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RESEARCH ARTICLE

AN ANALYTICAL STUDY ON THE RESULTS OF POSTERIOR FOSSA DECOMPRESSION AND LAX DUROPLASTY IN CHIARI 1 MALFORMATIONS.

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Manuscript Info

Abstract

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Introduction:-

Chiari 1 malformation has been approximately diagnosed in 1% to 4% of patients undergoing brain or cervical spine magnetic resonance imaging (MRI) studies,^{1,2}. Chiari malformation type 1 (CM-1) is a common and often debilitating neurosurgical condition. In recent years, there has been a growing emphasis on outcomes research, including efforts to compare the results of various surgical approaches.^{3,4} To help facilitate more objective comparisons, several groups have produced and/or validated different metrics to evaluate treatment outcomes.⁵⁻⁸ However, despite this growing interest in improved research methodology, evidence-based guidelines for surgical intervention are undefined. The decision to treat CM-1 surgically may be based on a variety of considerations, such as anticipated syrinx improvement and stabilization of spinal cord damage, as well as the risk of postoperative complications. The objective of this study was to use clinical and neuroimaging features to predict long-term patient-reported Quality of life outcomes in patients undergoing posterior fossa decompressions.

Methods:-

Patient population:-

This study is an analysis on the 28 patients evaluated and managed in our department of Neurosurgery in Govt Stanley medical college hospital, Chennai for Chiari 1 malformations between 2011-2016. The study was proceeded following the approval from the ethical committee from our institution and consent from the patients. All patients had a detailed neurological examination followed by MRI scans of the brain with whole spine screening to evaluate the clinical presentations. Chiari 1 malformation patients had been graded based on the Chiari severity index and underwent posterior fossa decompression with lax duroplasty.

Data collection:-

Preoperative signs and symptoms were recorded on admission. These findings were subsequently grouped into 3 categories: 1) classic Chiari headaches (including occipital, Valsalva-induced, posttussive, and exertional headaches), 2) atypical presentation (frontotemporal headaches; and poorly localized headaches) 3) myelopathic predominant. We defined myelopathic symptoms as numbness, weakness, hyperreflexia, or unsteady gait.

Radiological analysis with MRI craniovertebral junction was used mainly to analyse the extent of descent of cerebellar tonsils and the size of the syrinx. In addition to these, we recorded the following neuroimaging parameters potentially related to CM-1 pathology: (1) tonsillar ectopia, as the perpendicular distance from the tip of the cerebellar tonsil to McRae's line^{9,10}; (2) clivus-canal angle, as the angle between

Wackenheim's clivus baseline and the posterior C2 vertebral body line¹⁸; (3) dens angle, as the angle formed by a line through the C2 synchondrosis and a line through the odontoid tip measured from the posterior aspect of the C2 vertebral body¹¹; (4) pB-C2, as the perpendicular distance between the ventral dura and a line joining the basion to the inferoposterior C2 body^{17,19,20}; (5) obex position, as the distance between the obex and foramen magnum (basion-opisthion line)¹²; and (6) basilar invagination, as present when the tip of the dens was 5 mm above the Chamberlain's line.¹¹ We defined a syrinx as a contiguous spinal cord cavitation measuring at least 3 mm in maximum diameter on T2-weighted MRI.

Outcome assessment:-

We evaluated patient-defined outcome as improved, stabilised and worsened on the basis of postoperative follow up during the reviews. Any improvement from the presenting complaints was considered as IMPROVED. Stabilised was defined as non-progression of complaints following the procedure. Any worsening of symptoms was to be taken as WORSENERD.

Results and Discussion:-

Out of the total of 28 patients undergoing posterior fossa decompression for Chiari 1 malformation, the mean age of presentation was 24.5 years. 13 patients were male and 15 were female. Headache was the presenting complaint in all the 28 patients with classical Chiari type of headache in 24 and atypical presentation like generalised or fronto temporal headache in 4 patients. Features suggestive of myelopathy were seen in 14 patients. Scoliosis was present in 4 patients and Charcot's joint in 4 patients (as shown in table 1). Radiological findings found were syringomyelia in 14 patients, interhemispheric cyst in 2 patients, corpus callosal agenesis in 4 patients, block vertebra involving C2C3 in 1 patient and hydrocephalus in 3 patients (as shown in table 2).

Based on these presentations, clinical grading was done as grade 1 – typical presentation, grade 2 – atypical presentation, grade 3 – predominance of myelopathic features. Table 3 shows the distribution of patients based on the clinical grading. Radiological grading was done on the basis of syrinx. If the diameter of the syrinx was greater than 6mm, it was grade B and if it was less than 6mm or absent, it was considered as grade A as shown in table 4.

Patients were graded into 3 based on Chiari severity index. Grade 1 as clinical grade 1, Grade 2 as clinical grade 2/3 + radiological grade A, Grade 3 as clinical grade 2/3 + radiological grade B. There were 14 patients in grade 1 of Chiari severity index, 4 patients in grade 2 of Chiari severity index and 10 patients in grade 3 of Chiari severity index. All the patients underwent posterior fossa decompression with removal of posterior arch of C1 with lax duroplasty. The 3 patients with hydrocephalus underwent ventriculoperitoneal shunt procedure followed by PFD. Postoperatively, CSF leak was observed in 1 patient, aseptic meningitis in 1 patient, pseudomeningocele in 3 patients and hydrocephalus in 1 patient. Postoperative period was uneventful in 22 patients.

Postoperative outcome categorised as Improved (18 patients 64.2%), Stabilised (9 patients 32.1%) and worsened (1 patient 0.35%) as shown in table 5.

Conclusion:-

Posterior fossa decompression with lax duroplasty despite its complexity of the procedure is safe and effective way of reducing the symptomatology of Chiari malformations with a lesser complication rate.

Table 1:-showing the distribution of symptoms.

Symptoms	No Of Patients	Percentage
Headache	32	100 %
Occipital	26	
Frontotemporal headache	6	
Dissociated/ suspended sensory loss	14	44 %
Spasticity of lower limbs	14	44 %
Small muscle wasting of hands	12	38 %
Bladder / bowel disturbances	—	—
Trigeminal neuralgia	1	
Scoliosis	4	12.5 %
Charcot joint	4	12.5 %

Table 2:-showing the MRI findings

Mri Findings	No Of Patients
Syringomyelia	17
Interhemispheric cyst	2
Corpus callosal agenesis	4
Block c2- c3 body	1
Hydrocephalus	3

Table 3:- showing the distribution of patients on clinical grading.

Clinical grade	Number of patients
1 (typical presentation)	12
2 (atypical presentation)	2
3 (myelopathy)	14

Table 4:-showing radiological grading based on syrinx

Radiological grade	Number of patients
A (No syrinx or syrinx <6mm)	18
B (Syrinx > 6mm)	10

Table 5:-showing postoperative outcome following PFD

C.S.I	Number of patients	Postoperative outcome		
		Improved	Stabilised	worsened
1	14	12	2	-
2	4	-	3	1
3	10	6	4	-
Total	28	18 (64.2%)	9 (34.1%)	1

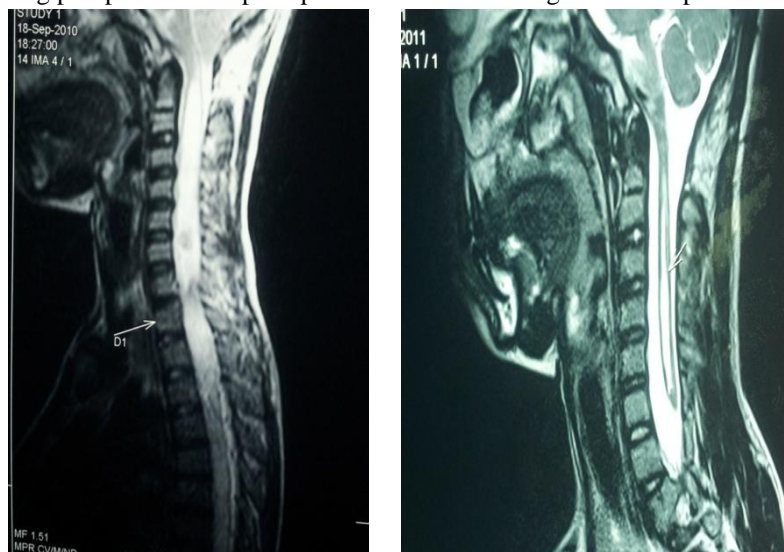
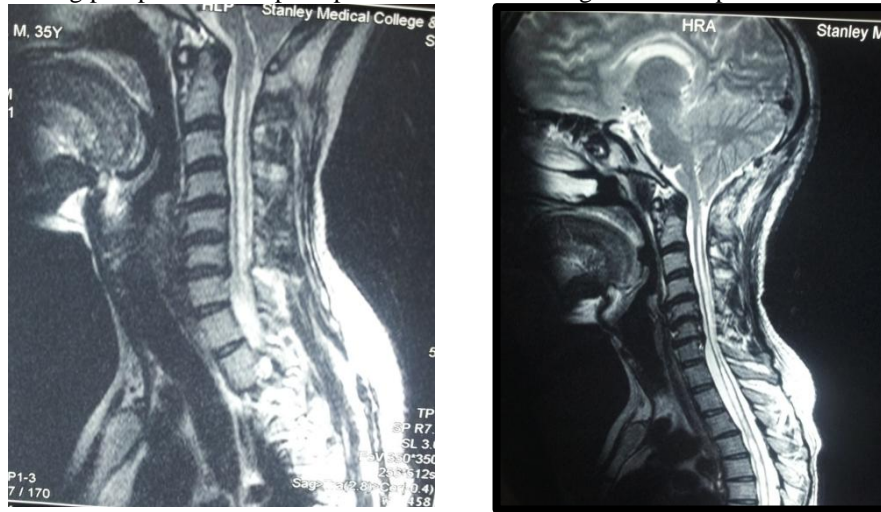
Figure 1:-showing preoperative and postoperative scans following successful posterior fossa decompression

Figure 2:-showing preoperative and postoperative scans following successful posterior fossa decompression



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