AAD's which included 6 secondary to tuberculosis, 3 of which were post-traumatic and 2 patients with rheumatoid arthiritis were also treated. The youngest patient with AAD was 4 years and the oldest 58 years of age and there was a male preponderance (54 males to 12 females).

The essence of surgical therapy in these patients was stabilisation of C1 and C2 usually by posterior bony fusion with pre and post operative cervical traction and later external stabilisation using a PVC shell. In 34 patients we utilised methyl methacrylate in addition to the use of bone graft and wire fixation. I believe it was Geoffrey Knight [11] who first used acrylic inlays in a patient with atlanto-axial subluxation. He reported a good result and noted no major complications. Braastrom and Granholm [12] used acrylic in 28 patients of atlanto axial subluxation due to rheumatoid arthritis. The surgical technique we employed was really a modification of Granholm's method. The use of acrylic reduced the period of post-operative traction and therefore lead to earlier mobilisation of the patient. Further wire fixation in young children often proved a problem during surgery because the wire readily cut through the thin spinous processes. Encasement in acrylic provide a more stable fusion. The Minerva jacket which was the usual form of external immobilisation was substituted in all our patients with a individually fitted PVC shell made in two halves. Most patients with acrylic fusion were able to dispense with the shell within 10 days of surgery.

Table 1 - Surgical Management

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The interesting radiological feature of atlanto-axial dislocation is their great diversity, after a careful radiological evaluation including a CT scan, cervical traction was applied using the modified Gardner's callipers. A majority of dislocations even these which had been present for years, could be reduced. Indeed even if the dislocation was not reduced many patients showed improvement in their neurological status.

Posterior fusion without decompression was carried out in 26 patients (Table 2) which included 16 in which the dislocation was mobile reducible and 10 patients with a fixed dislocation.

Table 2 - Posterior fusion alone

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A posterior fusion alone without decompression was carried out even if the AAD was fixed if the patient showed neurological improvements after traction though the site of compression was judged to be ventral to the cervicomedullary junction. Surprisingly 5 patients deteriorated after surgical fusion but all of them gradually improved before they were discharged.

Among this group of 28 patients (Table 3) 5 patients had associated abnormalities which included hydrocephalus in 2, posterior fossa cyst in 1 and Arnold Chiari Malformation in 2 patients.

Table 3 - Post fusion with decompression

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In 6 children who were 12 years old or less a preliminary halopelvic traction was applied in collaboration with the Department of Orthopaedics . The criteria for the use of halo-pelvic traction were

(a) poor respiratory reserve
(b) pronounced neurological deficit
(c) sagittal diameter at foramen magnum <10 mm.
(d) multiple skeletal abnormalities and finally
(e) acceptance by the patient.

Despite their pronounced deficit all these children did better than we could possibly have imagined. We have been greatly impressed and encouraged by this method of traction and immobilisation.

Two patients required excision of their odontoid pegs through the trans oral route because despite an adequate posterior decompression and fusion they failed to improve. Our experience with the antero-lateral fusion has been limited to only 3 cases.

Table 4 - Long term complications

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Results

Four patients died following surgery and 2 further deaths occurred, 2 to 4 years later. One of the latter was possibly due to fracture of the acrylic and bone graft after a fall. The second patient had very poor respiratory reserve and developed fulminant pneumonia 4 years after surgery.

The results were graded as excellent, with complete relief of signs and symptoms, in only 9 patients.

Undoubtedly the majority showed great improvement. Indeed 6 patients who were confined to bed became ambulant and able look after themselves though they still had pronounced long tract signs. Two patients were considered as unchanged or worse. None of the patients who had acrylic fusion developed any evidence of local infection. Among major post operative complication severe intractable pain was complained of in one patient which was likely due to associated syringomyelia. Two patients developed lower cranial nerve palsies which was not noted before surgery. A very unusual problem was the development of mechanical dysphagia several years following posterior fusion on account of accentuation of the cervical curve.

Conclusion

In conclusion the precise surgical management of these lesions is linked to a careful radiological evaluation. Plain radiographs of the craniovertebral region in flexion, extension and neutral position of the neck are essential. CT scans with sagittal and horizontal reconstruction of the CT images of the atlanto-occipital complex provide clear definition of the site of compression. More lately a NMR scan provides pictures not only of the site of compression but also of changes within the medullo-spinal junction.

Acrylic inlays in addition to bony fusion where found most useful with no increased risk of infection. The time honoured posterior approach could still be used for the majority of cases barring a few who had persistent neurological signs on account of ventral cord compression.

In children below 10 years, the use of halo-pelvic traction has been of very great value. This is particularly so when the canal diameter is very narrow and the patient is severely compromised neurologically.

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