A STUDY ON FORAMEN MAGNUM DECOMPRESSION AND DUROPLASTY AND ITS CLINICAL OUTCOME ON ACM WITH SYRINGOMYELIA- OUR INSTITUTE EXPERIENCE

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ABSTRACT

BACKGROUND

Various operative techniques have been tried for the treatment of syringomyelia with ACM type-1. We studied foramen magnum decompression at our institute.

METHODS

The operative outcome of foramen magnum decompression in 20 patients with syrinx with Chiari I malformations is studied. There were 9 women & 11 men in the study sample. Foramen magnum decompression combined with lax duroplasty with G patch and removal of fibrous band was done in all the cases.

RESULTS

Over an average period of 2 years of follow up after surgery (range, 6 months to 2 yrs.), clinical presentations showed improvement in 16 of 20 cases and remained same in 4 cases. Postoperative MRI scans taken 4 weeks after the surgery demonstrated adequate decompression at foramen magnum, free sub arachnoid space around the upper cervical cord, posterior surface of medulla and cerebellum.

CONCLUSIONS

Foramen magnum decompression with lax duroplasty is recommended first line surgical management for ACM with syringomyelia.

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BACKGROUND

Various surgical techniques were being tried for the treatment of syrinx with ACM type 1.^(1-21,22) There has always been an ambiguity in choosing the surgical technique for the disease. Decompressive craniotomy of Posterior fossa along with c1, c2 laminectomy foramen magnum widening^(6,8) with or without plugging at the obex,^(11,13,14) is the most commonly adapted operative technique. Described, there have been postsurgical complications with this technique, meningitis or pseudo meningocele. The aim of this presentation is to describe the surgical procedure of foramen magnum decompression along with duroplasty as an effective method for treating ACM with syrinx.

METHODS

20 patients of Chiari I malformation with syrinx were managed by surgery. The patients were admitted, treated at King George Hospital, Visakhapatnam, Andhra Pradesh from 2016-2018. Age at presentation was from 4 to 55 years. The average period of clinical symptoms was 2 years (range, 1yr - 12 yrs. ACM with syringomyelia was screened and confirmed by magnetic resonance imaging.

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All patients were studied pre and post operatively with T1-weighted MRI images and T2-weighted gradient echo. Regular follow-up MRI scans were obtained a 4 weeks later, and 6 months post operatively in all cases. Following that, the patients have undergone MRI every 12 months.

Clinical Findings

5 out of 20 cases presented with paraesthesia in the upper limbs. The remaining had neck pain which radiated to the shoulder and arms, aggravated by coughing and straining. Clinical features at presentation showed a decrease in pain and temperature sensation in all the cases. 12 patients had decreased reflexes in the upper limbs, and 8 patients had bilateral exaggerated reflexes in the lower limbs with hypertonia. Distal muscle wasting of the upper limbs was seen in 10 cases, and weakness of the upper limbs was present in 16 patients and 2 cases had weakness of only lower limbs. Gait disturbances in the form of swaying to one side noted in 8 cases. No cases with any spinal deformity

Radiological Evidence

MRI was the investigation of choice. The cerebellar tonsils were descended between the foramen magnum and the Cervical level as follows. (C2-T4 in 3 cases, C3-C7 in 8 cases, C3-C6 in 5 cases, C5-T2 in 2 cases. Only cerebellar tonsillar decent was seen in 2 cases. Holocord syrinx in 3 cases. A T2-weighted MRI demonstrated that the cisterna magna was compromised in all the twenty cases. Syrinx was diagnosed as a low-signal intensity area inside the spinal cord in T1-weighted MR imaging. The syrinx was seen from the cervical extending to thoracic level in 15 cases.

Figure 1

Depending on the connection with
fourth ventricle

Figure 2

Figure 5-17. Syringomyelia involving the cervicothoracic portion of the spinal cord.

Figure 3

Figure 4

Figure 5

Symptoms	Total	Improved	No Change
sensory	16	11	4
motor	18	12	6
Wasting	6	-	6
Gait	4	4	-

Table 1

Meningitis- 1 case

Operative Techniques

Suboccipital craniectomy and C1 arch removal was done in all the patients, and at times C2 laminectomy. About 2-3 cm square of occipital bone is removed far laterally and posteriorly along the foramen magnum. The dura is opened in the midline at the C1 level with caution avoiding injury to the underlying arachnoid. The incision is carried above and durotomy done just below the foramen magnum in a Y-shaped manner. The cisterna magna expands rapidly. The dura is reflected with 4-0 non absorbable suture. The G patch graft is sutured to the margins of dura with a running 4-0 non absorbable sutures. The graft increases the volume of the posterior fossa. Although Autologous pericranium forms a better seal with the surrounding dura, other graft materials like G patch makes it a good substitute. Almost all patients respond to simple decompressive surgery. In some cases, durotomy does not result in expansion of the cisterna magna with CSF, suggesting some bands or membranes are adhered to the arachnoid of cerebellum and the cord. Open the arachnoid of the cisterna magna, excision of the adhesions or

bands, and tacking the arachnoid to the durotomy margin is done in such situation.

RESULTS

Operative Results

Post surgery cases were followed up for 2 years in the outpatient basis. Clinical presentations (Table 1) showed improvement in sixteen of twenty cases (80%). Numbness & Pain showed improvement under one week post operatively in 5 cases. One month post operation, weakness of the upper extremities showed improvement in 12 cases & sensory deficit improved in 11 cases. Early improvement of the preoperative clinical presentations was sustained throughout the course of follow up. In 4 cases, whose symptoms remained, a preoperative MRI showed myelomalacia of the spinal cord, in which irreversible changes were evident, and a post procedure MRI scan did not demonstrate any decrease in the size of the syrinx. These patients had exaggerated reflexes of the lower extremities and muscle wasting in the upper limbs preoperatively. Wasting of upper limb muscles

did not improve in any case. Gait and balance had improved in all cases with presented gait abnormality.

Postoperative Magnetic Resonance Imaging

Postoperatively all patients underwent MRI. MRI performed, 4 weeks after surgery demonstrated decrease in the size of the syrinx in 12 of twenty patients. There was sustained decrease in the size of the syrinx throughout the follow up period of 2 years. In all patients, MRI showed that the cisterna magna was wider post surgery (Fig. 5). There was significant increase in the CSF space circumferentially around the brainstem and the cerebellar tonsils post operatively in 18 cases.

DISCUSSION

Various surgical techniques have been in trial for the treatment of syringomyelia along with ACM type 1.^(1-21,22) There has always been an ambiguity in choosing the surgical technique for the disease. Decompressive craniotomy of Posterior fossa along with upper cervical laminectomy (Foramen magnum decompression^(6,8) with or without plugging of the obex,^(11,13,14) are the most frequently adapted operative technique Which is (Gardner's operation).^(6,8) In view of the associated serious neurological morbidity Gardner's technique has been followed only infrequently and with caution. Williams,^(23,24) reported that a block at the level of the foramen magnum produced a difference of pressure between the spinal & cranial cerebrospinal fluid compartments, which caused to the formation of syrinx. Considering the above fact, the foramen magnum with duroplasty is the logical approach to free the CSF pathways in these cases of ACM with syrinx. Hence ideally foramen magnum decompression with lax duroplasty stands out to be logical and an effective method in correcting the obstructed cerebrospinal fluid circulation improving the syrinx and clinical outcome. Levy et al.⁽¹³⁾ and Logue and Edwards,⁽¹⁴⁾ reported that decompression of foramen magnum with durotomy achieved similar improvement with fewer postsurgical complications than Gardner's technique. The complications post surgery were with assessing the decompressive effect on foramen magnum and spinal cord with others in order being collection of cerebrospinal fluid at surgery site, pseudo meningocele, and meningitis.

CONCLUSIONS

We performed foramen magnum decompression, and lax duroplasty with G patch in a water tight closure for 20 cases. In 12 cases, the dura was incised along with the thick fibrous band constricting the cervical canal and foramen magnum. Neurological improvement has been seen in 80% cases both clinically and radiologically in the study, which proved it to be an efficient procedure; with the rest of them unchanged due to already set in cord disease. The removal of outer layer of dura mater of foramen magnum was at times needed to correct the circulatory disturbance of CSF. Hence foramen magnum decompression with lax duroplasty is recommended first line surgical management for ACM with syrinx.

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