A STUDY OF ANALYSIS OF VARIOUS CLINICAL FEATURES, RADIOLOGICAL CORRELATION, SURGICAL OPTIONS AND OUTCOME IN THE MANAGEMENT OF CHIARI MALFORMATION TYPE I

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GOVERNMENT STANLEY HOSPITAL
CHENNAI – 600001

THE TAMILNADU
DR.M.G.R. MEDICAL UNIVERSITY
CHENNAI

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CERTIFICATE

This is to certify that the dissertation entitled **– "A STUDY OFANALYSIS OF VARIOUS CLINICAL FEATURES, RADIOLOGICAL CORRELATION, SURGICAL OPTIONS AND OUTCOME IN THE MANAGEMENT OF CHIARI MALFORMATION TYPE I"** is the bonafide original work of **Dr.S.RAJKUMAR** in partial fulfillment of the requirements for M.ch. Branch II NEUROSURGERY (5 YEARS COURSE) examination of THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY to be held on August 2014. The period of post graduate study and training was from May 2009 to July 2014.

Prof. Dr. G. LAKSHMIPATHY M.ch,
GUIDE
PROFESSOR & HOD OF NEUROSURGERY,
STANLEY MEDICAL COLLEGE & HOSPITAL,
CHENNAI - 600001

Prof. Dr. Y.P.JACOB GRAND M.ch,
PROFESSOR OF NEUROSURGERY,
STANLEY MEDICAL COLLEGE & HOSPITAL,
CHENNAI – 600001.

Dr. A.L.MEENAKSHI SUNDARAM, MD., DA,
DEAN,
STANLEY MEDICAL COLLEGE & HOSPITAL,
CHENNAI - 600001

DECLARATION

I **Dr. S.RAJ KUMAR**, solemnly declare that this dissertation entitled **– "A STUDY OF ANALYSIS OF VARIOUS CLINICAL FEATURES, RADIOLOGICAL CORRELATION, SURGICAL OPTIONS AND OUTCOME IN THE MANAGEMENT OF CHIARI MALFORMATION TYPE I "** is the bonafide original work done by me at the Department of Neurosurgery, Stanley Medical College and Government Stanley Hospital during the period 2010-2014 under the guidance and supervision of the Professor and Head of Department of Neurosurgery of Stanley Medical College and Government Stanley Hospital, **Prof. Dr. G.LAKSHMIPATHY M.ch .** This dissertation is submitted to THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY, towards partial fulfillment of requirement for the award of M.ch Degree (Branch - II) in neurosurgery.

Place : **Dr. S.RAJ KUMAR**

Date :

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Beyond all I would like to thank all the patients and their relatives for participating in this study.

TABLE OF CONTENTS

INTRODUCTION

INTRODUCTION

Generally types I-IV Chiari malformations are congenital hindbrain abnormalities affecting the structural relationships between the bony cranial base and the brainstem, cerebellum and the upper cervical cord.

Cleland described the first case of Chiari malformation in 1883, the disorder is named after Hans Chiari, an Austrian pathologist, who classified Chiari malformations into types I through III in 1891. Hans Chiari (1851- 1916) was an Austrian professor of pathology at German University in Prague, Czechosolovakia. He analyzed data collected from more than 40 postmortum examinations of patients with hindbrain malformations and published a report in 1891. Chiari's colleague, 1894, Julius A. Arnold(Professor of Pathology at Heidelberg, Germany)-described a single myelodysplastic patient with associated hindbrain herniation .Julius Arnold, made additional contributions to the definition of Chiari II malformation. In his honour, students of Dr. Arnold , Schwalbe & Gerdig later named the type II malformation as Arnold-Chiari malformation. Other investigators later added the type IV malformation and recently these abnormalities were coined as chiari malformation.

Chiari types & features:

I - Tonsillar herniation >5 mm inferior to the plane of the foramen magnum (basionopisthion line)

No associated brainstem herniation or supratentorial anomalies

Hydrocephalus uncommon

Syringomyelia common

II - Herniation of the cerebellar vermis, brainstem, and fourth ventricle through the foramen magnum

Associated with myelomeningocele and multiple brain anomalies

Hydrocephalus and syringomyelia very common

III - High cervical or occipital encephalocele containing herniated cerebellar and brainstem tissue

IV - Hypoplasia or aplasia of the cerebellum and tentorium cerebelli

Chiari type 1.5

Tonsillar herniation as seen in Chiari I with addition of an elongated brainstem and fourth ventricle.

(Iskandar B,1999)

Chiari type 0

syringomyelia with no evidence of hindbrain herniation .

Chiari malformation I consists of herniation of the cerebellar tonsils through foramen magnum into the cervical spinal canal without descent of the brainstem . Association of syringomyelia with Chiari type-1 malformation is around 50-70% which will slowly lead to chronic and sometimes irreversible myelopathy . Surgery is the only way to cure this malformation. There are still controversies in current surgical techniques although much operative progress has been made in the last few decades and the expansion of posterior fossa volume has been widely accepted as the surgical goal .

Aiming to explore the surgical effect of foramen magnum decompression and duraplasty together to reduce the risks and postoperative complications of this

disorder, we have performed these surgeries in patients with CM I since 2010. A total of 32 CM I cases underwent these procedures at our department from 2010 to 2014. The postoperative complications and surgical efficacy regarding the clinical symptoms and resolution of syrinx in CM I patients were prospectively evaluated overall by follow-up and analyzed in this study.

Genetics of Chiari malformation :

A more recent twin study examined 6 additional sets of twins and reported a higher concordance between identical twins when compared with fraternal twins (Speer *et al*, 2003).

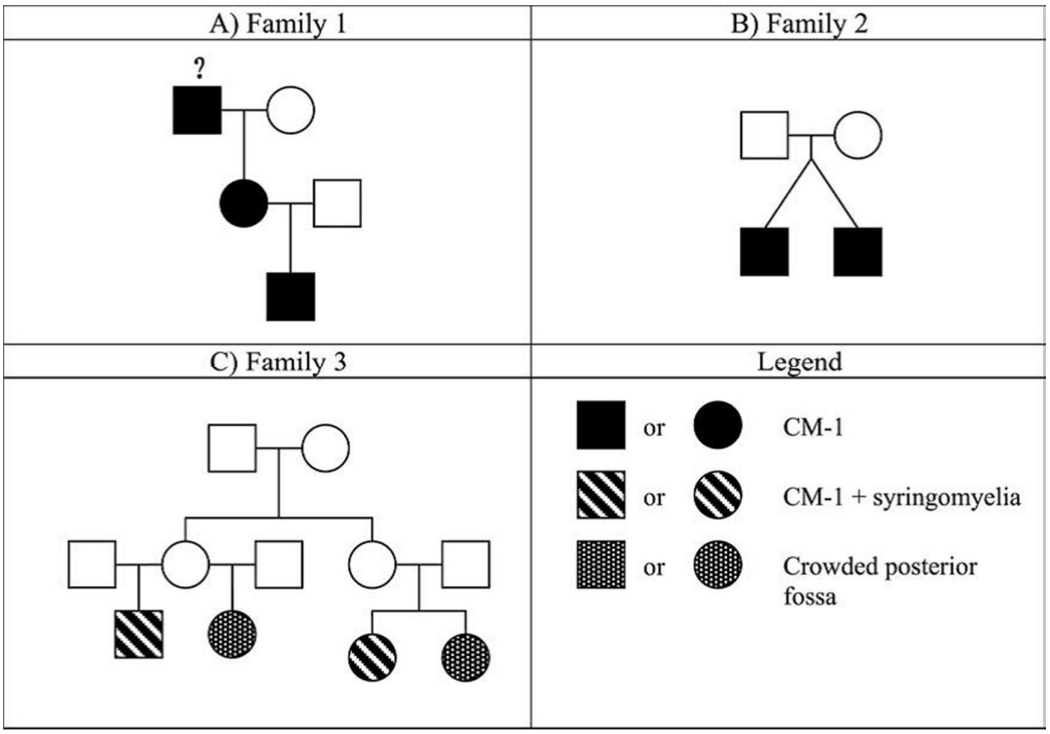
Many of the known genetic disorders that co-segregate with chiari malformation I affect mesodermally derived cartilage and/or bone such as achondroplasia, Klippel Feil sequence, Hadju-Cheney syndrome, Albright Hereditary Osteodystrophy (pseudohypoparathyroidism), familial hypophosphatemia rickets, and spondylo-epiphyseal dyplasia tarda.

Boyles and colleagues1 also conducted a genome screen in twenty-three families with multiple individuals affected with CMI. They found

significant evidence for a gene associated with CMI on chromosomes 9 and 15.

Pattern of inheritance :

Autosomal dominant with reduced penetrance



Pedigree of families.

(A) mother and son with Chiari malformation

(B) monozygotic twins

(C) half-brother and sister as well as their two female first cousins affected.

(Milhort et al. Neurosurgery.44:1005-1017,1999)

Acquired Chiari Malformation

The acquired Chiari malformation and syringomyelia following spinal CSF drainage, the coperitoneal shunt.

(Johnston I et al. Acta Neurochir (Wien). 140(5):417,1998)

AIM OF THE STUDY

AIMS AND OBJECTIVES

1. Inspite of the progress in the understanding the causes and pathophysiology of Chiari malformation Type I (CM-I), the role of surgical treatment remains unresolved. Different surgical techniques have been evolved over years, but there is no general consensus on the most appropriate surgical tecnique for this condition. This study analyses various clinical features, radiological correlations, surgical treatment and outcome in 32 patients with CM-I.

2. To evaluate prospectively the efficacy of foramen magnum decompression (FMD) with lax duraplasty in patients having type I Chiari malformation with and without syringomyelia.

3.To establish normal cerebrospinal fuid (CSF) circulation at the foramen magnum,

4. To relieve the compression exerted by the cerebellar tonsils on the brain stem. Although single effective therapeutic treatment in achieving actual cure of the disease is still under debate, foramen magnum decompression (FMD) has been widely recognized as an acceptable method in achieving these goals. Additional procedures such as dissection of arachnoid adhesions, plugging of the obex, shunting of

the fourth ventricle and resection of tonsils depends on the surgeon's personal understanding of the pathophysiology of the disease.

5. To prospectively review the surgical outcome in improvement of clinical symptoms and resolution of syrinx in 32 patients treated for Chiari I malformation in our institution. All patients in this study underwent Foramen magnum decompression with lax duraplasty as basic procedure either alone or combined with additional manipulations.

6. To assess the pre operative and post operative pain score (WONG – BAKER pain score).

7. To assess the resolution of syinx in the post op MRI.

8. To assess the improvement in spasticity using Ashworth scale.

9 . To assess the pre operative and post operative Nurick’s score.

MATERIALS AND METHODS

MATERIALS AND METHODS

SOURCE OF DATA

This is a prospective study of 32 patients of CHIARI TYPE I malformation with and without syringomyelia of age between 14 – 54 years which was carried out in the department of neurosurgery during the year 2010 – 2014 at GOVT STANLEY MEDICAL COLLEGE, CHENNAI.

METHODS OF COLLECTION

A standardized protocol is followed for assessment of patients after an informed consent.

Clinically patient had occipital headache and neck pain as their predominant complaint. Complete neurological examination to ascertain the motor/sensory loss and loss/brisk reflexes and any signs of myelopathy are routinely done.

There is some amount of neck movement restriction as the pain progresses because of the neck muscle spasm. Majority of the patients had dissociated sensory loss and hand muscle atrophy. In most of the patients occipitocervical pain is aggravated by coughing, sneezing, laughing and lifting heavy weights.

Careful history and examination is done to rule out shoulder pathology, angina and intraspinal tumors.

All patients clinically suspected to be suffering from chiari malformation are subjected to radiological imaging. Digital Xray skull ,cervical spine is taken to rule out any associated bony abnormalities.

X-RAY SKULL:

Underdevelopment of supraocciput and exocciput

Shortening of supraocciput

Shorter clivus

Smaller and shallow posterior fossa

Empty sella

Platybasia

Basilar impression

Midline occipital keel

Accessory occipital condyle

Spine :

Klippel-Feil deformity

Atlantoaxial assimilation

Retroflexion of odontoid process

Thickening of ligamentum flavum

Scoliosis

MRI C SPINE with myelogram with screening of brain and whole spine is done for all patints with chiari malformations. MRI is done to assess the level of cerebellar tonsil descent, presence of syringomyelia, brainstem compression, presence of hydrocephalus and any associated brain anomalies.

Ventricle and cistern :

Hydrocephalus (3-10%)

Elongated 4th ventricle

Retrocerebellar CSF space obliterated or diminished

Meninges :

Elevated slope of tentorium

Thickening of arachnoid at foramen magnum

Constricting dural bands at level of foramen magnum and posterior arch of atlas

Veils of arachnoid that obstruct fourth ventricular outlet

Spinal cord :

Syrinx (50-75%)

Brain :

Elongated midbrain, pons and medulla

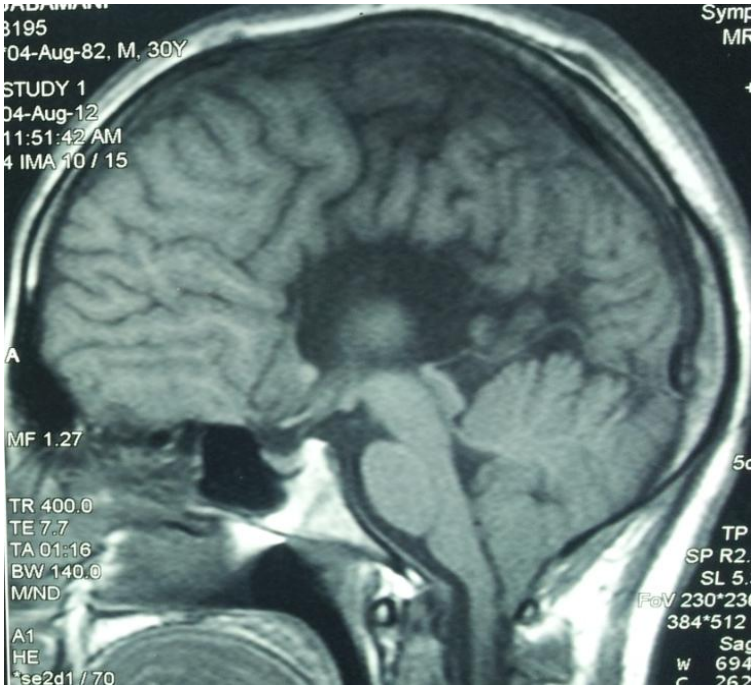
Medullary kinking or flattening

INCLUSION CRITERIA :

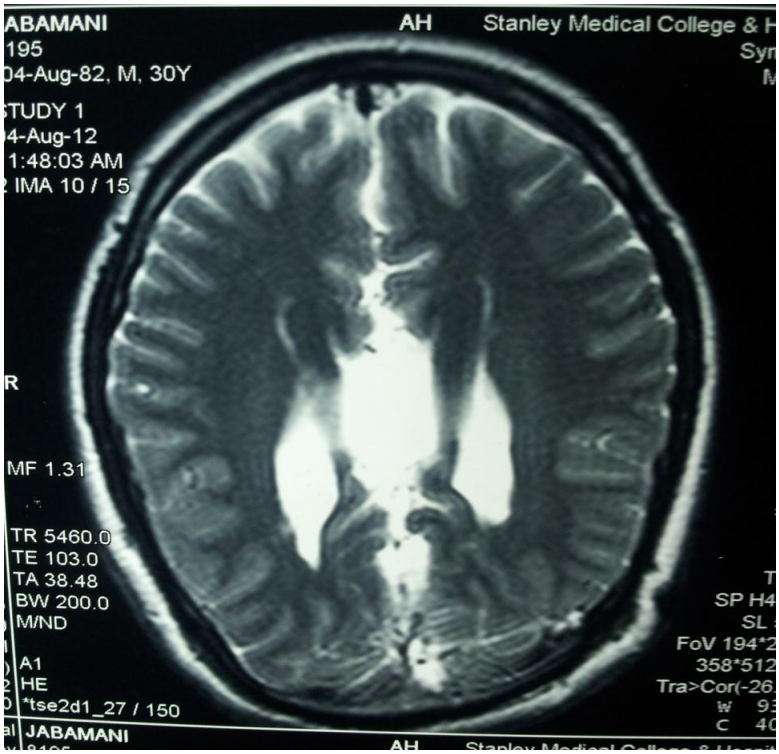
1.All age groups

2. Sex: male& female

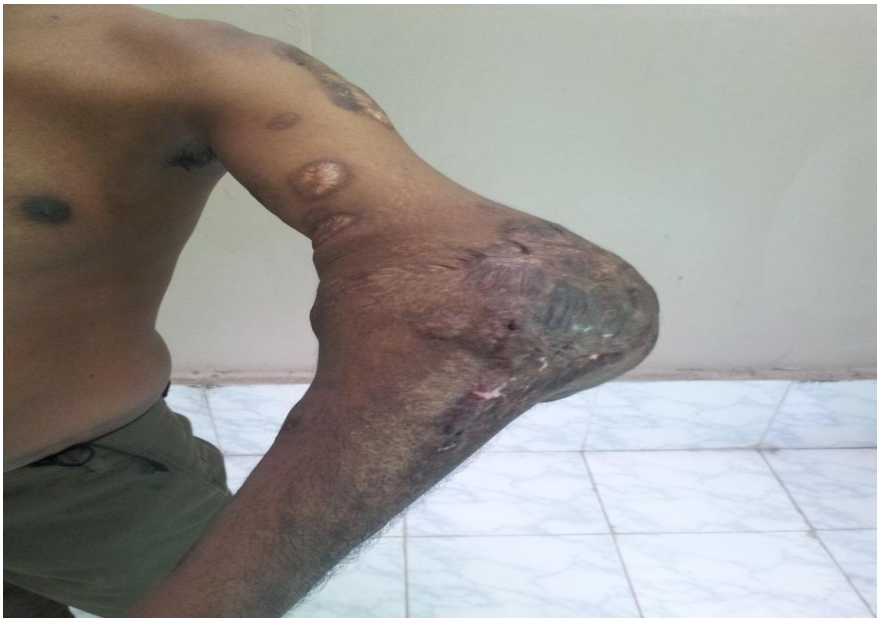
CHIARI MALFORMATION WITH CORPUS CALLOSAL AGENESIS

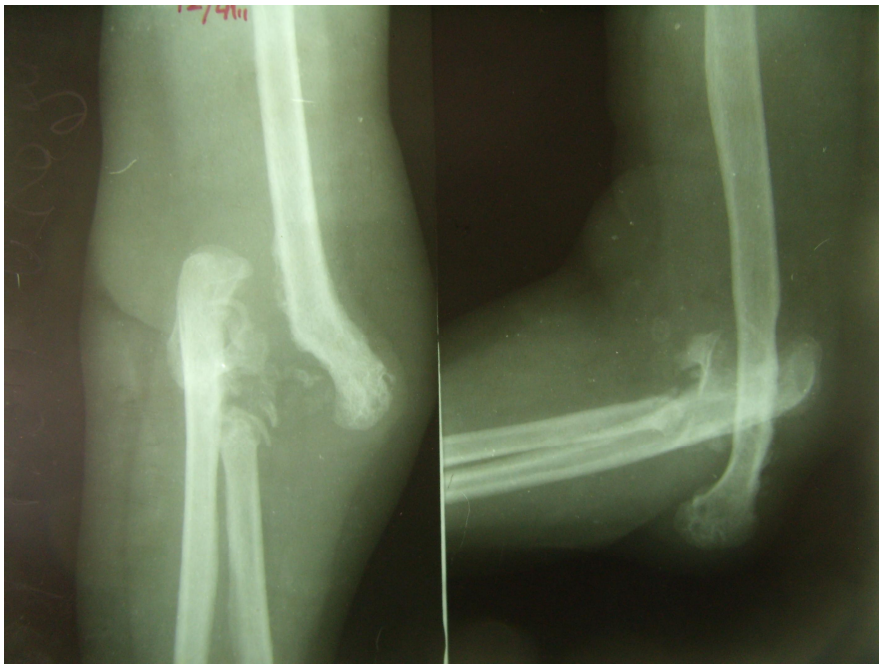


CHIARI MALFORMATION WITH INTRHEMISPHERIC CYST



CHIARI MALFORMATION PRESENTED WITH CHARCOTS JOINT





3. All patients with occipito cervical pain with MRI findings of tonsillar descent

4. Only Chiari Malformation Type I

5. All Chiari Malformation Type I with Syringomyelia.

EXCLUSION CRITERIA

1. Patients with medical illness contraindicating surgical management.

2. Patients not willing for surgical management.

3. Tonsillar herniation with posterior fossa lesions.

4. Syringomyelia associated with spinal tumours.

5. Syringomyelia without tonsillar descent.

TREATMENT OF CASES IN THIS STUDY

Though the treatment of CM I is essentially surgical, the following factors are to be considered before planning for surgery:

• The severity and nature of the symptoms;

• The alteration in the patient's quality of life secondary to these symptoms;

• The likelihood that these symptoms are related to the tonsillar descent, taking into consideration the clinical presentation, associated medical conditions, and the radiological findings;

• The presence of symptomatic syringomyelia;

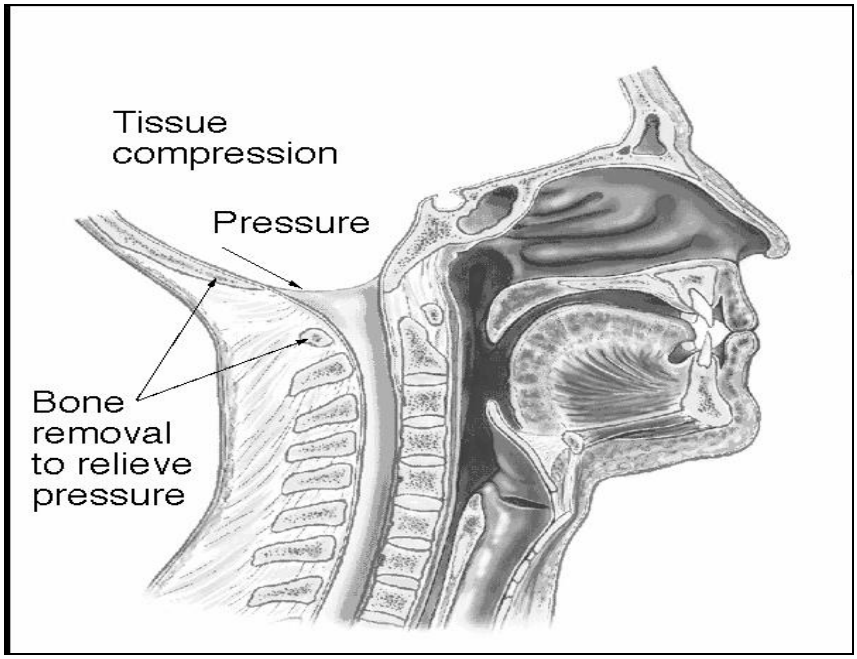
• The surgical complication rate;

• The long-term results for surgical treatment of the particular symptom that is being addressed.

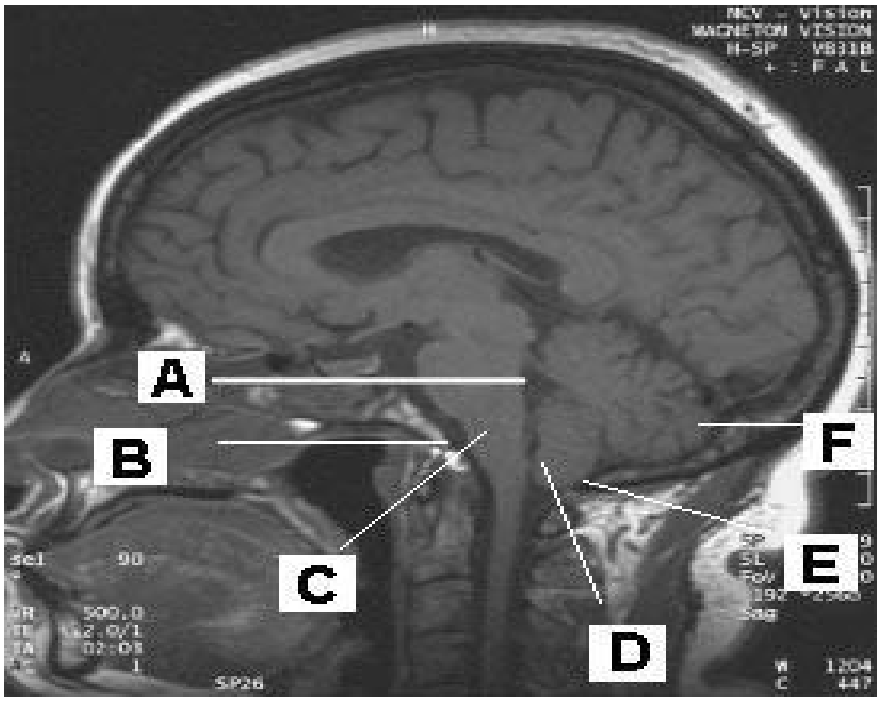
OPERATIVE TRETMENT

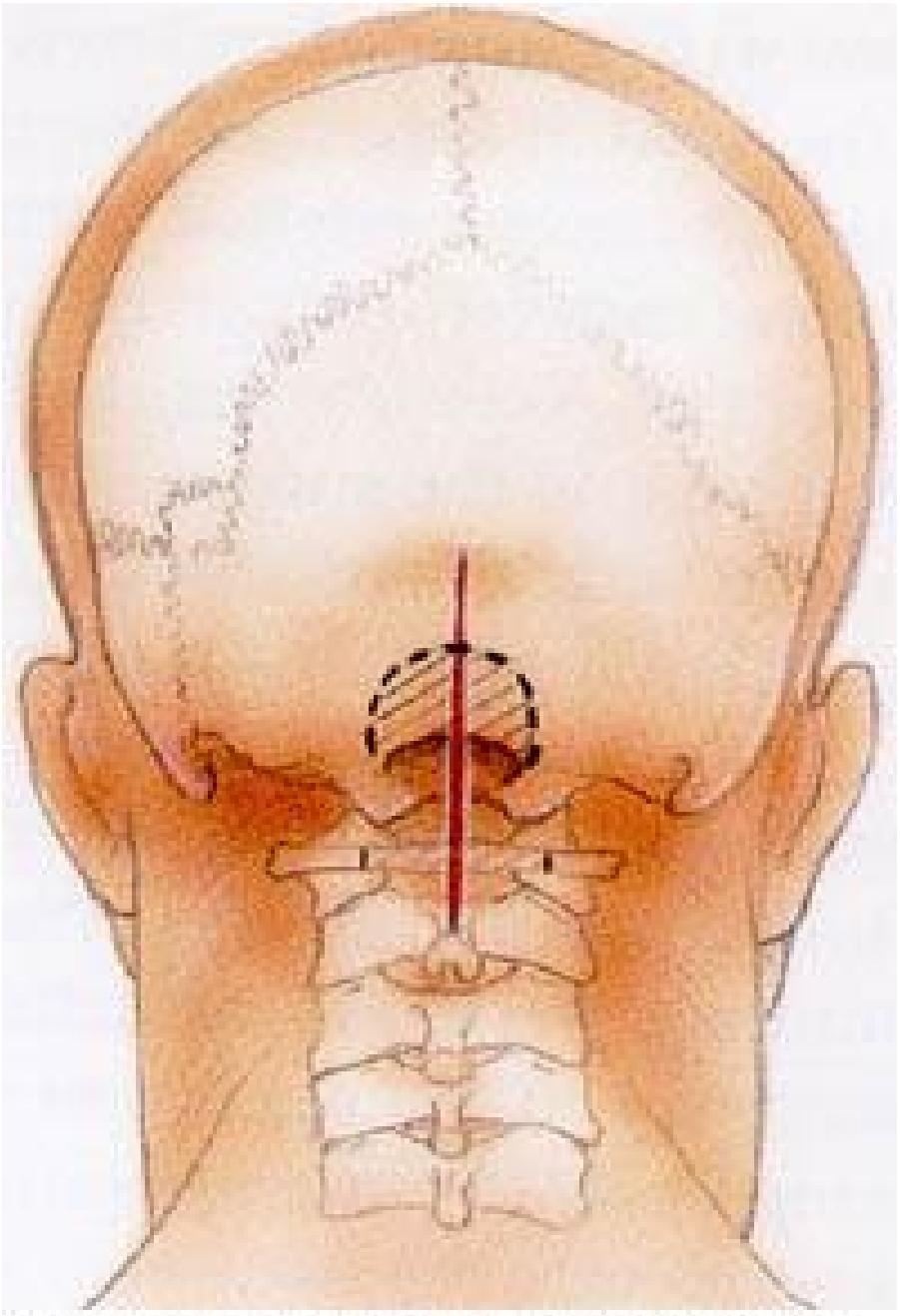
Surgical technique

Under general anesthesia with the patient in prone position with head fixed in three pin Mayfield head rest, vertical midline skin incision from external occipital protuberance down to the level of the C-3 spinous process was made. Then paravertebral cervical muscles were dissected in the midline and retracted laterally and sub occipital craniectomy approximately 3cm/3cm (1.5cm from midline on either side) was performed to decompress the foramen magnum. C-1 laminectomy was then performed to visualise the lower limit of tonsils. Constricting dural bands are looked for and divided. C-2 laminectomy was done in



A-4TH VENTRICLE, B-BASION, C-MEDULLA, D-TONSIL, E-OPISTHION, F-CEREBELLUM





Operative exposure of a Chiari I malformation.

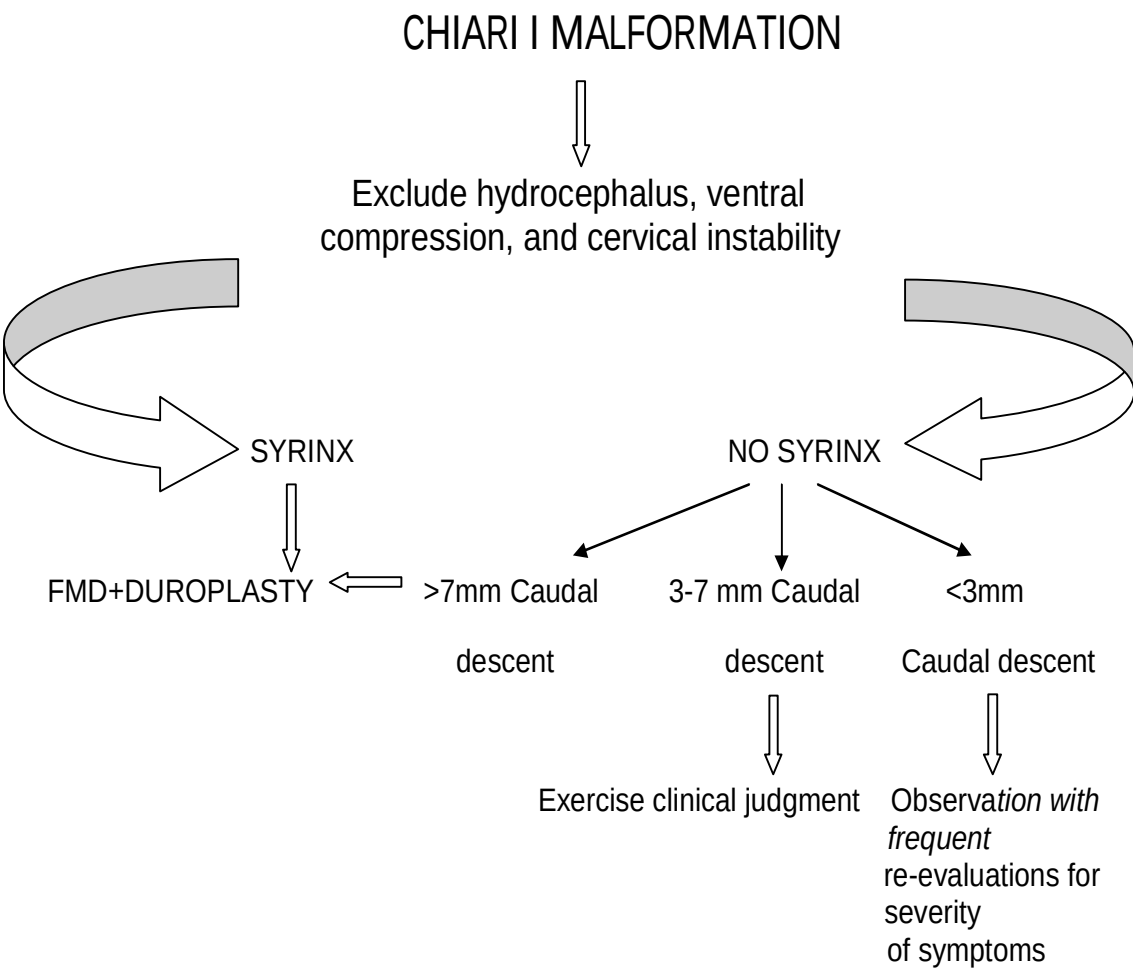
cases based on radiological level of tonsillar descent and intraoperative findings .

After C1laminectomy the dura was opened in midline using the microscope and after opening the dura arachnoid adhesions if found should be dissected and removed . In our study tonsillar coagulation or obex plugging was not done . Then lax duraplasty was done with fascia lata graft harvested from the patient and sutured in Y shaped manner and the wound closed in layers after securing perfect hemostasis. In none of the patients artificial dura was used for duraplasty.

Follow up of cases in our study:

The follow-up regimen is determined by preoperative pathology and the postoperative clinical course. Our clinical paradigm includes seeing patients without a syrinx and symptomatic improvement at 1, 6, and 12 months with repeat imaging at the 6^{th} month.Patients with a preoperative syrinx receive a follow-up MRI in 6 to 12 months. No further imaging is obtained if symptoms improve or the syrinx decreases in size significantly.

MANAGEMENT PROTOCOL

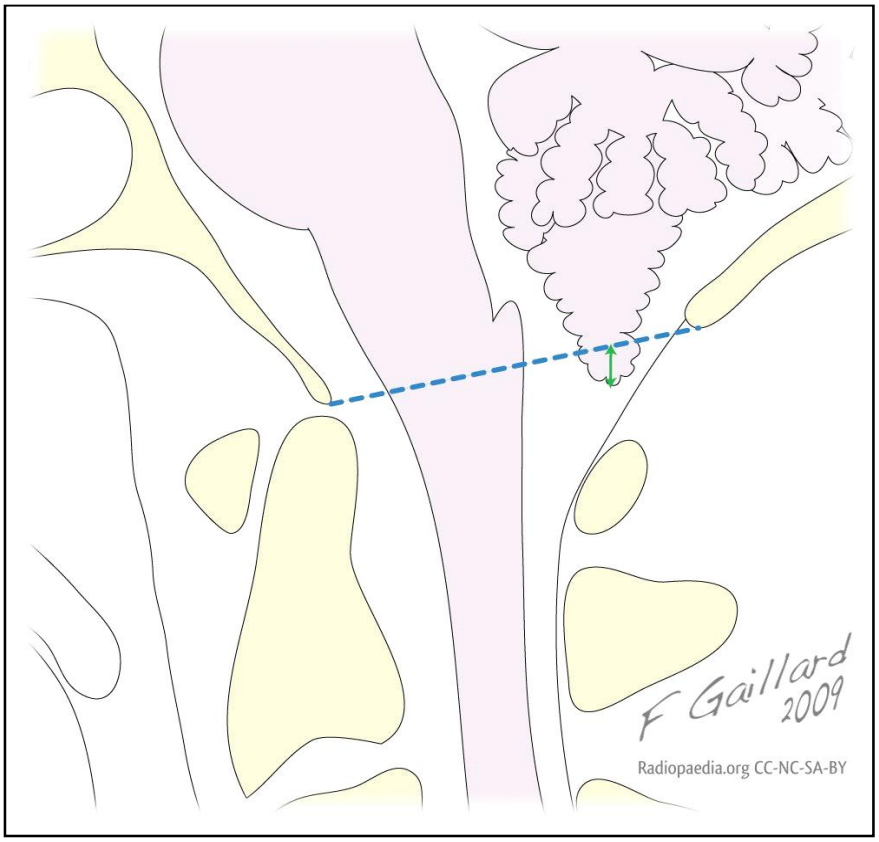


REVIEW OF LITERATURE

REVIEW OF LITERATURE

Chiari malformation -Otherwise called congenital tonsillar ectopia .

The radiological diagnosis of tonsillar ectopia is based on the degree of tonsilar descent for the age at the time of diagnosis.



AGE	DECREE OF DESCENT
1ST DECADE	6mm
2ND and 3rd DECADE	5mm
4TH - 8TH DECADE	4mm
9TH DECADE	3mm

Chiari malformations and syringomyelia are strongly associated. .The association of syrinx in chiari I is about 30-50% and in type II chiari it is about 45-90%. The usual location of syrinx is in cervical or cervicothoracic region.

Etiology :

Chiari malformation usually occurs due to craniocephalic disproportion which leads to tonsillar descent. The main event is a mismatch between the bony skull base and the brainstem,cerebellar vermis ,fourth ventricle and the tonsils.

Pathophysiology :

Several mechanisms produce the varied clinical features in chiari malformations. The clinical features are mainly due to the herniated tonsils which compresses the nervous tissue or produces valve effect in the foramen magnum . The partial valve-and-piston effect leads to intermittent obstruction to the flow of cerebrospinal fluid (CSF) between the cranial and spinal compartments which causes intracranial hypertension and syringomyelia . With every systole, the cerebral blood volume increases, leading to brain engorgement. The perispinal cord pressure increases, pushing the CSF into the perivascular Virchow-Robin

spaces of the spinal cord which leads to the formation of syrinx in the spinal cord.

Oldfields study based on MRI and realtime ultrasonogram suggested that the origin, maintenance and propagation of syringomyelia might result from downward migration of the tonsils with each systolic pulse, producing a systolic pressure-wave in the spinal CSF compartment that acts on the external surface of the spinal cord . This ``piston-like'' mechanism might explain syrinx progression by propelling fluid longitudinally within the cavity with each systolic pulse .

Based on the theories of Gardner, Williams and Oldfield's which concludes that the main event is impaired CSF circulation around the foramen magnum and that foramen magnum decompression should be considered as appropriate management in these cases.

PATHOGENESIS OF CHIARI MALFORMATION and SYRINGOMYELIA

Any single acceptable theory of pathogenesis of Chiari malformation should be able to explain the associated brain and spinal cord anomalies. Multiple theories need to be applied and may not be mutually exclusive. Knowledge essential to direct therapeutic strategies

Hydrocephalus theory (Chiari, 1891)

Attributed the congenital hindbrain herniation to ‘ chronic hydrocephalus of the cerebrum’ with ‘pushing out ‘ of the cerebellum and the brainstem through the foramen magnum.

Hydrocephalus not universal and children with hydrocephalus and no dysraphism do not have herniation. Upward herniation through tentorial notch along with caudal displacement of hindbrain in Chiari II with hydrocephalus

Cerebral Dysgenesis theory (Cleland,1883)

Dysplastic changes in brainstem, cerebellum, corpus callosum based on chick embryo studies.

Caudal Traction theory (Penfield, Coburn, Lichtenstein et al.)

Tethering of the cord by the myelomeningocele with ‘pulling down’ of the posterior fossa contents Reverse herniation seen in CIIM Abnormal relation of the nerve roots to cord normal in thoracic segments Tension within the caudal segments dissipated over four segments (Goldstein & Kepes,1966) Cervicomedullary kink and other anomalies not explained by this theory.

Cerebral overgrowth theory (Barry, Patten, Stewart - 1957)

Attributed excessive volume of cerebral cortex with downward displacement of tentorium and hindbrain in an abnormal small posterior fossa.

Developmental Arrest (Daniel , Strich - 1958)

The primary dysgenesis of brainstem impairs the formation of pontine flexure resulting elongated and herniated brainstem into upper cervical canal.

Hydrodynamic theory (Gardner & Goodall, 1965)

Failure of the rhombic roof to perforate resulting in the gentle undampened ‘waterhammer ‘ effect of the arterial pulsation of the choroid plexus dissipated through a patent obex into the central canal resulting in progressive spinal cord cavitation.

Pros:

Animal studies to support the same by occlusion of the fourth ventricular outlet. Compensated hydrocephalus with communicating syringomyelia in 14/15 patients of myelodysplasia in whom VP shunt resulted in neurological improvement with resolution of the syrinx . (Hall et al.)

Cons :

Hydrocephalus present in some.

Fourth ventricular obstruction not present in all.

Obex rarely communicates with syrinx.

Craniospinal Pressure Dissociation theory (William , 1969)

Attributed venous pressure changes rather than arterial pulsations as the driving force for hydromyelia. Increase in the subarachnoid fluid pressures resulted from increase in venous pressure during coughing and Valsalva ‘s maneuver due to distended epidural venous plexus resulting in the cranial flow of CSF with dissipation of pressure difference. Hindbrain herniation prevents this caudal flow of CSF due to ball valve effect of the tonsils which impact at the foramen magnum ‘cork in a bottle’ phenomenon results in cranio spinal pressure differences over 100 mm Hg which ‘sucks ‘ the fluid into the syrinx cavity from the fourth ventricle through the patent obex (eventually sealed off by the impacted hindbrain) later through normal brain tissue. Venous dilatation creates a fluid wave exerting pressure on the cavitated cord thus propagating the syrinx by a ‘ sloshing action’

Clinical features :

The clinical features in chiari malformations are mainly due to

1.increased ICP

2.compression of the cranial nerves

3.compression of brainstem

4.changes in the spinal cord

5.cerebellar signs

Size of craniectomy in foramen magnum decompression :

There are various consensus about the size of craniectomy by some series, but in our study a small –sized craniectomy 3cm/3cm (1.5cm from the midline on either side) was done and extensive removal of bone was not done considering the post operative instability and kyphosis.

Arachnoid dissection :

In our study dissection of arachnoid adhesion (in selected patients based on intra-op findings) without tonsillar resection was performed.

In our study opening of arachnoid and dissection of arachnoid adhesions around the herniated tonsils was routinely done. CSF leak occured in one patient and the csf leak subsided after reexploration and suturing of dural rent.

Resection of tonsils and obex plugging :

Regarding resection of tonsils, the complications associated with the resection like posterior inferior cerebellar artery injury as mentioned in literature, the resection of tonsils doesnt give significant results compared to foramen magnum decompression with lax duraplasty.

Obex plugging to occlude the csf flow into the central canal was largely abandoned due to manipulation related risk and high rate of complications. Hence in our study we had not done resection of tonsils or obex plugging.

Lax duraplasty :

In our study, lax duraplasty was done in 32 patients using the fascia lata (autograft) harvested from the patient . Some series reports use of artificial dural graft or pericranium for duraplasty. In our study CSF leak was observed in 1 patient and the csf leak subsided after re-exploration and suturing of dural rent.

Shunting of syrinx :

Shunting can be done from a syrinx to subarachnoid space, fourth ventricle, peritoneum, and pleura to establish CSF flow during external cord compression, which occurs during cardiac systole .In the past two

decades only shunting of syrinx cavity was used for the management of syrinx. Due to long term failure rate and associated complications like shunt obstruction, shunt migration, and clinical deterioration we had not done shunting in any of the patients in this study. Recently Goel and Desai published that foramen magnum decompression combined with syringo- subarachnoid shunt is superior when compared to placing shunt alone.

Foramen magnum decompression without duraplasty :

Sinduo et al. reviewed literature and concluded that foramen magnum decompression alone was not useful as the outcome of results was only 71% .

Literature on surgical outcome :

SPASTICITY : ASHWORTH SCALE

0 No increase in tone

1 Slight increase in muscle tone, manifested by a catch and release or minimal resistance at the end of the ROM when the affected part(s) is moved in flexion or extension

1+ Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM

2 More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved

3 Considerable increase in muscle tone, passive movement difficult

4 Affected part(s) rigid in flexion or extension

NURICK'S GRADING :

Grade 0 : No evidence of spinal cord disease

Grade 1 : signs of spinal cord disease but no difficulty in walking

Grade 2 : slight difficulty in walking which does not prevent full-time employment

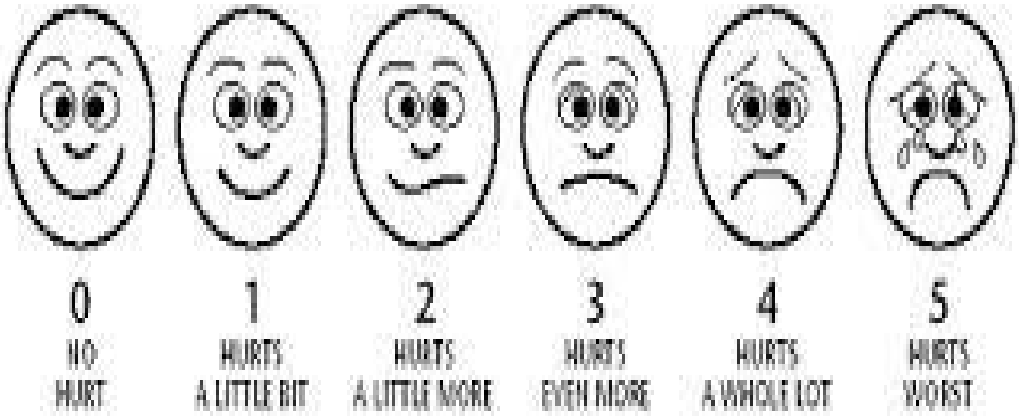
Grade 3 : difficulty in walking which prevented full time employment Or the ability to do all housework, but which was not so severe as to require someone else's help to walk

Grade 4: able to walk only with someone else's help or with the aid of a frame

Grade 5: chair bound or bedridden .

WONG – BAKER PAIN SCORE :

Pain (occipito cervical) is one of the major complaint in patients with chiari malformation. There are many scales to assess the pre op and post op severity of pain in a patient. In our study WONG – BAKER pain scale was used to assess the pre op and post op severity of pain.



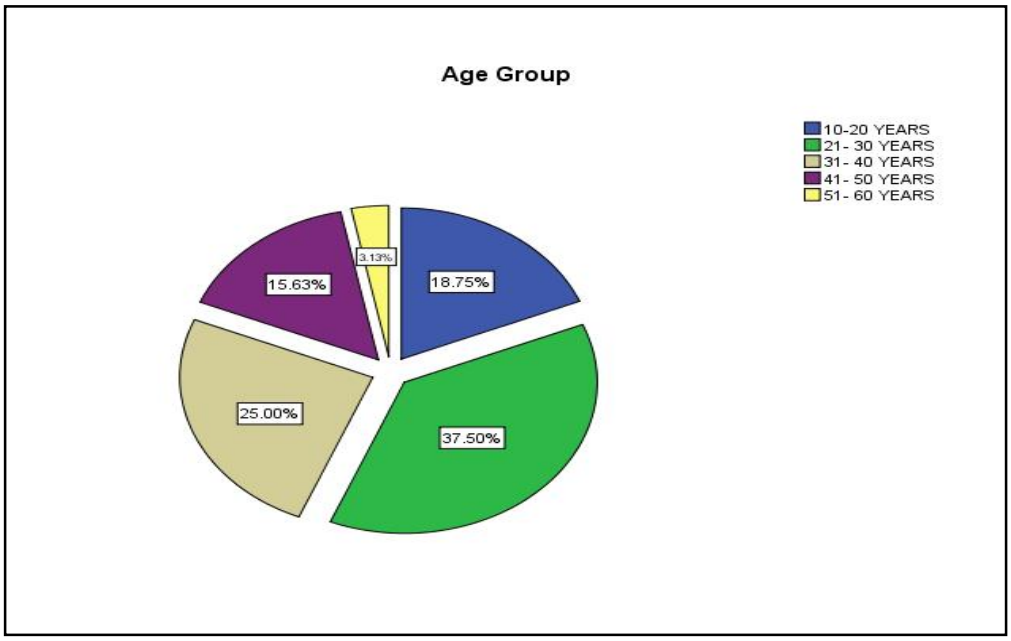
OUTCOME AND ANALYSIS

Frequency Table

AGE GROUP

	Frequency	Percent
1	6	18.8
2	12	37.5
3	8	25.0
4	5	15.6
5	1	3.1
Total	32	100.0

The incidence of chiari malformation is more in age group 2 – 37.5%



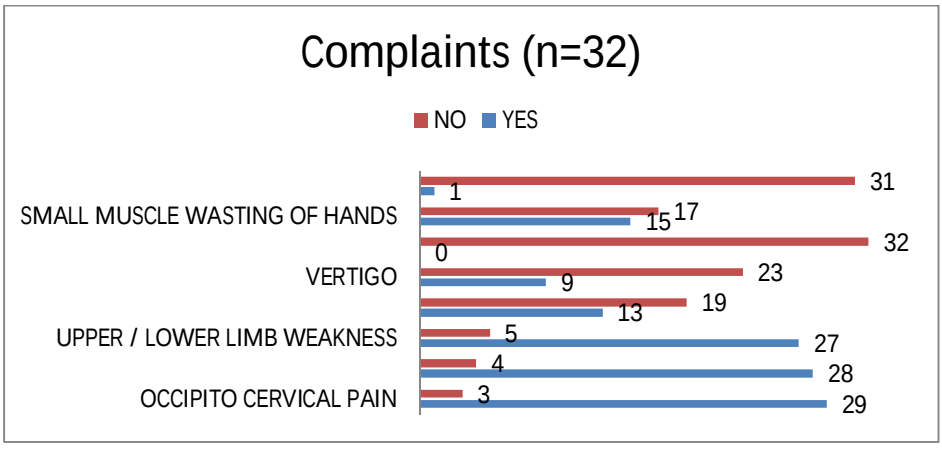
Sex			
		Frequency	Percent
	Female	14	43.8
	Male	18	56.3
	Total	32	100.0

Scoliosis			
		Frequency	Percent
Valid	NO	30	93.8
	YES	2	6.3
	Total	32	100.0

Height Neck Ratio			
		Frequency	Percent
Valid	LESS THEN 13	17	53.1
	MORE THEN 13	15	46.9
	Total	32	100.0

Occipito Cervical Pain

		Frequency	Percent
Valid	NO	3	9.4
	YES	29	90.6
	Total	32	100.0



Tightness Of Limbs

		Frequency	Percent
Valid	NO	4	12.5
	YES	28	87.5
	Total	32	100.0

Upper Lower Limb Weakness

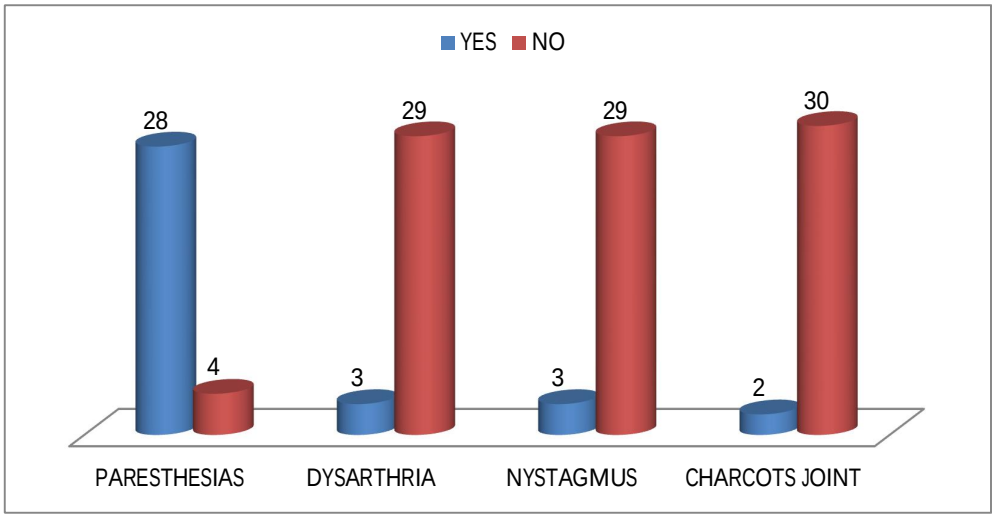
		Frequency	Percent
Valid	NO	5	15.6
	YES	27	84.4
	Total	32	100.0

paresthesias

		Frequency	Percent
Valid	NO	19	59.4
	YES	13	40.6
	Total	32	100.0

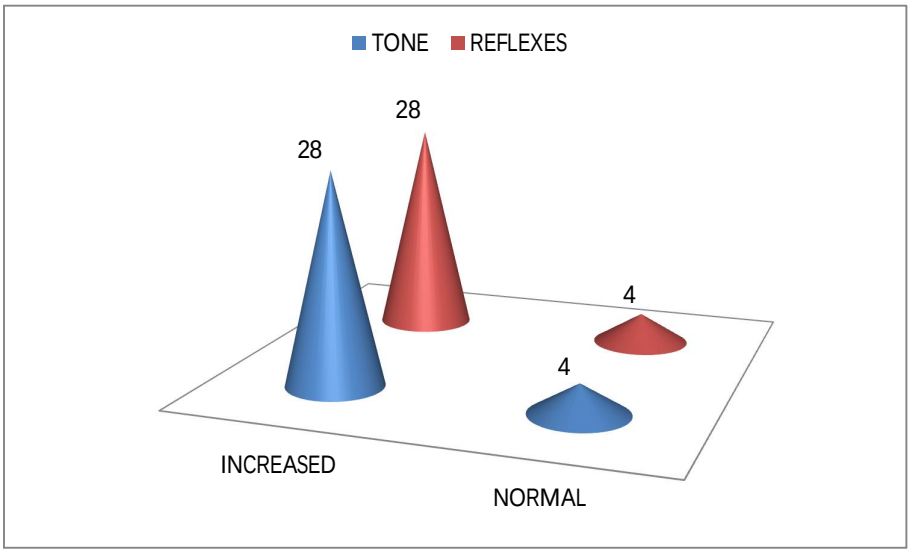
Small Muscle Wasting Of Hands

		Frequency	Percent
Valid	NO	17	53.1
	YES	15	46.9
	Total	32	100.0



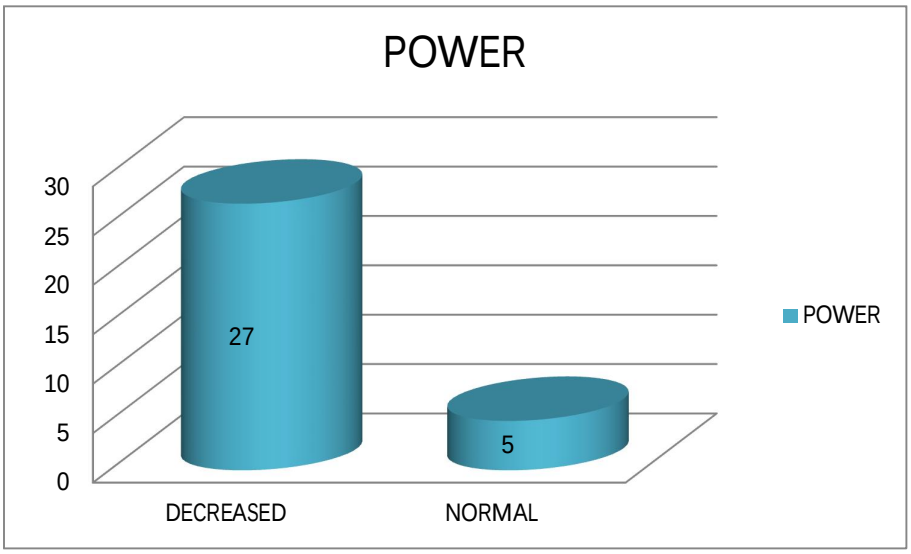
TONE

		Frequency	Percent
Valid	INCREASED	28	87.5
	NORMAL	4	12.5
	Total	32	100.0



POWER

		Frequency	Percent
Valid	DECREASED	27	84.4
	NORMAL	5	15.6
	Total	32	100.0



REFLEXES

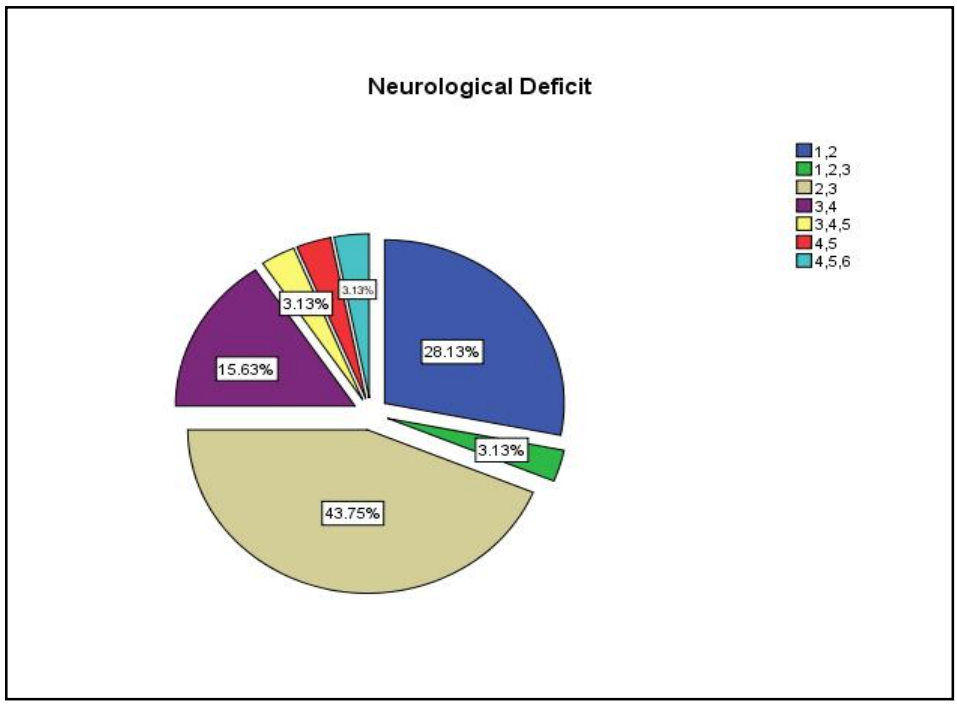
		Frequency	Percent
Valid	INCREASED	28	87.5
	NORMAL	4	12.5
	Total	32	100.0

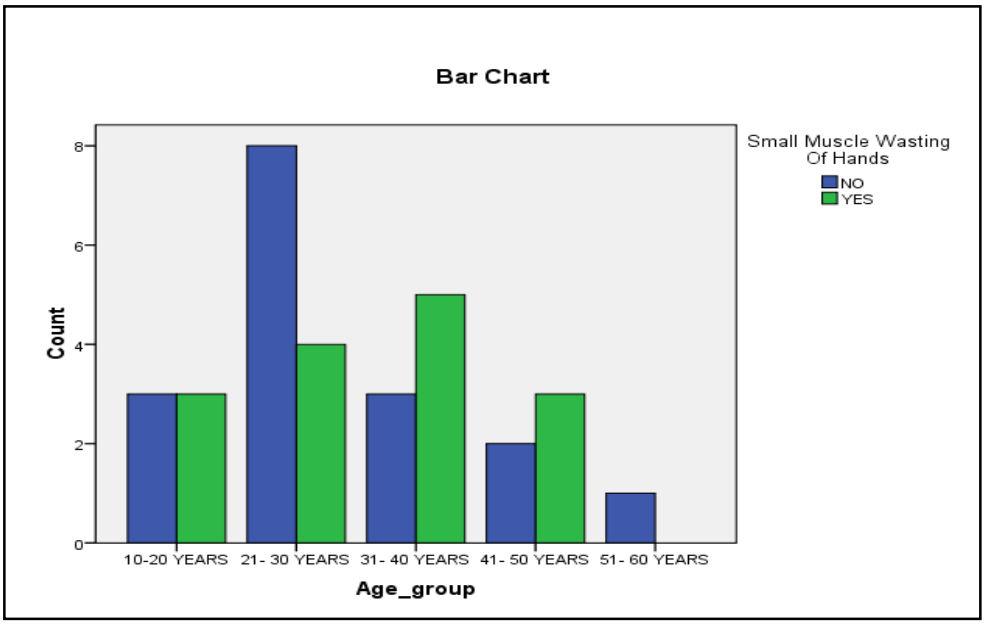
MYELOPATHY

		Frequency	Percent
Valid	NO	4	12.5
	YES	28	87.5
	Total	32	100.0

SENSORY SYSTEM

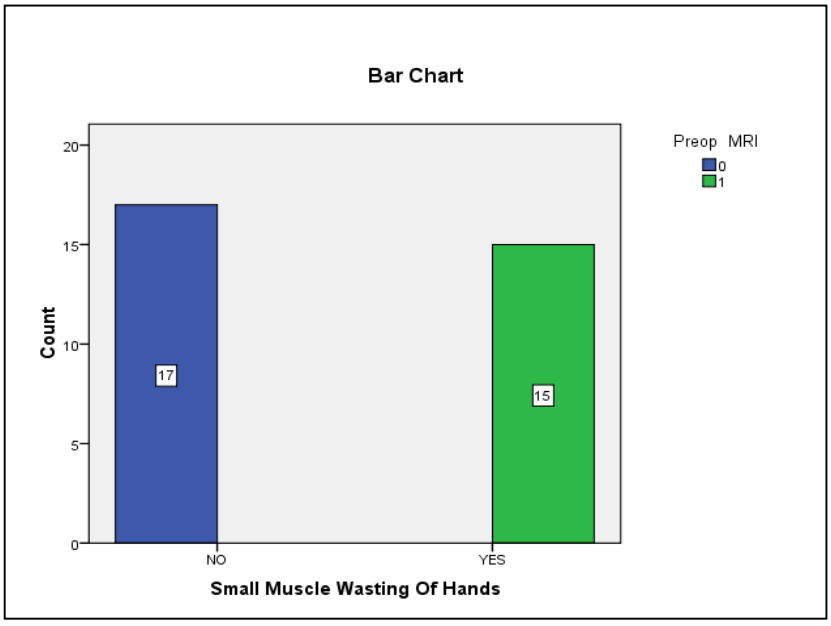
		Frequency	Percent
Valid	DECREASED	17	53.1
	DISSOCIATED SENSORY LOSS	15	46.9
	Total	32	100.0


Neurological Deficit
1,2
1,2,3
2,3
3,4
3,4,5
4,5
4,5,6
28.13%
3.13%
43.75%
15.63%
3.13%
3.13%


Bar Chart
Small Muscle Wasting Of Hands
NO
YES
Count
0
2
4
6
8
10-20 YEARS
21- 30 YEARS
31- 40 YEARS
41- 50 YEARS
51- 60 YEARS
Age_group

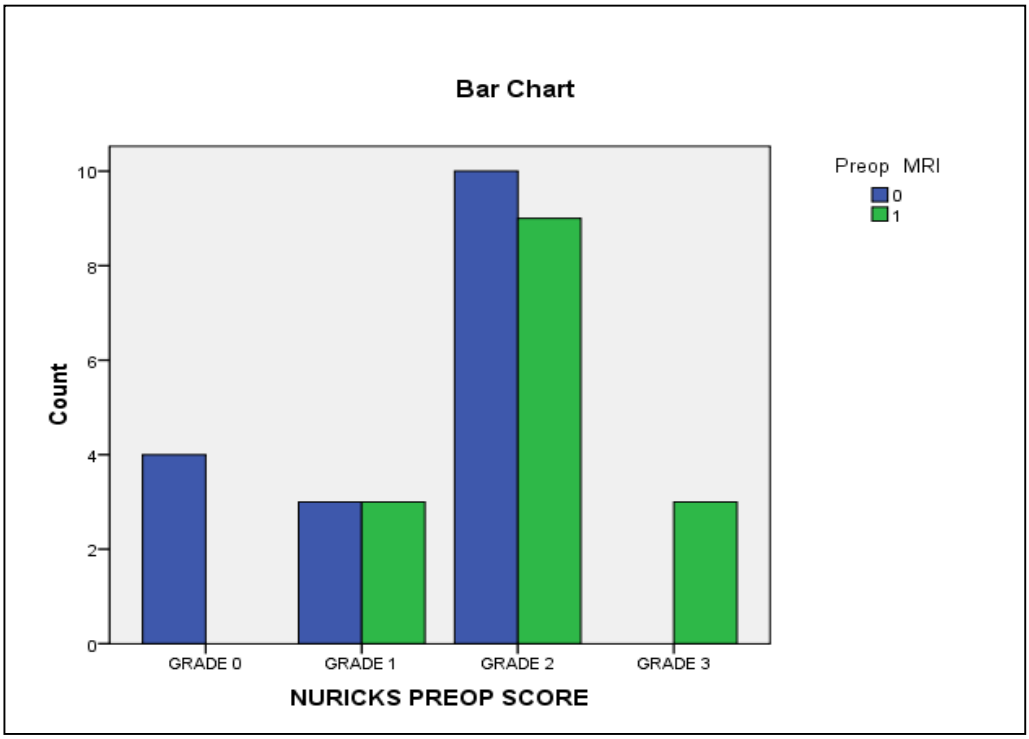
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.920[a]	4	.571
Likelihood Ratio	3.327	4	.505
N of Valid Cases	32		



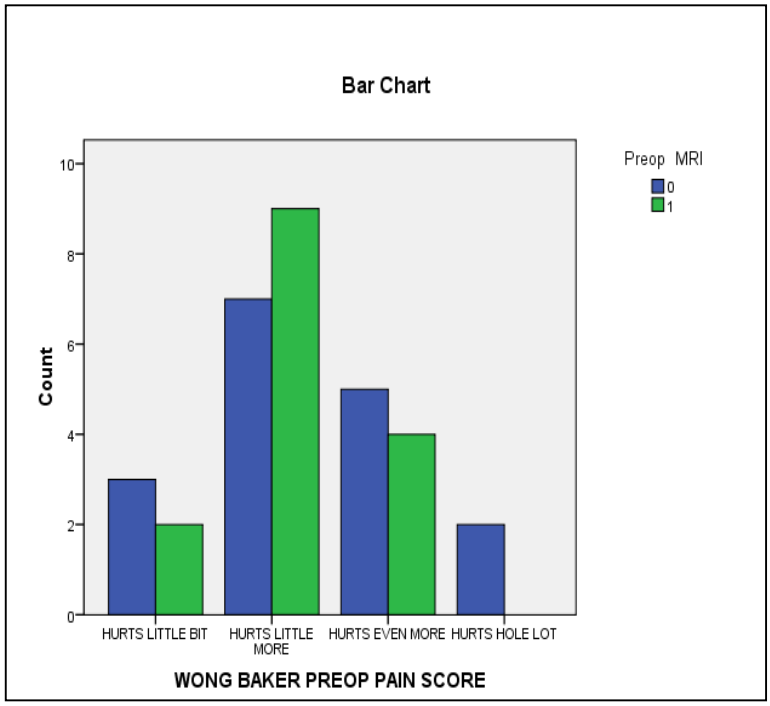
NURICKS PREOP SCORE * Preop MRI Crosstabulation

			Preop MRI		
			0	1	Total
NURICKS PREOP SCORE	GRADE 0	Count	4	0	4
		% within NURICKS PREOP SCORE	100.0%	.0%	100.0%
	GRADE 1	Count	3	3	6
		% within NURICKS PREOP SCORE	50.0%	50.0%	100.0%
	GRADE 2	Count	10	9	19
		% within NURICKS PREOP SCORE	52.6%	47.4%	100.0%
	GRADE 3	Count	0	3	3
		% within NURICKS PREOP SCORE	.0%	100.0%	100.0%
Total		Count	17	15	32
		% within NURICKS PREOP SCORE	53.1%	46.9%	100.0%



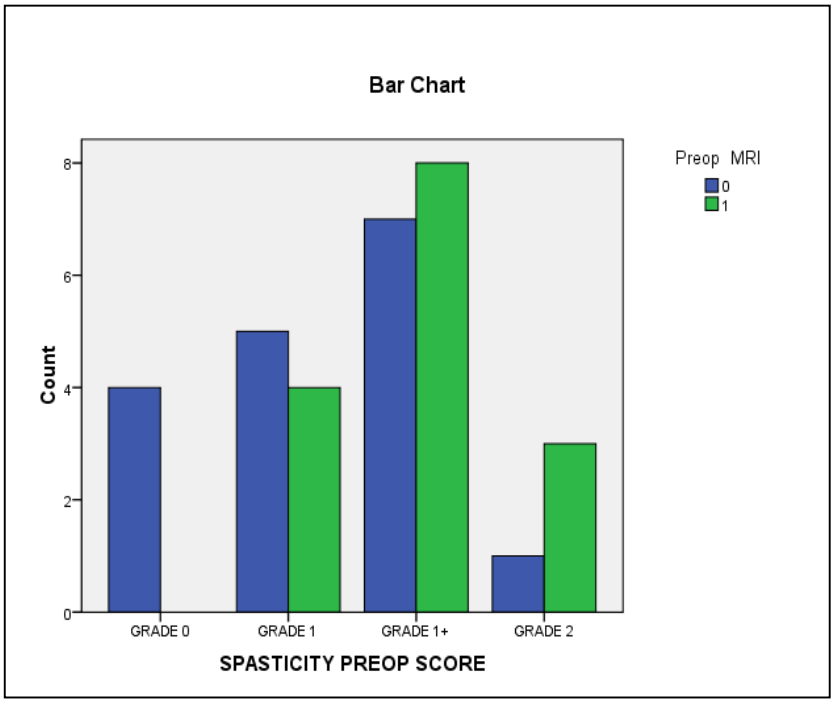
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.955[a]	3	.073
Likelihood Ratio	9.632	3	.022
Linear-by-Linear Association	4.874	1	.027
N of Valid Cases	32		



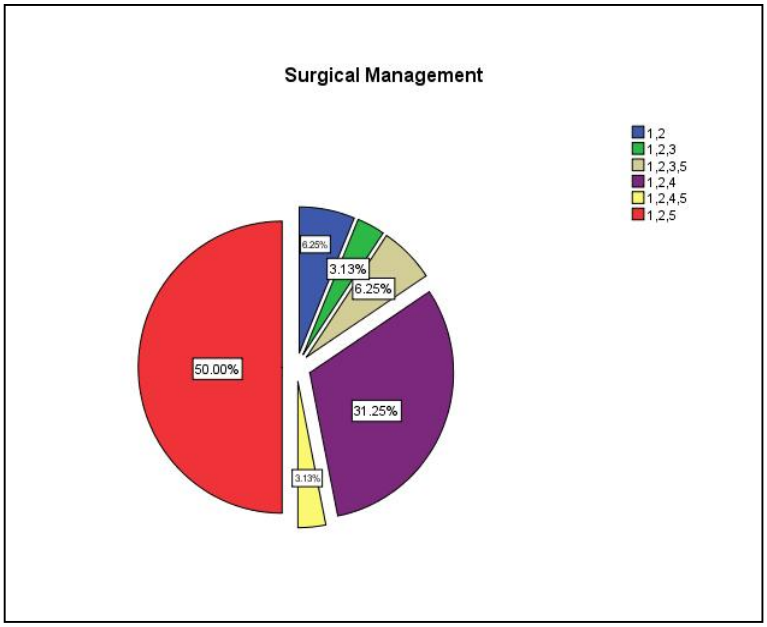
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.446[a]	3	.485
Likelihood Ratio	3.211	3	.360
Linear-by-Linear Association	.596	1	.440
N of Valid Cases	32		

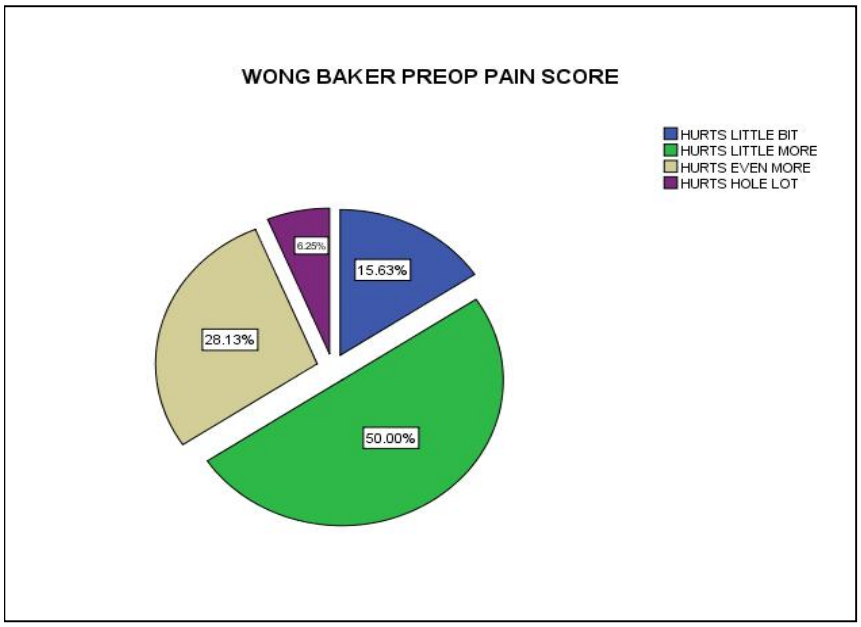


Chi-Square Tests

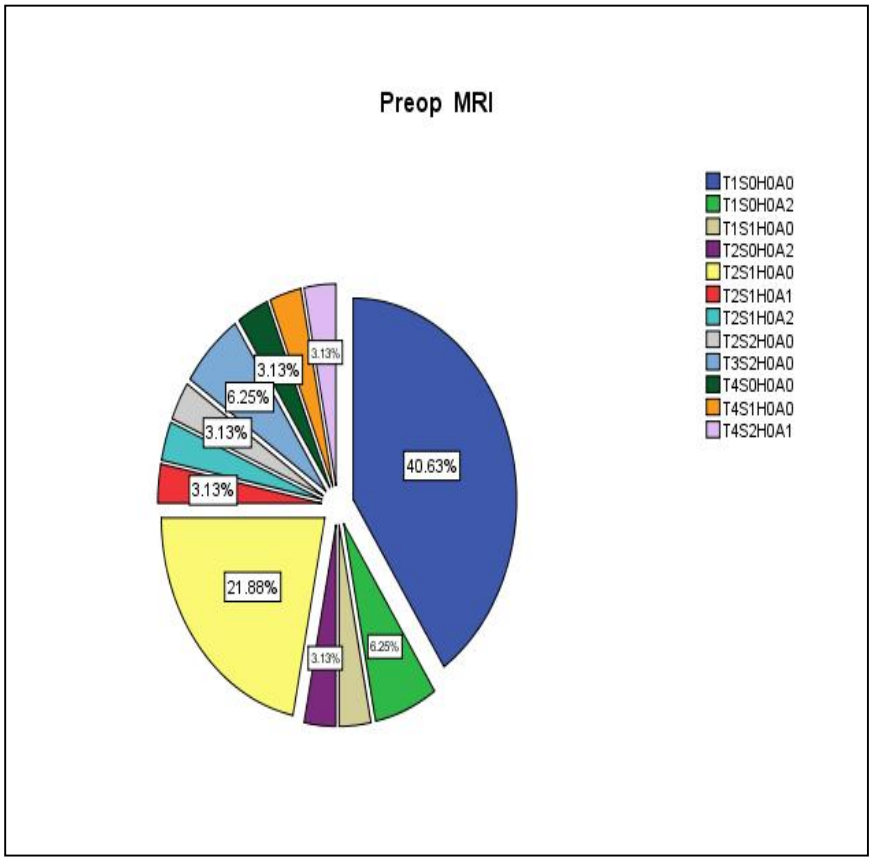
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.073[a]	3	.167
Likelihood Ratio	6.645	3	.084
Linear-by-Linear Association	4.256	1	.039
N of Valid Cases	32		



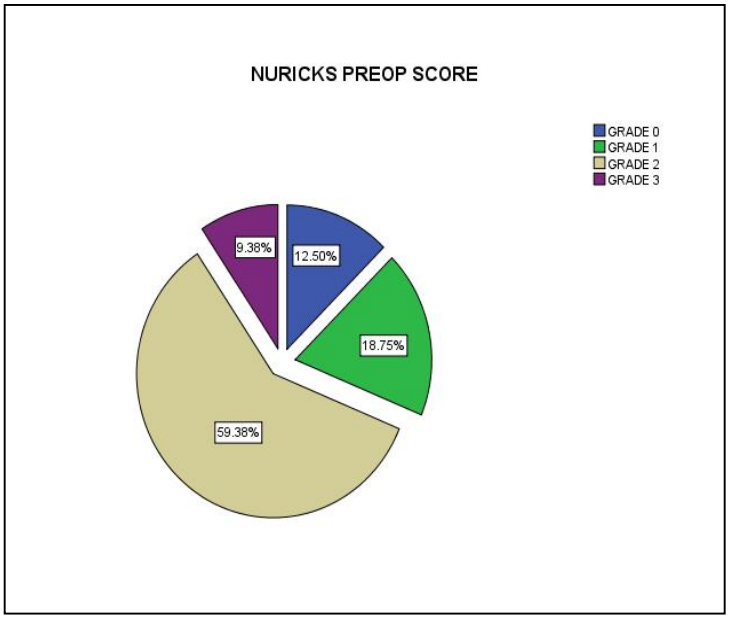
The analysis shows in 50% of cases arachnoid dissection was done along with foramen magnum decompression.

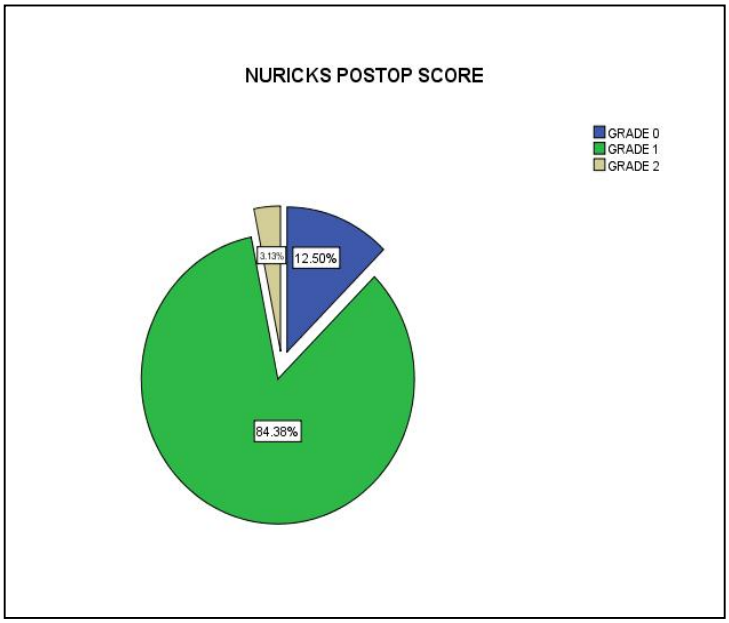


The analysis shows 50% of cases had Wong-Baker pain score of 2.



The analysis showed 40.63% of patients had purely type I chiari Malformation with tonsillar descent of 7mm.





The statistical analysis shows 84.38% to grade 1 post operatively

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	NURICKS PREOP SCORE	1.6563	32	.82733	.14625
	NURICKS POSTOP SCORE	.9063	32	.39015	.06897
Pair 2	SPASTICITY PREOP SCORE	1.5938	32	.87471	.15463
	SPASTICITY POSTOP SCORE	.1250	32	.33601	.05940
Pair 3	WONG BAKER PREOP PAIN SCORE	2.2500	32	.80322	.14199
	WONG BAKER POSTOP PAIN SCORE	.1875	32	.39656	.07010

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	NURICKS PREOP SCORE & NURICKS POSTOP SCORE	32	.796	.000
Pair 2	SPASTICITY PREOP SCORE & SPASTICITY POSTOP SCORE	32	.508	.003
Pair 3	WONG BAKER PREOP PAIN SCORE & WONG BAKER POSTOP PAIN SCORE	32	.658	.000

Paired Samples Test

		Paired Differences		
		Mean	Std. Deviation	Std. Error Mean
Pair 1	NURICKS PREOP SCORE - NURICKS POSTOP SCORE	.75000	.56796	.10040
Pair 2	SPASTICITY PREOP SCORE - SPASTICITY POSTOP SCORE	1.46875	.76134	.13459
Pair 3	WONG BAKER PREOP PAIN SCORE - WONG BAKER POSTOP PAIN SCORE	2.06250	.61892	.10941

Paired Samples Test

		Paired Differences	
		95% Confidence Interval of the Difference	
		Lower	Upper
Pair 1	NURICKS PREOP SCORE - NURICKS POSTOP SCORE	.54523	.95477
Pair 2	SPASTICITY PREOP SCORE - SPASTICITY POSTOP SCORE	1.19426	1.74324
Pair 3	WONG BAKER PREOP PAIN SCORE - WONG BAKER POSTOP PAIN SCORE	1.83935	2.28565

NURICKS POSTOP SCORE * NURICKS PREOP SCORE

Crosstab

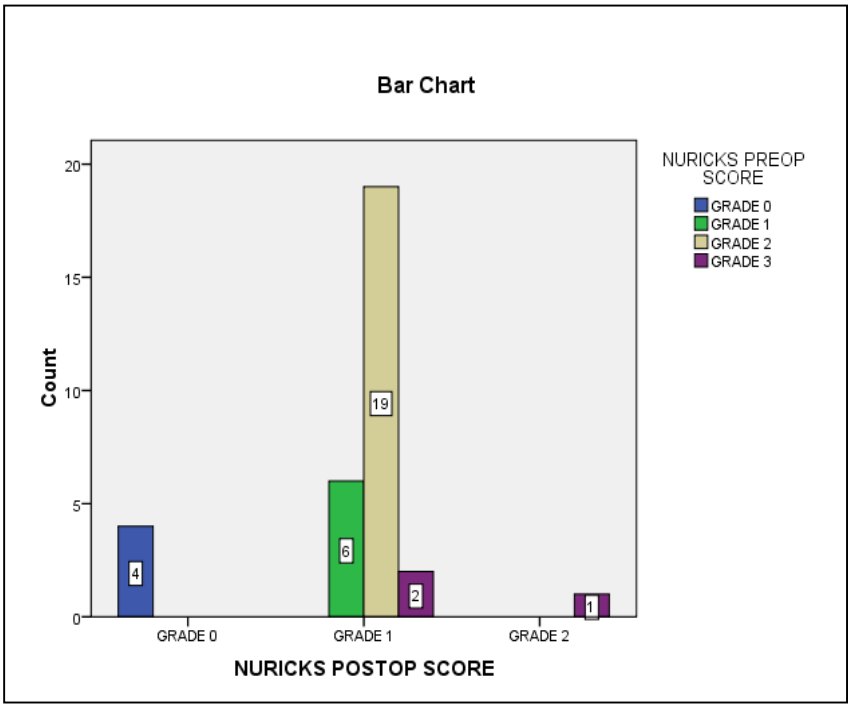
			NURICKS PREOP SCORE		
			GRADE 0	GRADE 1	GRADE 2
NURICKS POSTOP SCORE	GRADE 0	Count	4	0	0
		% within NURICKS POSTOP SCORE	100.0%	.0%	.0%
	GRADE 1	Count	0	6	19
		% within NURICKS POSTOP SCORE	.0%	22.2%	70.4%
	GRADE 2	Count	0	0	0
		% within NURICKS POSTOP SCORE	.0%	.0%	.0%
	Total	Count	4	6	19

Crosstab

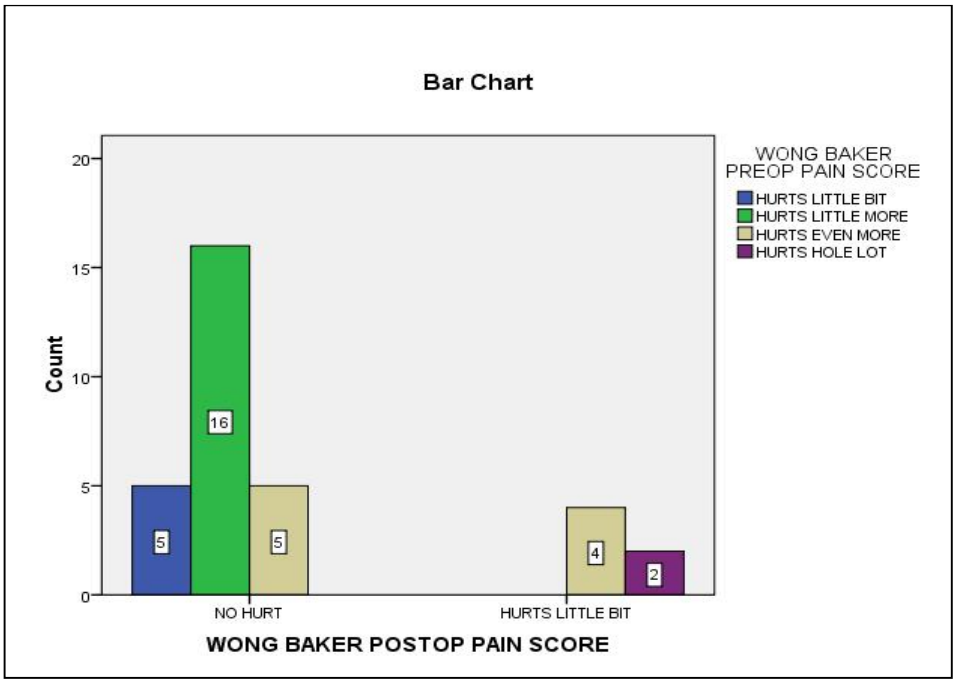
			NURICKS PREOP SCORE		
			GRADE 0	GRADE 1	GRADE 2
NURICKS POSTOP SCORE	GRADE 0	Count	4	0	0
		% within NURICKS POSTOP SCORE	100.0%	.0%	.0%
	GRADE 1	Count	0	6	19
		% within NURICKS POSTOP SCORE	.0%	22.2%	70.4%
	GRADE 2	Count	0	0	0
		% within NURICKS POSTOP SCORE	.0%	.0%	.0%
	Total	Count	4	6	19
		% within NURICKS POSTOP SCORE	12.5%	18.8%	59.4%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	41.877[a]	6	.000
Likelihood Ratio	28.922	6	.000
Linear-by-Linear Association	19.661	1	.000
N of Valid Cases	32		



NURICKS POSTOP SCORE * NURICKS PREOP SCORE



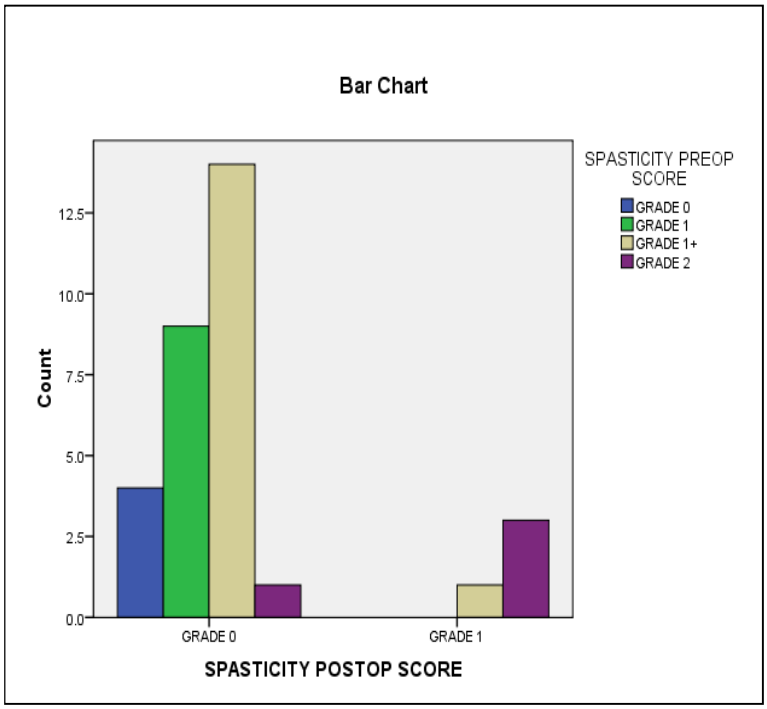
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.413[a]	3	.001
Likelihood Ratio	18.520	3	.000
Linear-by-Linear Association	13.433	1	.000
N of Valid Cases	32		

SPASTICITY POSTOP SCORE * SPASTICITY PREOP SCORE

Crosstab

			SPASTICITY PREOP SCORE		
			GRADE 0	GRADE 1	GRADE 1+
SPASTICITY POSTOP SCORE	GRADE 0	Count	4	9	14
		% within SPASTICITY POSTOP SCORE	14.3%	32.1%	50.0%
	GRADE 1	Count	0	0	1
		% within SPASTICITY POSTOP SCORE	.0%	.0%	25.0%
	Total	Count	4	9	15
		% within SPASTICITY POSTOP SCORE	12.5%	28.1%	46.9%



Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.610[a]	3	.001
Likelihood Ratio	12.267	3	.007
Linear-by-Linear Association	7.988	1	.005
N of Valid Cases	32		

Postop MRI * Preop MRI

Crosstab

			Preop MRI			
			T2S1H0 A0	T2S1H0 A1	T2S1H0 A2	T2S2H0 A0
Postop MRI	T1	Count	1	0	0	0
		% within Postop MRI	5.6%	.0%	.0%	.0%
	T1S1	Count	1	0	0	1
		% within Postop MRI	20.0%	.0%	.0%	20.0%
	T1S2	Count	5	1	1	0
		% within Postop MRI	55.6%	11.1%	11.1%	.0%
	Total	Count	7	1	1	1
		% within Postop MRI	21.9%	3.1%	3.1%	3.1%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	51.911[a]	22	.000
Likelihood Ratio	50.961	22	.000
N of Valid Cases	32		

Postop MRI * Preop MRI

Cross tab

			Preop MRI		
			T3S2H0A0	T4S0H0A0	T4S1H0A0
Postop MRI	T1	Count	0	0	0
		% within Postop MRI	.0%	.0%	.0%
	T1S1	Count	2	0	0
		% within Postop MRI	40.0%	.0%	.0%
	T1S2	Count	0	0	1
		% within Postop MRI	.0%	.0%	11.1%
	Total	Count	2	1	1
		% within Postop MRI	6.3%	3.1%	3.1%

DESCRIPTIVE OF PAIRED SAMPLE GROUPS

	Mean	Std. Deviation
WONG BAKER PREOP PAIN SCORE	2.2500	.80322
WONG BAKER POSTOP PAIN SCORE	.1875	.39656
PREOP MRI SCORE	.47	.507
POSTOP MRI SCORE	.16	.369
NURICKS PREOP SCORE	1.6563	.82733
NURICKS POSTOP SCORE	.9063	.39015
SPASTICITY PREOP SCORE	1.5938	.87471
SPASTICITY POSTOP SCORE	.1250	.33601

PAIRED SAMPLES TEST

	Paired Differences				
			95% Confidence Interval of the Difference		
	Mean	Std. Deviation	Lower	Upper	P - VALUE
WONG BAKER PREOP PAIN SCORE - WONG BAKER POSTOP PAIN SCORE	2.06250	.61892	1.83935	2.28565	>**0.001**
PREOP MRI SCORE - POSTOP MRI SCORE	.313	.471	.143	.482	**0.001**
NURICKS PREOP SCORE - NURICKS POSTOP SCORE	.75000	.56796	.54523	.95477	>**0.001**
SPASTICITY PREOP SCORE - SPASTICITY POSTOP SCORE	1.46875	.76134	1.19426	1.74324	>**0.001**

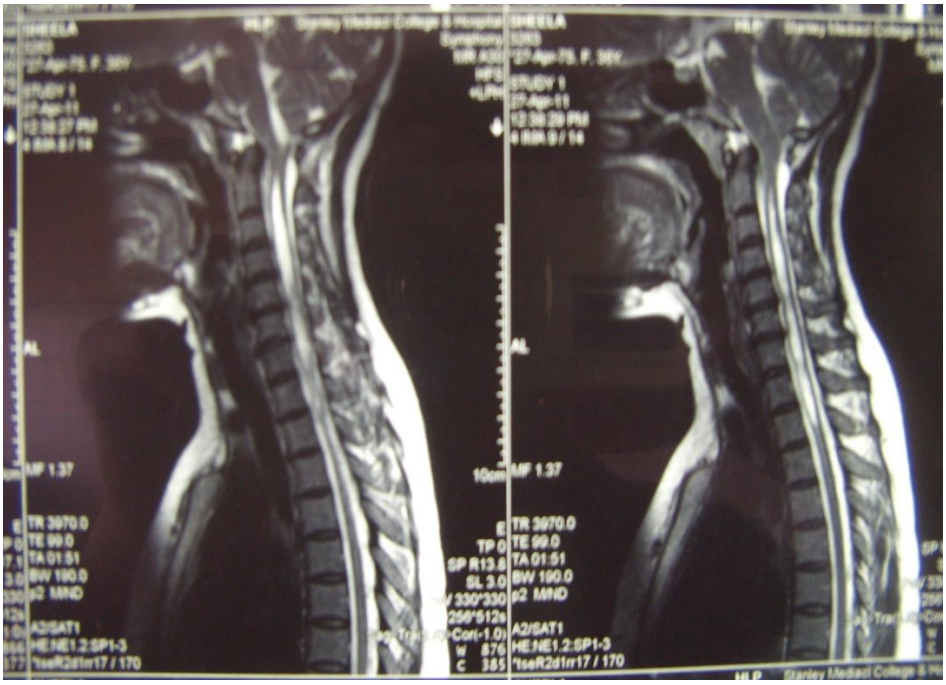
PRE-OPERATIVE SYMPTOMS AND SIGNS AND THEIR POST-OPERATIVE STATUS

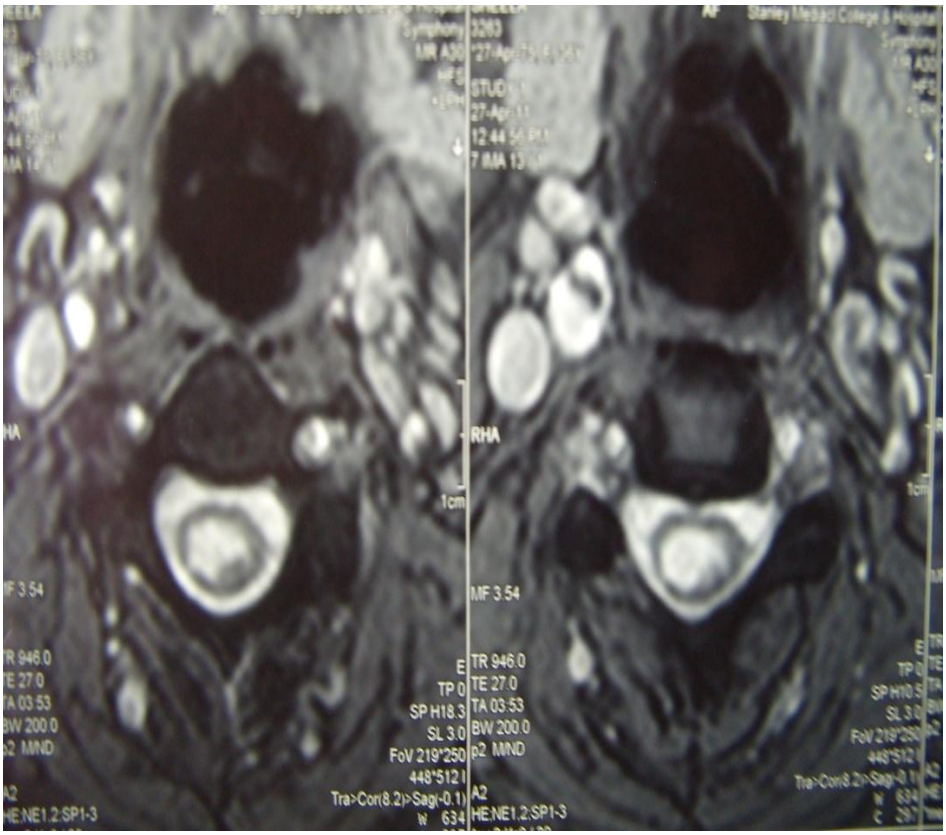
SYMPTOMS/SIGNS	At presentation	Follow-up (6months)		
		Mild improvement	Significant improvement	Disappeared
Head/neck pain	27	-	8	19
Vertigo	8	2	2	4
Upper extremity wks/hyperreflexia	16	2	12	2
Ataxia	8	1	5	2
Lower extremity wks/hyperreflexia	16	2	12	2

Paresthesia	8	2	4	2
Nystagmus	3	1	2	-
Scoliosis	2	2	-	-
Charcot joint	2	2	-	-
Romberg sign	2	-	-	2
Dysarthria	3	1	2	-
Trigeminal neuralgia	1	-	-	1

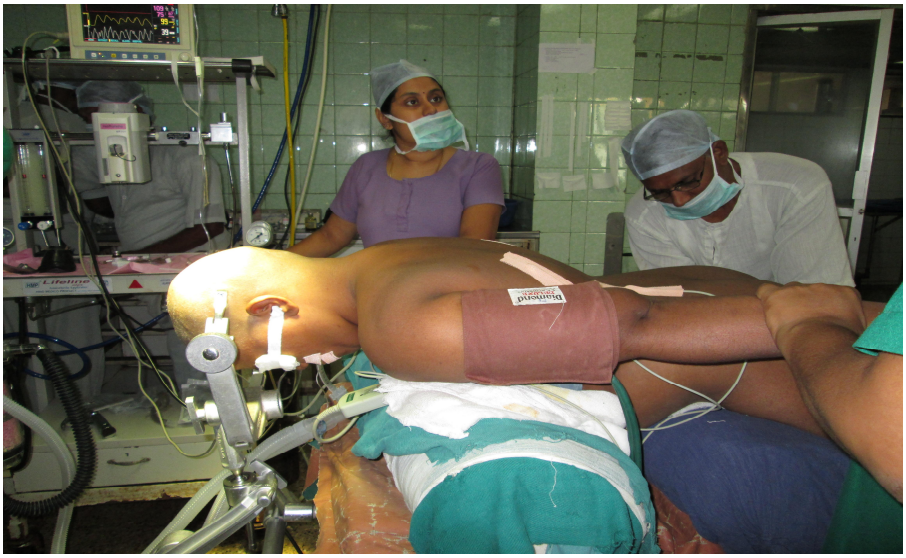
RESULTS AND DISCUSSION

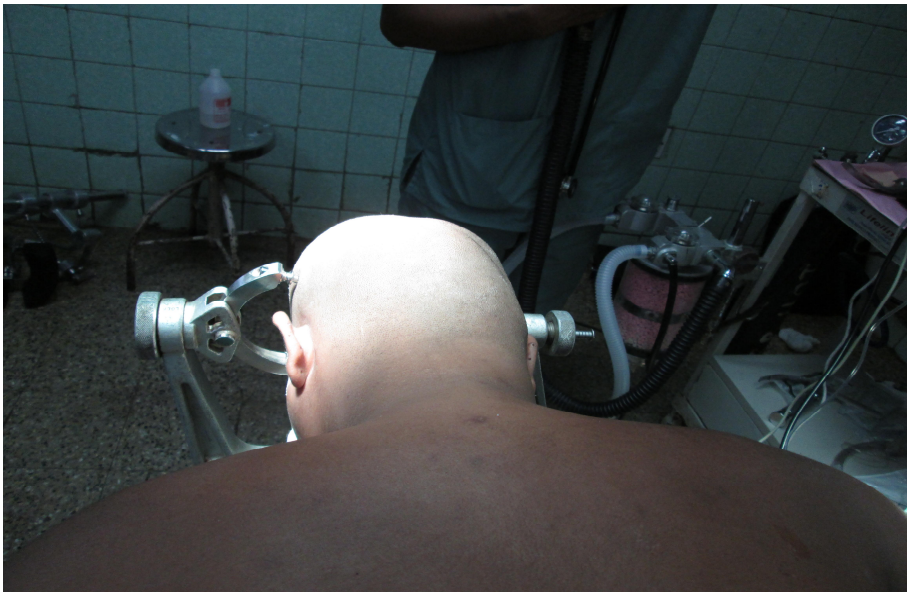
T2 SAGITTAL / AXIAL IMAGES SHOWING TONSILLAR DESCENT WITH SYRINX



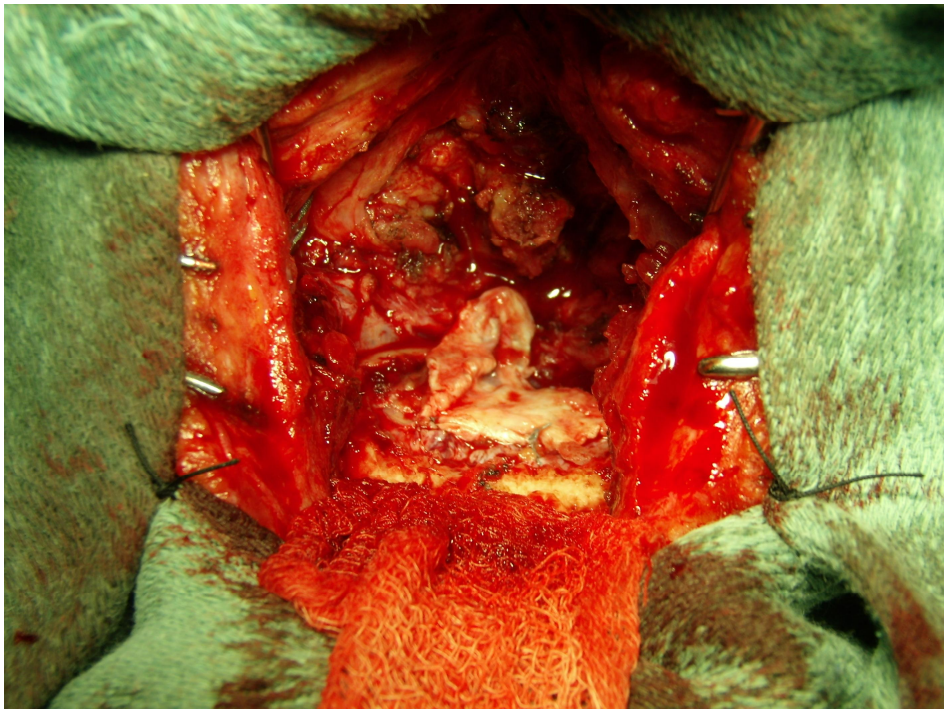


POSITIONING FOR FORAMEN MAGNUM DECOMPRESSION

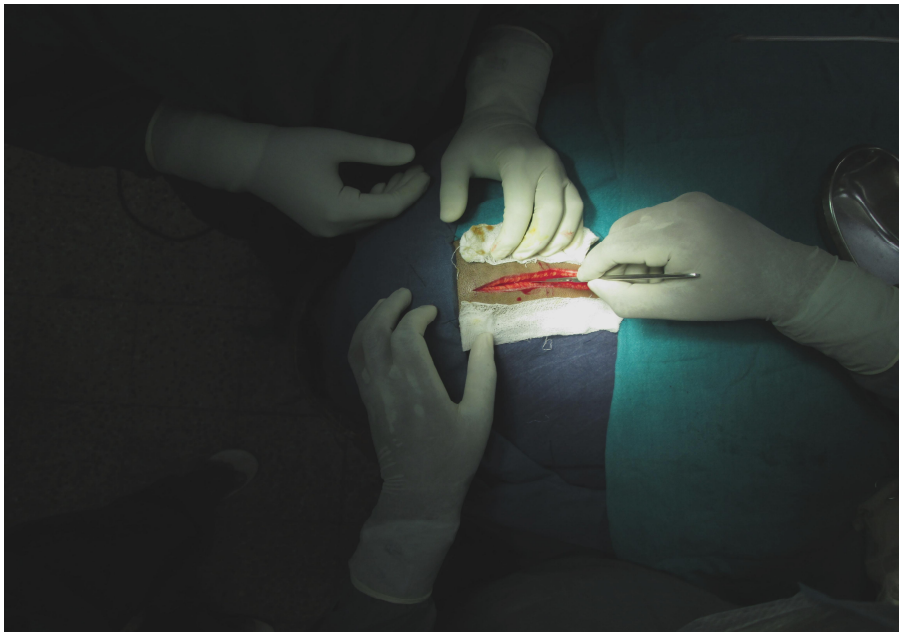


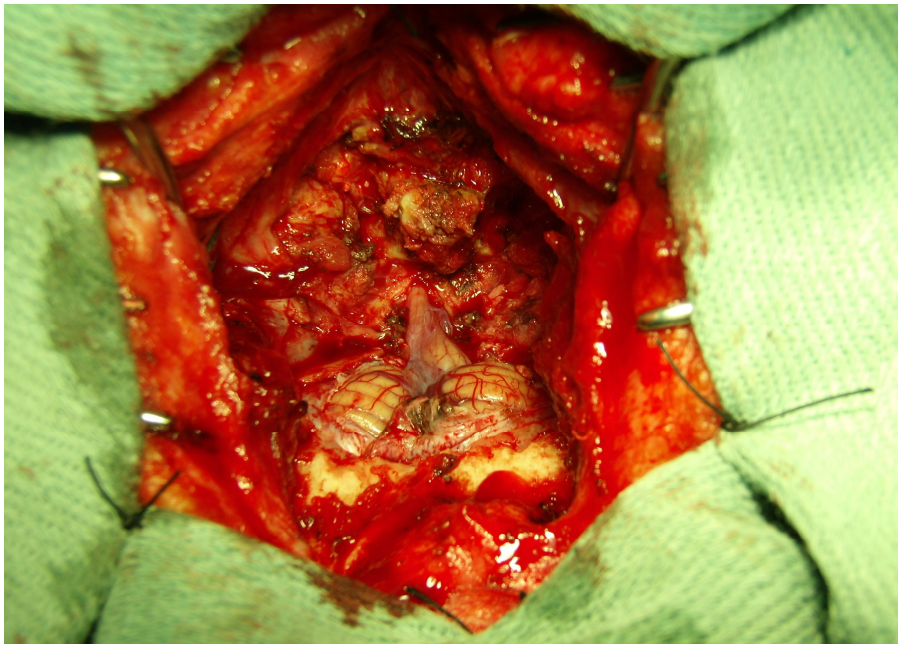


LAX DURAPLASTY WITH FASCIA LATA GRAFT

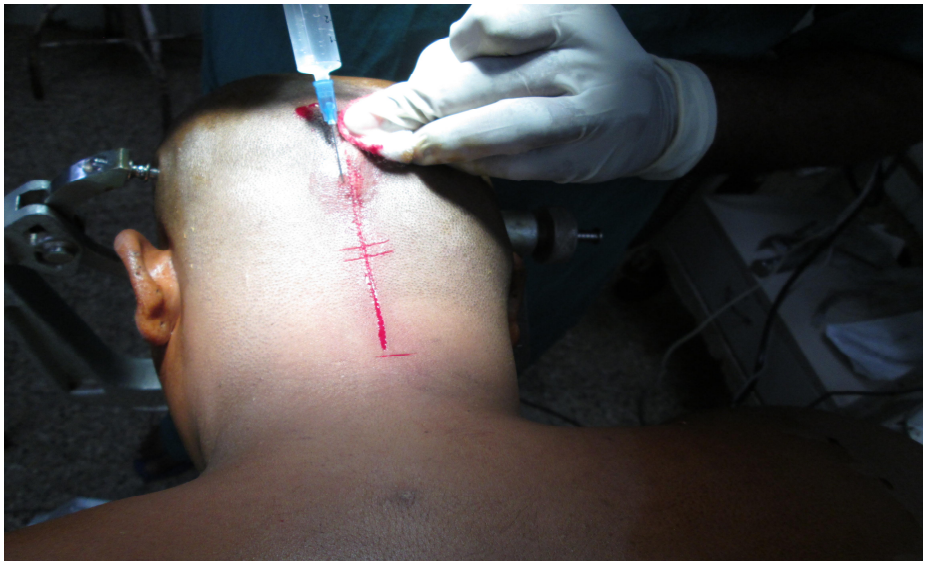


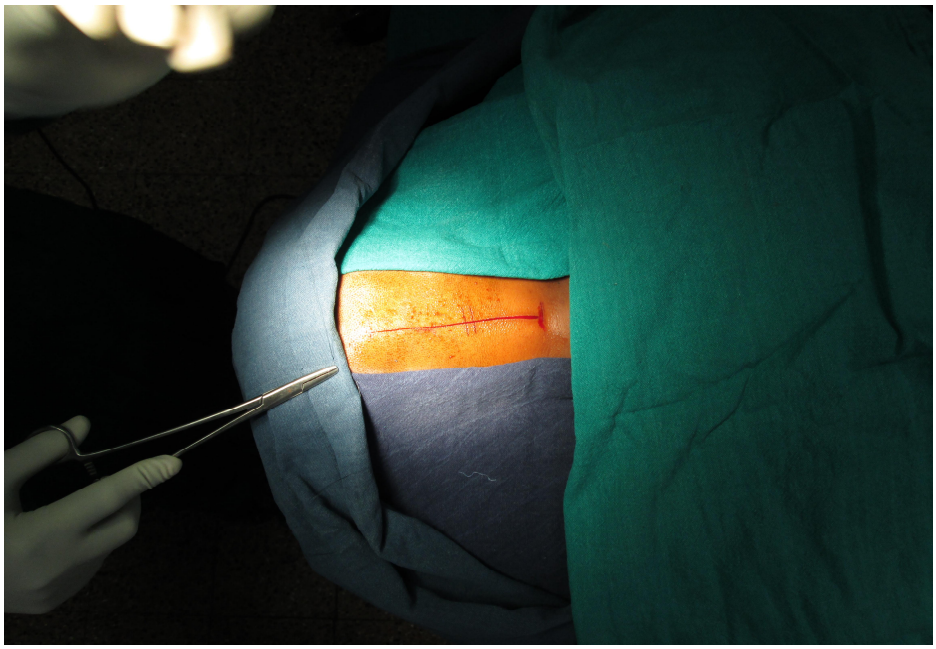
LOWER LIMIT OF TONSILS VISUALISED AFTER FORAMEN MAGNUM DECOMPRESSION



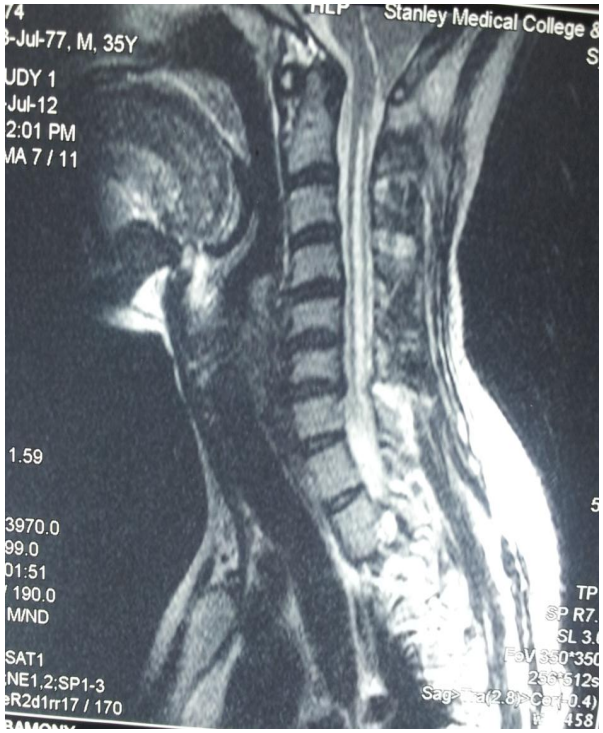


SKIN MARKING (EOP TO C3) AND DRAPPING



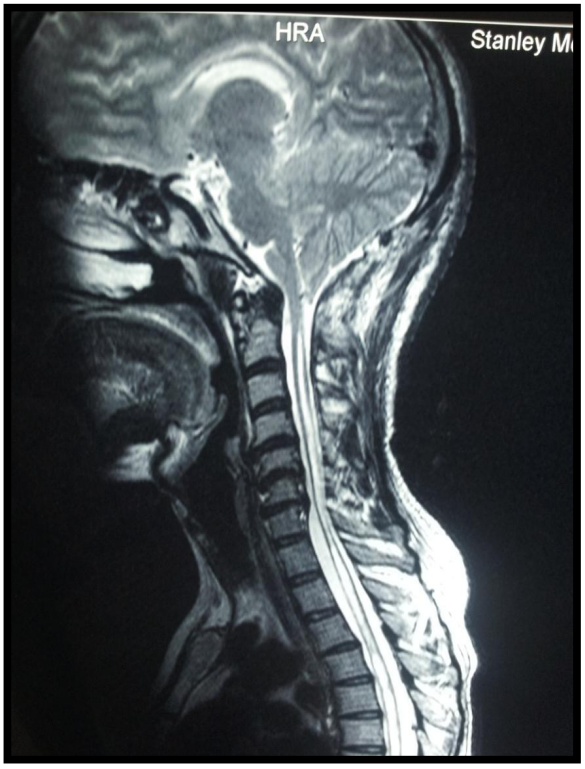


T2 SAGITTAL MRI SHOWING PRE OP AND POST OP WITH ASCEND OF TONSILS WITH RESTORING NORMAL CSF FLOW ACROSS CRANIOCERVICAL JUNCTION WITH RESOLVING SYRINX.

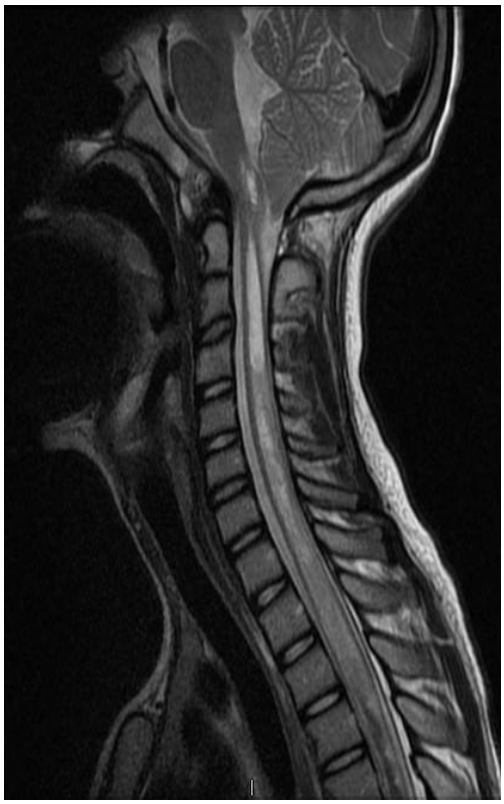


PRE OP

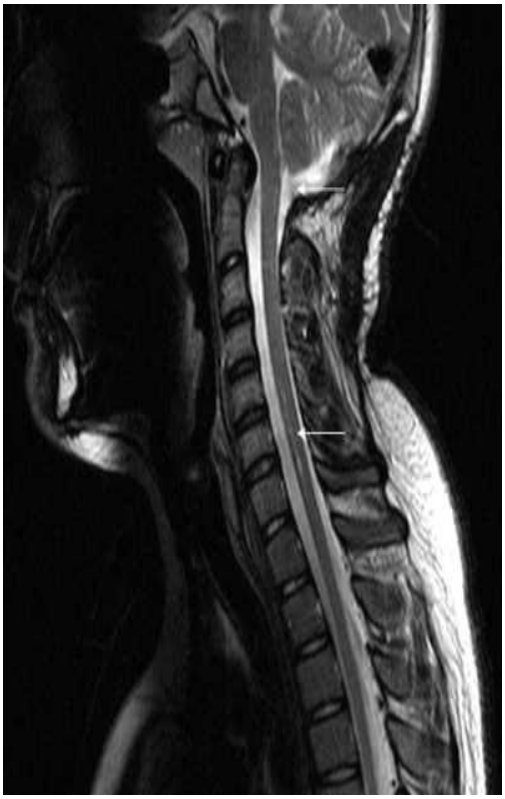
POST OP



SAGITTAL MRI SHOWING PRE OP AND POST OP WITH RESOLVING SYRINX WITH ESTABLISHING CSF FLOW ACROSS FORAMEN MAGNUM AT 6 MONTH FOLLOW UP



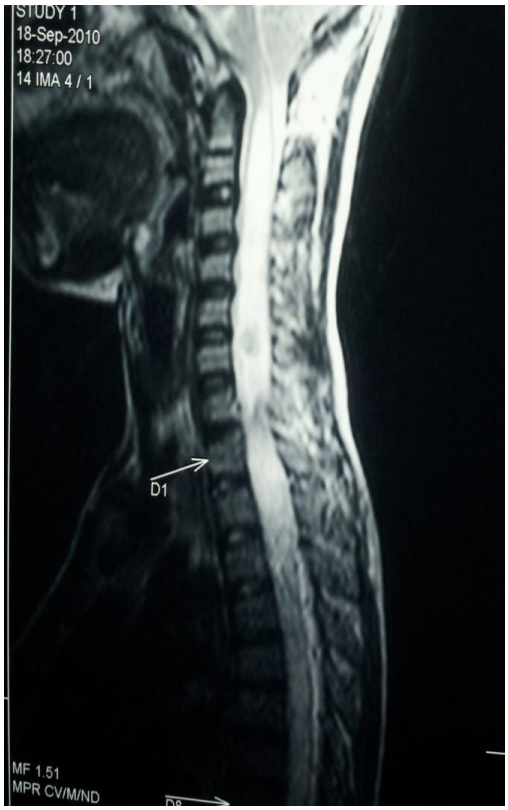
PRE OP

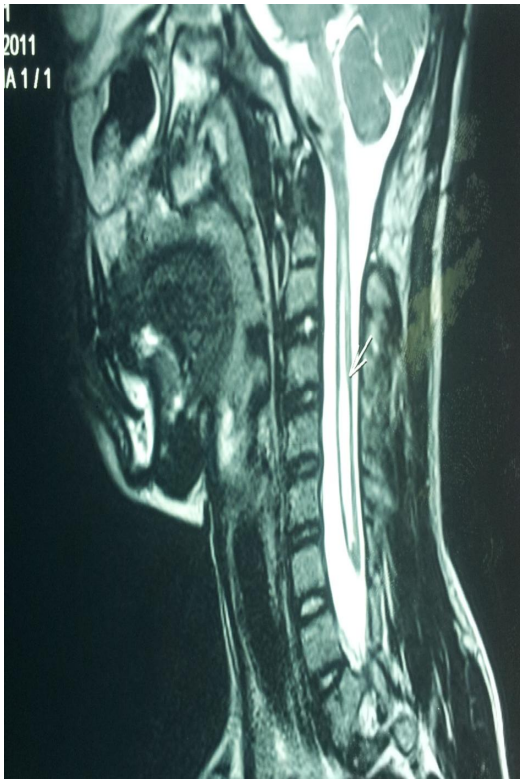


POST OP

T2 SAG ITTAL MRI SHOWING PRE OP AND POST OP WITH RESOLVING SYRINX WITH RE-ESTABLISHED CSF FLOW ACROSS CRANIO CERVICAL JUNCTION

PRE OP





POST OP

RESULTS AND DISCUSSION

1. From the statistical analysis 90.6% presented with occipitocervical pain as their principal complaint present in all age groups.

2. Of the 32cases 15 cases 46.9% had syringomyelia in MRI and they had small muscle wasting of hands on clinical examination.

3. The WONG BAKER POSTOP PAIN SCORE with mean 0.1875 (pre-op 2.2500) with p value <0.001 is statistically significant which indirectly reflects efficacy of surgical procedure.

4. The NURICKS POSTOP SCORE with mean 0.9063 (pre-op 1.6563) with p value <0.001 is statistically significant which indirectly reflects efficacy of surgical procedure.

5. The POSTOP MRI SCORE with mean 0.16 (pre-op 0.47) with p value <0.001 is statistically significant which indirectly reflects efficacy of surgical procedure.

6. The SPASTICITY POSTOP SCORE with mean 0.1250 (pre-op 1.5938) with p value <0.001 is statistically significant which indirectly reflects efficacy of surgical procedure.

7. Two cases presented with charcots joint 6.2% with chiari malformation I with syrinx.

8. The incidence of myelopathy in our study was 87.5% and they were assessed based on Nuricks grading pre and post operatively.

9. The incidence of upper and lower limb weakness in our study was 84.4%.

10. From the statistical analysis the incidence of chiari malformation in our study was seen predominantly in males with 56.3%.

11. The incidence of dissociated sensory loss in our study was 46.9%

12. The symptoms like vertigo,nystagmus and dysarthria showed significant improvement after surgical procedure.

13. Inspite of persistent syrinx on MR image in one patient, no further surgical procedure was advised to avoid even the minimal rate of complications associated with shunting of syinx.

14. One patient who presented with trigeminal neuralgic pain in this study showed complete recovery of pain after surgery.

15. Improvement in clinical symptoms with with resolution of the syrinx is noted in 93.3% of the cases.

COMPARISION WITH LITERATURE SYNOPSIS

Authors&year	Study period	No. Of Patients	Ages (yrs)	No.of syrinx	Operative technique	Type of shunt	Morbidity	Results
Paul et al.,1983	1943-1981	71	15-66	?	SC(71),C1-C3 LM+fascial Graft(69),re-op (1)for pseudomeningocele	4th VSS (17)	respiratory depression (10),hematoma(1), pseudomeningocele(1) death(1)	82% improved,subsequent deterioration 21% after 3yrs FU 6months – 9yrs
Dyste & Menezes	1975-1985	11	1-19	11	PFC+LM+Arachnoid Dissection+duraplasty (11), odontoidectomy(2)	4th VSS(1) VPS(2) SSS(3)	None	37.5% asymptomatic 50% improved 12.5% stable. FU 2-12YRS
Pillay et al., 1991	3yrs	35	18-57	20	PFD+Plugging of obex(31) PFD+SSS(1), Odontiodectomy(2), Re-op (3)	sss(3)	None	63% improved,31% stable 6% worse FU-3-4yrs

Milhorat et al., 1992	1986-1991	6	20-48	6	PFD (3) RE-OP (1)	Syringocisternostomy (3)	None	PFD 66% improved 1 re-op SC 100% FU-1-4-5yrs
Isu et al., 1993		7	23-54	7	SC_C1C2 LM(5) SC+C1LM(2) Removal of outer Dural layer(7)	None	None	86% improved 16% unchanged
Raftopoulos 1993	1990-1991	8	18-66	8	SC+LM+arachnoid dissection+duraplasty (8)	None	None	100% improved FU-14-43 months
Old field et al., 1994		7	11-36	7	SC+C1C2LM+Dural graft (7)	None	None	71.4% improved 28.65 stabilized FU-6wks-20 months
Badie et al., 1995	1986-1993	20	21-84	16	SC+C1C2LM in selected cases DP+ tonsillar Resection(20)	SPS(2)	None	85% improved 15% unchanged FU 0.2-5yrs

Bindal et al., 1995	1986-1991	22	18-66	12	SC+C1C2LM+dural graft(10),pos.brain Stem decomp(12) Plugging of obex(7) Re-op odontoidectomy+ Pos fusion(1)	SSS(7) SPS(1)	Medical complication(1)	Dramatically improved not specified. FU 2-6yrs
Hida et al., 1995	1982-1993	70	3-59	70	PFD+LM(33),DP(21) removal of outer dural layer(12), Reop (3)	SSS(37) Reop(7)	Meningitis(2) Kyphosis(1)	PFD 82% improved 18% unchanged SSS 97% improved 3% unchanged FU 0.6-12.5yrs
Park et al., 1997	1988-1996	68	<16	40	SC+LM+DP(68) tonsil resection(40) Plugging of obex(23)	4th VSS(32)	None	93% improved FU 6-70 months

Cinalli et al., 1998	1993-1996	4	<1	0	Occipital vault remodelling+SC Without dural opening (3)	VPS(1)	None	100% stable FU 1-18 months
Grabb etal., 1999		34	1.3-27	22	PFD+Occipito cervical fusion(4),SC+LM+DP(30) Odontoidectomy(2)	None	brainstem comp (1)	Not specified FU 18-24 months
Genitori et al., 2000 60	1994-1998	53	0.3-26	10	SC+LM+fibrous band removal(26),reop(2)	None	wound infection (2)	97.2% improved 2.8% unchanged FU Months
Munshi et al., 2000	1988-1998	32	4-62	19	SC+LM(34) Dural band excision(11) DP(23) Reop –DP(2)	None	CSF leak (2) aseptic meningitis (1) sub-galeal csf collection (4),wound infection(4)	81.2% improved 18.2% unchanged FU 1-6 months

Tubbs et al., 2003	23yrs	130	0.2-20	75	SC+LM (129) C2 LM (1) DP(129) Arachnoid dissection(10) Tonsil resection(22) Reop (9)	4^{th} VSS(26) SPS(1)	brain stem comp-1 odontoidectomy(1) Extra axial subdural collection (2)- external temporary drainage	83% improved 17% unchanged FU 3mos-15yrs
Our study	2010-2014	32		15	FMD+c1LM+DP (32) C2 LM (2) Arachnoid dissection(20)	None	CSF leak (1)- re-exploration+ dural rent repair done	93.3% IMPROVED 6.7% improving

COMPARITIVE STUDY :

With comparing Pillay et al., (who perfomed posterior fossa decompression+obex plugging+syringosubarachnoid shunt) 63% improved,31% stable ,in our study without obex plugging or syrinx shunting the results were 93.3% improved and 6.7% static.

With comparing Milhorat et al., who performed posterior fossa decompression +Syringocisternostomy of which 66% improved which again shows our study is valid with results 93.3% improved.

Regarding resection of tonsils Badie et al., study showed 85% improvement, Tubbs et al., 83% improvement, Park et al., 93% improvement (tonsillar resection+obex plugging) in contrast to our study which showed 93.3% improvement without tonsillar resection.

In comparing with other studies mentioned in the literature our study foramen magnum decompression with lax duraplasty seems to be valid surgical option for chiari malformation I patients with and without syringomyelia .

CONCLUSION

CONCLUSION

The low morbidity rate associated with the simplified approach contrasts with a significant incidence of postoperative complications reported in the literature in the case of “traditional” treatment.

From our study it is evident that foramen magnum decompression along with lax duraplasty can produce opening up of sub-arachnoid spaces which will restore csf circulation along the foramen magnum and remove the compression at the craniocervical junction along with reduction in the size of syrinx as shown by postoperative imaging .

From the statistical analysis of our study foramen magnum decompression with C-1 laminectomy + lax duraplasty in chiari malformation I with and without syringomyelia can achieve comparable results with those obtained with more invasive surgical methods. Also in our series the percentage of results is similar to that reported in the literature where more aggressive surgical procedures were used.

From our study it is evident that moderate or no change in postoperative neuroimages may be regarded as a good outcome when accompanied by clinical improvement or complete recovery

Although there are various conflicts regarding surgical options in the management of chiari malformation I with and without syringomyelia, from our study it is evident that foramen magnum decompression with duraplasty seems to be a valid surgical option.

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ANNEXURES

AIMS AND OBJECTIVES

1. Inspite of the progress in the understanding the causes and pathophysiology of Chiari malformation Type I (CM-I), the role of surgical treatment remains unresolved. Different surgical techniques have been evolved over years, but there is no general consensus on the most appropriate surgical tecnique for this condition. This study analyses various clinical features, radiological co-relations, surgical treatment and outcome in 32 patients with CM-I.

2. To evaluate prospectively the efficacy of foramen magnum decompression (FMD) with lax duraplasty in patients having type I Chiari malformation with and without syringomyelia.

3. To establish normal cerebrospinal fuid (CSF) circulation at the foramen magnum,

4. To relieve the compression exerted by the cerebellar tonsils on the brain stem.

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3.To establish normal cerebrospinal fuid (CSF) circulation at the foramen magnum,
4. To relieve the compression exerted by the cerebellar tonsils on the brain stem.

Although single effective therapeutic treatment in achieving actual cure of the disease is still under debate, foramen magnum decompression (FMD) has been widely recognized as an acceptable method in achieving these goals. Additional procedures such as dissection of arachnoid adhesions, plugging of the obex , shunting of the fourth ventricle and resection of tonsils depends on the surgeon's personal understanding of the pathophysiology of the disease.

5. To prospectively review the surgical outcome in improvement of clinical symptoms and resolution of syrinx in 32 patients treated for Chiari I malformation in our institution. All patients in this study underwent Foramen magnum decompression with lax duraplasty as basic procedure either alone or combined with additional manipulations.

6. To assess the pre operative and post operative pain score (WONG – BAKER pain score).

7. To assess the resolution of syinx in the post op MRI.

ABBREVIATIONS

CM – Chiari malformation

FMD – Foramen magnum decompression

LP – Lumbar puncture

SSS - Syringo sub-arachnoid shunt

VP - Ventriculo peritoneal

SC - Suboccipital craniectomy

LM - Laminectomy

PFD - Posterior fossa decompression

DP - Duraplasty

CSF - Cerebrospinal fluid

OP - Operative

ROM - Range of movement

EOP - External occipital protuberance

FU - Follow up

DOA - Date of admission

DOS - Date of surgery

DOD - Date of discharge

PROFORMA

PATIENT DETAILS:

Name :

Age :

Sex : Male/ Female

IP NO :

DOA :

DOS :

DOD :

Address :

Occupation :

Socioeconomic Status:

1.Upper

2. Middle

3.Lower

Place : 1. Urban

2.Rural

COMPLAINTS

Headache :

Onset:

Duration:

Progression: Static/Progressive

Area of distribution:

Referred Pain:

Neck pain:

Onset:

Duration:

Progression: Static/Progressive

Referred Pain:

Sensory disturbance :

Onset :

Duration :

Progression:

Type :

Dermatomal distribution:

Opthalmologic symptoms :

Blurred vision

Diplopia

Visual field defects

Otologic symptoms :

Tinnitus

Hearing loss

Vertigo

Symptoms related to cerebellar / brainstem /lower cranial nerve compromise :

Ataxia

Incordination

Dizziness

Dysphagia

Dysarthria

Hiccoughs

Glossal atrophy

Trigeminal / Glossopharyngeal neuralgia

Bladder, bowel disturbances :

Gait :

1.Steady

2.Unsteady

Family History : yes/no

Past History **:** DM / SHT / Asthma / TB / CAD

Personal history **:**

Risk factors **:**

General Examination :

Build : Height : Neck : Ratio :

Weight:

CVS :

RS : Single breath count :
Chest expansion :

Neurocutaneous markers :

Examination of Cental Nervous System:
Higher mental functions

Cranial nerves Right Left

I

II **V_A**

V_F

Fundus

III, IV & VI

V **Motor**
Sensory
Jaw jerk

VII

VIII

IX, X

XI

XII

Spinomotor system

Rt Lt

Upper limb

Bulk

Tone

Power S

E

W

Reflexes

BJ

TJ

SJ

Hand grip

Lower limb

Bulk

Tone

Power H

K

A

Reflexes

KJ

AJ

Plantar

Superficial reflexes :

Sensory system :

Cerebellar signs :

Gait :

Spine & Cranium :

Investigations

Hb	**:**				
TC	**:**				
DC	**: P**	**L**	**E**	**M**	
ESR	**:**				
Blood Sugar	**:**				
Blood Urea	**:**				
Serum creatinine	**:**				
Serum electrolytes	**:**				

X- ray cervical spine :

MRI cervical spine with brain and whole spine screening :

Date of surgery :

Procedure done :

Intra op findings :

Post op period :

Follow up :

Consent Form

I agree to participate in the study titled - "**A STUDY OF ANALYSIS OF VARIOUS CLINICAL FEATURES, RADIOLOGICAL CORRELATION, SURGICAL OPTIONS AND OUTCOME IN THE MANAGEMENT OF CHIARI MALFORMATION TYPE I** "

I confirm that I have been told about this study in my mother tongue and have had the opportunity to ask question.

I understand that my participation is voluntary and I may refuse to participate at any time without giving any reason and without affecting my benefits.

I agree not to restrict the use of any data or results that arise from the study.

I agree to undergo the necessary investigation which is part of the study.

Name of the participant:

Signature / thumb impression:

Investigator:

நோயாளிகளுக்கான ஆலோசனை

A STUDY OF ANALYSIS OF VARIOUS CLINICAL FEATURES, RADIOLOGICAL CORRELATION, SURGICAL OPTIONS AND OUTCOME IN THE MANAGEMENT OF CHIARI MALFORMATION TYPE I பற்றி நான் ஒரு ஆய்வு மேற்கொண்டு உள்ளேன்.

இந்த கண்காணிக்கப்பட்ட மருத்துவ ஆய்விற்கு தாங்களும் பதிவு செய்து தங்களது முழு ஒத்துழைப்பை நல்குமாறு தங்களை அன்புடன் கேட்டுகொள்கிறேன் .

நோயாளிகள் ஒப்புதல்

இந்த இருதய உட்புகுத்து பரிசோதனை மற்றும் மீளொலி பரிசோதனை பற்றி விளக்கப்பட்டது. அதனுடன் இதனால் ஏற்படகூடிய பக்க விளைவுகள் பற்றி மருத்துவரின் மூலம் தெரிந்துகொண்டேன்.

பரிசோதனை மற்றும் நடத்தப்படும் ஆய்வை பற்றி முழுமையாக மருத்துவர் விளக்கினார். நான் இந்த ஆய்வில் பங்கெடுக்க முழு மனதுடன் சம்மதம் தெரிவிகின்றேன் .

நோயாளியின் கையொப்பம்

ஒப்புதல் படிவம்

A STUDY OF ANALYSIS OF VARIOUS CLINICAL FEATURES, RADIOLOGICAL CORRELATION, SURGICAL OPTIONS AND OUTCOME IN THE MANAGEMENT OF CHIARI MALFORMATION TYPE I

நோயாளியின் ஒப்புதல் படிவம்

ஆராய்ச்சி நிலையம் : அரசு ஸ்டான்லி மருத்துவமனை, சென்னை 600001

பங்கு பெறுபவரின் பெயர் :

பங்கு பெறுபவரின் கையொப்பம் :

பங்கு பெறுபவர் இதனை ( ) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது . ☐

நான் இந்த ஆய்வில் தன்னிச்சையாகத்தான் பங்குபெருகிரேன் .எந்த காரணத்தினாலோ எந்த சட்டசிக்கல்களுக்கும் உட்படாமல் நான் இந்த ஆய்வில் இருந்து விலகிக்கொள்ளலாம் என்று அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற் கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்துகொள்கிறேன்.நான் ஆய்வில் இருந்து விலகிக்கிகொண்டாலும் இது பொருந்தும் என அறிந்தேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும் , பரிசோதனை முடிவுகளையும், மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக்கொள்ளவும் அதை பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்கு கொடுக்கப்பட அறிவுரைகளின் படி நடந்து கொள்வதுடன் இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்றும் உறுதி அளிகின்றேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ அல்லது எதிர்பாராத, வழக்திர்க்குமாறன நோய்க்குறி தென்பட்டாலோ உடனே அதை மருத்துவ அணிக்கு தெருவிப்பேன் என உறுதி அளிக்கிறேன்.

இந்த ஆய்வில் எனக்கு ரத்தம், சிறுநீர், எக்ஸ்ரே, ஸ்கேன், உட்பட அனைத்து பரிசோதனைகளையும் செய்து கொள்ள நான் முழு மனதுடன் சம்மதிக்கிறேன்.

பங்கேற்பவரின் கையொப்பம்..... .....இடம்.....தேதி .....

கட்டைவிரல் ரேகை.....

பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....

.....

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ஆய்வாளரின் கையொப்பம்..... ..இடம்.....
தேதி.....

ஆய்வாளரின் பெயர் .....

KEY TO MASTER CHART

AGE:

10-20 YEARS : 1

21- 30 YEARS : 2

31- 40 YEARS : 3

41- 50 YEARS : 4

51- 60 YEARS : 5

61- 70 YEARS : 6

SEX :

MALE / FEMALE

OCCUPATION :

UNEMPLOYED (OLDAGE,HOME MAKERS,STUDENTS) : 1

LABOURER (DAILY WAGES) : 2

FARMERS : 3

SELF EMPLOYED : 4

BOBY MASS INDEX :

1 : < 20

2 : 20.5 -23

3 : 23.5 -25

4 : 25.5 – 27

5 : 27.5 – 30

6 : > 30

NEUROLOGICAL DEFICIT :

X : NO NEUROLOGICAL DEFICIT

1 : C4

2 : C5

3 : C6

4 : C7

5 : C8

6 : T1

SPASTICITY : ASHWORTH SCALE

0 No increase in tone

1 Slight increase in muscle tone, manifested by a catch and release or minimal resistance at the end of the ROM when the affected part(s) is moved in flexion or extension

1+ Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM

2 More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved

3 Considerable increase in muscle tone, passive movement difficult

4 Affected part(s) rigid in flexion or extension

HEIGHT NECK RATIO : 1(<13)

2(>13)

MRI BRAIN WITH WHOLE SPINE SCREENING :

TONSILLAR DESCENT : 1(7mm)

2(8mm)

3 (9mm)

4 (10mm)

SYRINX : 0 (N0)

1(CERVICAL)

2(CERVICOTHORACIC)

HYDROCEPHALUS : 0 (NO)

1 (YES)

ASSOCIATED ANOMALIES : 0(NO)

1 (INTERHEMISPHERIC CYST)

2(CORPUS CALLOSAL AGENESIS)

NURICK'S GRADING :

Grade 0 : No evidence of spinal cord disease

Grade 1 : signs of spinal cord disease but no difficulty in walking

Grade 2 : slight difficulty in walking which does not prevent full-time employment

Grade 3 : difficulty in walking which prevented full time employment

Or the ability to do all housework, but which was not so severe as to

Require someone else's help to walk

Grade 4: able to walk only with someone else's help or with the aid of a frame

Grade 5: chair bound or bedridden .

SURGICAL PROCEDURE :

1 : FORAMEN MAGNUM DECOMPRESSION + LAX DURAPLASTY

2 : C1 ARCH REMOVAL

3 : C2 LAMINECTOMY

4 : DURAL BAND REMOVAL

5 : ARACHNOID DISSECTION

POST OP MRI :

TONSILLAR DESCENT : T0 (STATIC)

T1 (DECREASED)

SYRINX : S0 (STATIC)

S1 (RESOLVING)

S2 (RESOLVED)

MASTER CHART

S no	Name	Age group	Sex	Occupation	Marital status	IP NO	Risk factors	Bmi	Scoliosis	Height/neck ratio	DOA	DOS	DOD	SE Status	Place	occipito cervical pain	tightness of limbs
1	Chinnathambi	3	Male	2	married	24156	0	2	0	2	16.7.2010	21.7.2010	1.8.2010	Lower	Rural	YES	YES
2	Sheela	3	Female	4	married	54721	0	1	0	1	24.4.2011	29.4.2011	10.5.2011	Lower	Urban	YES	YES
3	Naseera	1	Female	1	unmarried	72066	0	5	0	1	14.6.2011	20.6.2011	02.7.2011	Lower	Rural	YES	NO
4	Shankar	4	Male	3	married	17567	0	2	0	2	16.6.2011	24.6.2011	05.7.2011	Upper	Rural	YES	YES
5	Vinoth kumar	1	Male	2	unmarried	21682	0	1	0	2	28.6.2011	1.7.2011	11.7.2011	Lower	Urban	YES	YES
6	Vinothini	2	Female	4	unmarried	25137	0	4	0	1	21.7.2011	29.7.2011	9.8.2011	Upper	Rural	YES	YES
7	Devendran	3	Male	2	married	30684	0	4	1	1	1.9.2011	9.9.2011	20.9.2011	Lower	Urban	YES	YES
8	Sivabagiyam	4	Female	2	married	32239	0	2	0	2	8.9.2011	16.9.2011	27.9.2011	Middle	Urban	NO	YES
9	Mageshwaran	1	Male	1	unmarried	31094	0	1	0	2	10.9.2011	17.9.2011	29.9.2011	Middle	Rural	YES	NO
10	Ajith	1	Male	1	unmarried	74423	0	2	0	1	22.9.2011	30.9.2011	11.9.2011	Lower	Urban	YES	NO
11	ponnusamy	4	Male	4	married	81172	0	3	0	2	06.9.2011	12.10.2011	24.9.2011	Lower	Rural	NO	YES
12	Santhana raj	2	Male	2	married	43359	0	2	0	1	10.12.2011	14.12.2011	26.12.2011	Lower	Rural	YES	YES
13	Shanthi	2	Female	4	unmarried	17209	0	4	0	1	17.4.2012	20.4.2012	1.5.2012	Middle	Rural	YES	NO
14	Anushree	3	Female	2	married	17076	0	1	0	2	19.4.2012	23.4.2012	3.5.2012	Middle	Urban	YES	YES
15	Ashok	1	Male	1	unmarried	17820	0	1	0	2	26.4.2012	30.4.2012	21.5.2012	Lower	Rural	YES	YES
16	Brathiksha	2	Female	4	unmarried	21522	0	2	0	2	28.4.2012	03.5.2012	14.5.2012	Lower	Rural	YES	YES
17	Srinivasan	2	Male	2	married	21247	0	1	0	1	19.5.2012	25.5.2012	5.6.2012	Middle	Urban	YES	YES
18	Jeevanandham	3	Male	2	married	22833	0	3	0	1	31.5.2012	2.6.2012	14.6.2012	Lower	Rural	NO	YES
19	Senthil	2	Male	2	married	80961	0	3	0	2	30.6.2012	7.7.2012	17.7.2012	Lower	Rural	YES	YES

20	Kumaran	3	Male	2	unmarried	89964	0	2	0	2	14.7.2012	18.7.2012	30.7.2012	Middle	Rural	YES	YES
21	Radhakrishnan	4	Male	3	married	31204	0	4	0	1	19.7.2012	21.7.2012	2.8.2012	Lower	Rural	YES	YES
22	Mahalakshmi	2	Female	4	unmarried	28580	0	4	0	1	24.7.2012	28.7.2012	7.8.2012	Lower	Urban	YES	YES
23	Kavya	2	Female	4	unmarried	32167	0	3	0	1	26.7.2012	30.7.2012	9.8.2012	Lower	Urban	YES	YES
24	Jebamani	3	Male	2	married	33177	0	5	1	2	09.8.2012	13.8.20`12	27.8.2012	Middle	Rural	YES	YES
25	Surendar	1	Male	2	unmarried	44524	0	3	0	1	25.10.2012	31.10.2012	10.11.2012	Lower	Urban	YES	YES
26	Thangammal	4	Female	1	married	43438	0	2	0	2	30.10.2012	3.11.2012	13.10.2012	Middle	Rural	YES	YES
27	Revathi	2	Female	4	married	51951	0	1	0	1	17.11.2012	23.11.2012	3.12.2012	Lower	Urban	YES	YES
28	Marriappan	3	Male	2	married	85041	0	2	0	2	10.12.2012	14.12.2012	24.12.2012	Middle	Rural	YES	YES
29	Subramani	2	Male	2	unmarried	90023	0	3	0	1	18.12.2012	21.12.2012	31.12.2012	Lower	Rural	YES	YES
30	Sumathi	2	Female	4	unmarried	1118	0	2	0	1	17.1.2013	21.1.2013	1.2.2013	Lower	Urban	YES	YES
31	Nathiya	2	Female	4	married	5026	0	1	0	2	21.2.2013	25.2.2013	7.3.2013	Lower	Urban	YES	YES
32	Ganthimathi	5	Female	1	married	16461	0	4	0	1	23.5.2013	27.5.2013	6.3.2013	Lower	Rural	YES	YES

Complaints						Duration	Preop pain			
upper/lower limb weakness	paresthesias	vertigo	bladder/bowel disturbances	small muscle wasting of hands	trigeminal neuralgia			SMALL MUSCLE WASTING OF HANDS	TONE	POWER
YES	YES	NO	NO	YES	NO	2 years	2	YES	INCREASED	DECREASED
YES	YES	NO	NO	YES	NO	6 years	2	YES	INCREASED	DECREASED
NO	NO	YES	NO	NO	NO	6months	3	NO	NORMAL	NORMAL
YES	NO	NO	NO	YES	NO	9months	2	YES	INCREASED	DECREASED
YES	YES	NO	NO	YES	NO	2 years	1	YES	INCREASED	DECREASED
YES	NO	NO	NO	NO	NO	12months	2	NO	INCREASED	DECREASED
YES	NO	YES	NO	YES	NO	3years	3	YES	INCREASED	DECREASED
YES	YES	NO	NO	YES	NO	2years	3	YES	INCREASED	DECREASED
NO	NO	YES	NO	NO	NO	6months	2	NO	NORMAL	NORMAL
NO	NO	YES	NO	NO	YES	6months	1	NO	NORMAL	NORMAL
YES	YES	NO	NO	YES	NO	3years	3	YES	INCREASED	DECREASED
YES	NO	NO	NO	NO	NO	12months	3	NO	INCREASED	DECREASED
YES	NO	YES	NO	NO	NO	3months	4	NO	NORMAL	DECREASED
YES	YES	NO	NO	NO	NO	2years	1	NO	INCREASED	DECREASED
YES	YES	NO	NO	YES	NO	10months	2	YES	INCREASED	DECREASED
YES	NO	YES	NO	YES	NO	2years	3	YES	INCREASED	DECREASED
YES	NO	NO	NO	NO	NO	6months	2	NO	INCREASED	DECREASED
YES	YES	NO	NO	NO	NO	12months	3	NO	INCREASED	DECREASED
YES	NO	YES	NO	YES	NO	3years	2	YES	INCREASED	DECREASED

YES	NO	NO	NO	NO	NO	10months	4	NO	INCREASED	DECREASED
YES	YES	NO	NO	NO	NO	12months	3	NO	INCREASED	DECREASED
YES	NO	NO	NO	NO	NO	7months	2	NO	INCREASED	DECREASED
NO	YES	NO	NO	NO	NO	6months	2	NO	INCREASED	NORMAL
YES	NO	NO	NO	YES	NO	6years	2	YES	INCREASED	DECREASED
YES	NO	YES	NO	YES	NO	3years	2	YES	INCREASED	DECREASED
YES	YES	NO	NO	NO	NO	5years	2	NO	INCREASED	DECREASED
NO	YES	NO	NO	NO	NO	7months	1	NO	INCREASED	NORMAL
YES	NO	NO	NO	YES	NO	2years	2	YES	INCREASED	DECREASED
YES	NO	NO	NO	YES	NO	3years	1	YES	INCREASED	DECREASED
YES	NO	YES	NO	YES	NO	4years	2	YES	INCREASED	DECREASED
YES	YES	NO	NO	NO	NO	12months	2	NO	INCREASED	DECREASED
YES	NO	NO	NO	NO	NO	3years	3	NO	INCREASED	DECREASED

Clinical Findir							Neurological deficit	Pre-op MRI	Surgical management	Nurick's pre op	Nurick's post op	Spasticity pre op	Spasticity post op	Post op pain	Post op MRI
REFLEXES	MYELOPATHY	DYSARTHRIA	NYSTAGMUS	CHARCOTS JOINT	SENSORY SYSTEM	GAIT									
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	STEADY	2,3	T2S2H0A0	1,2,4,5	2	1	2	0	0	T1S1
INCREASED	YES	NO	NO	YES	DISSOCIATED SENSORY LOSS	STEADY	1,2	T4S1H0A0	1,2,3,5	1	1	1	0	0	T1S2
NORMAL	NO	NO	NO	NO	DECREASED	UNSTEADY	2,3	T1S0H0A0	1,2,4	NA	NA	0	0	1	T1
INCREASED	YES	YES	YES	NO	DISSOCIATED SENSORY LOSS	UNSTEADY	1,2,3	T2S1H0A0	1,2,5	1	1	1	0	0	T1S2
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	STEADY	2,3	T3S2H0A0	1,2,5	2	1	2	0	0	T1S1
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	3,4,5	T1S0H0A0	1,2,4	2	1	2	0	0	T1
INCREASED	YES	YES	YES	NO	DISSOCIATED SENSORY LOSS	UNSTEADY	4,5,6	T2S1H0A0	1,2,5	2	1	2	0	1	T1S2
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	UNSTEADY	2,3	T2S1H0A2	1,2,5	2	1	2	0	0	T1S2
NORMAL	NO	NO	NO	NO	DECREASED	STEADY	2,3	T1S0H0A0	1,2,4	NA	NA	0	0	0	T1
NORMAL	NO	NO	NO	NO	DECREASED	STEADY	1,2	T1S0H0A0	1,2	NA	NA	0	0	0	T1
INCREASED	YES	NO	NO	NO	DISSOCIATED SEN SORYLOSS	STEADY	3,4	T2S1H0A0	1,2,5	2	1	2	0	0	T1S2
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	1,2	T1S0H0A2	1,2,5	2	1	2	0	0	T1
NORMAL	NO	NO	NO	NO	DECREASED	UNSTEADY	3,4	T1S0H0A0	1,2,4	NA	NA	0	0	1	T1
INCREASED	YES	YES	YES	NO	DECREASED	STEADY	2,3	T2S0H0A2	1,2	2	1	2	0	0	T1
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	STEADY	1,2	T3S2H0A0	1,2,5	2	1	2	0	0	T1S1
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	UNSTEADY	4,5	T2S1H0A0	1,2,5	3	1	3	1	1	T1S2
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	2,3	T1S0H0A0	1,2,4	2	1	2	1	0	T1
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	2,3	T1S0H0A0	1,2,5	2	1	2	0	0	T1
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	UNSTEADY	3,4	T2S1H0A0	1,2,5	3	1	3	1	0	T1S2

INCREASED	YES	NO	NO	NO	DECREASED	STEADY	1,2	T1S0H0A0	1,2,4	1	1	1	0	1	T1
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	1,2	T1S0H0A2	1,2,5	2	1	1	0	0	T1
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	1,2	T4S0H0A0	1,2,3	2	1	3	1	0	T1
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	2,3	T1S0H0A0	1,2,4	1	1	1	0	0	T1
INCREASED	YES	NO	NO	YES	DISSOCIATED SENSORY LOSS	UNSTEADY	2,3	T4S2H0A1	1,2,3,5	3	2	3	0	0	T1S1
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	STEADY	3,4	T1S1H0A0	1,2,5	2	1	1	0	0	T1S2
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	2,3	T1S0H0A0	1,2,4	2	1	2	0	0	T1
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	1,2	T1S0H0A0	1,2,4	2	1	1	0	0	T1
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	STEADY	2,3	T2S1H0A0	1,2,5	2	1	2	0	0	T1S1
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	STEADY	2,3	T2S1H0A1	1,2,5	1	1	1	0	0	T1S2
INCREASED	YES	NO	NO	NO	DISSOCIATED SENSORY LOSS	STEADY	3,4	T2S1H0A0	1,2,5	2	1	2	0	0	T1
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	1,2	T1S0H0A0	1,2,4	1	1	1	0	0	T1
INCREASED	YES	NO	NO	NO	DECREASED	STEADY	2,3	T1S0H0A0	1,2,5	2	1	2	0	1	T1