Original Research Article

Profile of patients of spinal dysraphism undergoing MRI

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Abstract

Background: Congenital malformations of the spine cord are collectively called as spinal dysraphism. These conditions are usually diagnosed at birth or in early infancy but some may be discovered in older children or adults. Spinal lesions are increasingly being diagnosed due to advent of newer imaging modality like MRI. MRI has resulted in better imaging resolution and thus resulting in an improved modality for evaluation of spinal disorders. **Aims and Objectives:** To study the profile of clinically suspected patients of spinal dysraphism and advised to undergo MRI. **Materials and Method:** 70 patients with clinically suspected spinal dysraphism were included in the study. All the patients were made to undergo MRI spine using 1.5 Tesla MRI (superconducting magnet, MAGNETOM SYMPHONY) manufactured by SIEMENS after taking informed consent for the same. The findings of MRI spine were assessed and analyzed. **Results:** The peak occurrence of congenital spinal lesions was seen in age group 0-20 yrs (70%) and more common in females than males. Subcutaneous mass was observed in 38.5% patients whereas curvature abnormality was seen in 42.8% patients. Among the patients of curvature abnormality, lumbar curvature was the most commonly involved. Spina-bifida was the commonest (45.7%) vertebral anomaly and it was followed by Block vertebra (24.2%) and Hemi vertebra (22.8%). **Conclusion:** Spinal dysraphism was common in younger female. Majority of the patients present with sub cutaneous mass and curvature abnormality with lumbar region involvement. On MRI Vertebral anomalies were the commonest spinal anomalies followed by spina bifida, tethered cord, scoliosis/kyphosis, syrinx and diastematomyelia.
Key Words: spinal dysraphism, MRI, Congenital spinal disorders.

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INTRODUCTION

Congenital malformations of the spine cord are collectively called as spinal dysraphism. These conditions are usually diagnosed at birth or in early infancy but some may be discovered in older children or adults. The basic embryologic stages during which spinal cord is formed are gastrulation (weeks 2–3), primary neurulation (weeks 3–4), and secondary neurulation (weeks 5–6)[1,2]. Spinal dysraphisms originate from abnormalities occurring during one of these periods. Spinal dysraphic abnormalities are described as open (not covered by skin or aperta) and closed (covered or occult) lesions and are divided into different groups depending on the presence of a back mass. The anomalies with back masses and uncovered protrusion of all or part of the intraspinal contents include myelocele, myelomeningocele and meningocele. They are called spina bifida aperta and are usually clinical obvious at birth. Spinal lesions are increasingly being diagnosed due to advent of newer imaging modality like MRI. MRI has resulted in better imaging resolution and thus resulting in an improved modality for evaluation of spinal disorders. The application of MRI for evaluation of spine disease, and particularly spinal dysraphism, in children has received encouraging, though limited, attention in the imaging literature[3,4]. High-resolution sonography has proved useful for screening, but it is presently restricted

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to infants or older patients with spinal defects that provide a bony window[5,6]. Subtraction digital myelography has been used successfully for metrizamide examination, but its application has been limited to the lower neuraxis of infants and young children because of contrast medium dilution and motion difficulties[7]. Until now, metrizamide myelography and CT have been the most reliable combination of techniques for definitive presurgical evaluation. These procedures are currently superior to all other techniques, including MRI, for the demonstration of the cauda equina and filum terminale; the location of placode, fat, and nerve roots; and the indication of the presence of osseous, cartilaginous, or fibrous bands dividing the dura in diastematomyelia. MRI, which is noninvasive and has superb contrast resolution, may be an excellent screening technique for lumbosacral dysraphism, as suggested by the findings in various studies. With further application, experience, and technological development, MRI may become a cost-effective method for complete pretherapy evaluation and follow up.

MATERIALS AND METHOD

The present observational study was conducted in KLES imaging centre, Belgaum, over a period of one year. The following inclusion and exclusion criteria were used select the study subjects.

Inclusion Criteria

- All clinically suspected cases who are advised MRI.

Exclusion Criteria

- All post operative cases.
- Claustrophobic patients.
- Patients on pace maker and metallic implants.

By using the above mentioned inclusion and exclusion criteria, total 70 cases were registered during the study duration. After obtaining the informed consent from the patients, information was collected on a prestructed proforma. Complete clinical examination was done in all the patients. After this all the patients were subjected to the MRI spine. All examinations (MRI spine) were performed using 1.5 Tesla superconducting magnet, MAGNETOME SYMPHONY, Siemens, software version SYNGO 2002 of Germany, using a Phased array spine coils. The MRI spine findings were recorded on the proforma and were confirmed by senior faculties also to reduce the error in the diagnosis. Data analysis will be done using rates, ratios and percentages of different diagnosis and outcomes made by MRI spine, which will be computed and compiled.

RESULTS

Table 1: Sex and age wise distribution in patients.

Variable		No. of cases	Percentage
Sex	Males	34	48.57
	Female	36	51.43
Age	0-10	33	47.14
	11-20	16	22.86
	21-30	3	4.29
	31-40	5	7.14
	41-50	4	5.71
	> 50	9	12.86

The peak occurrence of congenital spinal lesions was seen in age group 0-20 yrs (70%) and more common in females than males. And the ratio of male to female was 1:1.05.

Table 2: Distribution of patients based on clinical presentation

Clinical presentation		No. of cases	Percentage
Subcutaneous mass (n=70)	Present	27	38.57
	Absent	43	61.43
Curvature abnormality (n=70)	Present	30	42.86
	Absent	40	57.14
Level of Curvature abnormality (n=30)	Cervical	2	6.67
	Thoracic	6	20.00
	Lumbar	16	53.33
	Sacral	6	20.00
Age-wise distribution of spinal curvature abnormalities	Infantile(<3yrs)	5	16.66
	Juvenile(3-10yrs)	8	26.67
	Adolescent (>10yrs)	17	56.67

Subcutaneous mass was observed in 38.57% patients whereas curvature abnormality was seen in 42.86% patients. Among the patients of curvature abnormality, lumbar curvature was the most commonly involved. Cervical region is rarely involved. The peak occurrence of spinal curvature abnormalities was seen in adolescents (56.67%).

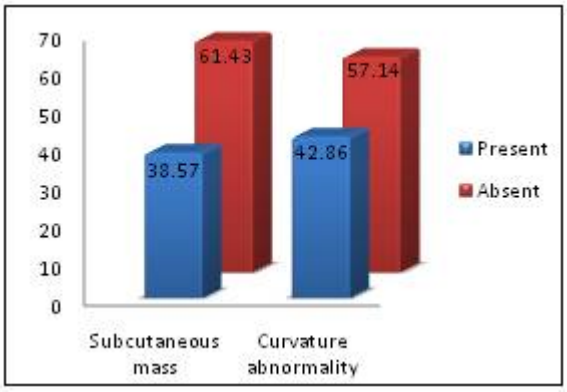

Figure 1: Distribution of patients based on clinical presentation

Table 3: Distribution of vertebral anomalies in patients

Vertebral anomalies	No. of cases (n=70)*	%
Spina bifida	32	45.71
Block vertebra	17	24.29
Hemi vertebra	16	22.86
Butterfly vertebra	13	18.57
Posterior element dysraphism	8	11.43
Sacral agenesis	0	0.00

*Multiple responses were obtained.

It was observed that Spina-bifida was the commonest (45.71%) vertebral anomaly diagnosed in the present study and it was followed by Block vertebra (24.29%) and Hemi vertebra (22.86%).

Table 4: Distribution of patients according to spinal anomalies

Spinal anomalies	No. of Cases (n=70)*	Percentage
Diastematomyelia	16	22.86
Spina bifida	32	45.71
Tethered cord	30	42.86
Syrinx	28	40.00
Scoliosis/kyphosis	30	42.86
Lipoma	6	8.57
MC	2	2.86
MMC	6	8.57
LMMC	6	8.57
FLp	4	5.71
Dermoid	1	1.43
Teratoma	1	1.43
DDS	4	5.71
NEC	1	1.43
Thick filum terminale	9	12.86
Arnold chiari malformation	8	11.43
Vertebral anomalies	54	77.14

*Multiple responses were obtained.

In the present study, vertebral anomalies are the commonest observation seen in 54 cases (77.14%), followed by Spina bifida (45.71%), Tethered cord (42.86%), Scoliosis/ kyphosis (42.86%), Syrinx (40%) and Diastematomyelia (22.86%).

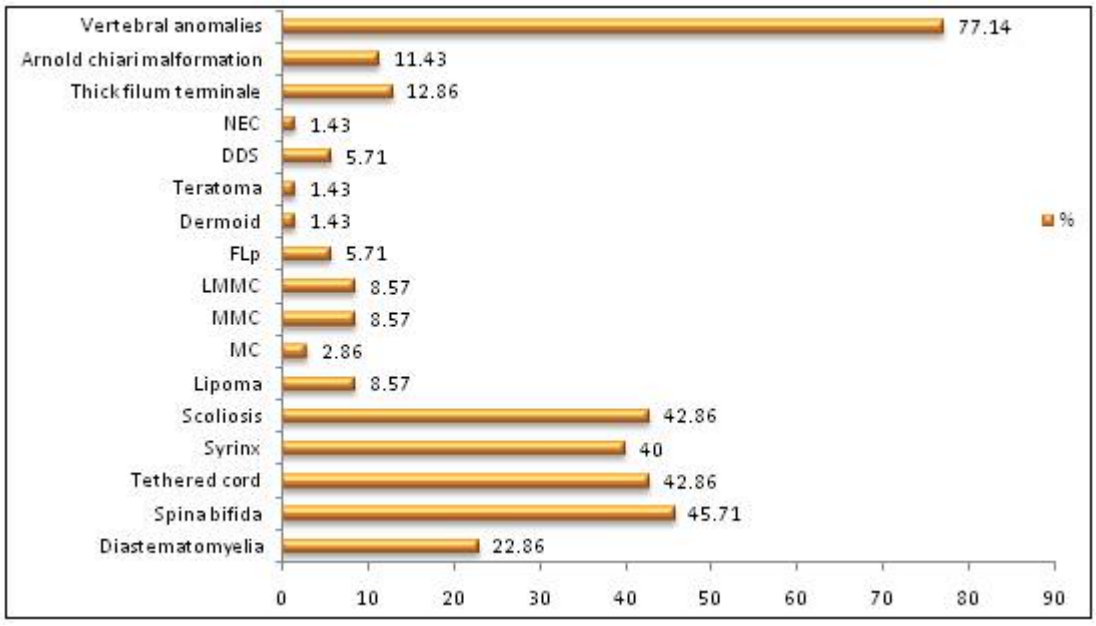

Figure 2: Distribution of patients according to spinal anomalies diagnosed by MRI

DISCUSSION

Congenital malformations of the spine cord are collectively called as spinal dysraphism. These conditions are usually diagnosed at birth or in early infancy but some may be discovered in older children or adults. The present study was conducted to study the various spinal dysraphism reported in the study institutes. In present study female predominance was noted. According to various authors spinal dysraphism is believed to be more common in females as compared to males. The sex difference seems to be consistent in most studies. The study done by De Wals P *et al*[8] has shown that, about 55-70% of neural tube defects occurred in females. This female predominance was seen in both still and live births. Another study was conducted by Kemal Sarica *et al*[9], where a total of 47 children were enrolled out of which 27 were girls and 20 were boys and male: female ratio was 1.3. It was also observed that spinal dysraphism was more common in younger age group with the peak occurrence in the age group of 0-20 years (70%). The study by Kemal Sarica *et al*[9] have shown that, the age range of the children with spinal dysraphism was 2 months to 16 years (mean 6.9 years). During a special roentgenographic survey of the skeletal system in Japanese children by Wataru W *et al*[10] also showed the age distribution as 6 to 7 year. The overlying skin in spinal dysraphism contains various cutaneous lesions such as hairy nevus, dimples, capillary hemangioma, tails, and subcutaneous masses. Among these subcutaneous mass is observed most commonly. In present study spinal dysraphism with subcutaneous mass accounted for 38.57%. Similar observations were also reported by Gibson PJ *et al*,[11] Guggisberg *et al*,[12] Tortori-Donati P *et al*.[13] Lumbar region (53.33%) was the commonest location observed to be involved. Cervical region was rarely involved accounting for 6.67%. Assaad A *et al*[14] also observed that almost all of the spinal dysraphism with subcutaneous mass occured in the lumbosacral region in their study. It was seen that 42.86% of the spinal dysraphism had spinal curvature abnormality. Prahinski, John R *et al*[15] and McMaster *et al*[16] also observed similar findings. The Scoliosis Research Society adopted a scoliosis classification that is based on the age of onset: infantile scoliosis, 0 to 3; juvenile scoliosis, 3 to 10; and adolescent scoliosis, older than 10 years of age. By far the most common variety is adolescent scoliosis[17]. In the present study, the peak occurrence of the spinal curvature abnormalities was in adolescent type with 56.67%, followed by 26.67% in juvenile type and 16.66% in infantile type. In the present study, of all the vertebral anomalies in patients with congenital spinal lesions, spina bifida is the commonest (45.71%), followed by block vertebra (24.29%), hemivertebra (22.86%), butterfly vertebra (18.57%) and posterior element dysraphism (11.43%). The present study showed that the vertebral anomalies were the commonest spinal anomalies in patients with congenital spinal lesions with 77.14%, followed by spina bifida (45.71%), tethered cord (42.86%), scoliosis/kyphosis (42.86%), syrinx (40%) and diastematomyelia (22.86%).

CONCLUSION

Thus in the end we conclude that Spinal dysraphism was common in younger female. Majority of the patients present with sub coetaneous mass and curvature abnormality with lumbar region involvement. On MRI Vertebral anomalies were the commonest spinal anomalies followed by spina bifida, tethered cord, scoliosis/kyphosis, syrinx and diastematomyelia.

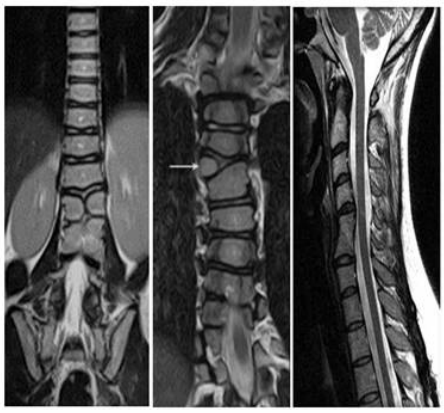

Figure 1: Vertebral anomalies

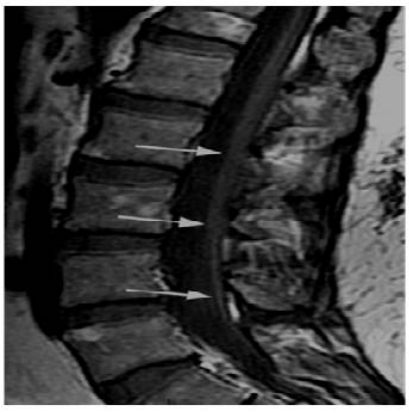

Figure 2: Tight filum terminale

Coronal T2 weighted images showing butterfly vertebra and hemi vertebra and sagittal T2 weighted image shows block vertebra. Sagittal T1 weighted image demonstrate the termination of the cord to be abnormal. The filum (arrows) is thick at L5. It is not infiltrated with fat.

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