International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Research Article

EVALUATION OF PREVALENCE OF SPINAL ANOMALIES IN CASES OF ANORECTAL MALFORMATION BY SPINAL ULTRASOUND AND MRI

Dr. Malay Karmakar[1], Dr. Sayantan Roy[2], Dr. Md Moslemuddin[3]

[1] Associate Professor, Dept of Radiodiagnosis, Nil Ratan Sircar Medical College and Hospital, Kolkata.
[2] Senior Resident, Dept of Radiodiagnosis, Nil Ratan Sircar Medical College and Hospital, Kolkata.
[3] 3rd Year Junior Resident, Dept of Radiodiagnosis, Nil Ratan Sircar Medical College and Hospital, Kolkata.

OPEN ACCESS

Corresponding Author:

Dr. Md Moslemuddin

3rd Year Junior Resident, Dept of Radiodiagnosis, Nil Ratan Sircar Medical College and Hospital, Kolkata.

Received: 23-09-2025
Accepted: 02-10-2025
Available online: 13-10-2025

ABSTRACT

Objective: To find the prevalence of spinal anomalies in cases of anorectal malformations.
Methods: This study was performed on 202 Infants, aged 1 day to 18 months for anorectal malformation, referred for USG of the spine and desired to take part in the study, therefore taken into the study. Those children, who have found to have spinal anomalies on USG, or who have high degree of clinical suspicion as having spinal abnormalities (for example having cutaneous markers indicative of spinal dysraphism) but with a normal study on Spinal USG, has been evaluated using MRI Spine.
Results: Among 202 patients 116 were male and 86 were female. Among male 18 (15.52%) and among feamle 15 (17.44%) patients had spinal anomalies.
Conclusion: Every infant with anorectal malfomations should undergo radiological evaluations of spine irrespective of signs to do early interventions if needed.

Keywords: *Perianal fistula, MR fistulogram, Fistula-in-ano, Surgical correlation, Abscess detection.*

INTRODUCTION

Anorectal malformations (ARMs) are a complex group of malformations diagnosed at the time of birth, because of either the absence or the ectopic location of the anus (1). The incidence is approximately 1:5000 live births and they are seen more often in boys than in girls (2). The broad spectrum of ARM includes anal atresia, anal stenosis, ectopic anus, congenital anal fistula and persistence of the cloaca (3). Anal atresia is the most frequent of congenital anal anomalies. ARMs can be subdivided into high, intermediate, and low atresia according to the level of termination of the rectum or anal canal in relation to the levator ani muscle. (4) ARMs are involved with several other congenital anomalies, involving most commonly the genitourinary system and vertebral column (5). The vertebral anomalies have been associated with occult lesions of the spinal cord (for example, occult myelodysplasia) and cord tethering (6,7)

MATERIALS AND METHODS

This study was performed in Department of Radiology, Nil Ratan Sircar Medical College and Hospital on Infants, aged 1 day to 18 months for anorectal malformation, referred for USG of the spine and desired to take part in the study, therefore taken into the study. Those children, who have found to have spinal anomalies on USG, or who have high degree of clinical suspicion as having spinal abnormalities (for example having cutaneous markers indicative of spinal dysraphism) but with a normal study on Spinal USG, has been evaluated using MRI Spine.

In case of spinal ultrasound, the infant has been scanned with Ultrasonography machine: BPL Alpinion E-CUBE 8 and GE LOGIQ P9 with L3-12H linear probe and C1-6T curvilinear probe (for larger anomalies) in a prone and lateral decubitus position, for visualisation of fine details of anatomy. We have scanned the entire back in both longitudinal and transverse planes.

In case of MRI spine, the protocol included whole spine sagittal T2- weighted images; lumber spine axial and sagittal Tl-weighted and T2- weighted images, axial and sagittal gadolinium enhanced Tl-weighted images, if necessary through SIGNA Hde 1.5Tesla MRI Machine.

RESULTS

Total 202 patients were included in the study after their guardians' consent and approval of ethics committee.

Out of them 116 (57.43%) male patients, among them 18 had associated spinal anomalies (15.52%) and out of the 86(42.57%) female patients, 15 had associated anomalies (17.44%). Amongst the cases having spinal anomalies, male: female ratio was 1.2:1.

Amongst the age wise distribution of the study population, highest percentage of patients were in the age group 0 day – 6 months, that were 97 in number (48.02 %) followed by the age group of 6 months – 12 months which were 77 in number (38.12%).

The calculated overall prevalence of spinal anomalies in cases of anorectal malformation, as determined in our study came out to be 16.34%.

Amongst the cases with spinal anomalies, 20 (60.6%) were in the age group 0 day – 6 months, whereas 11(33.33%) were in the age group 6 months- 12 months and 2 (6.06%) were in the age group 12 months – 18 months.

Out of the cases with detected spinal anomalies, in the age range of 0 days – 6 months, 11 were male (55%) and 9 were female (45%). In the age range of 6 months – 12 months, 5 were male (45.45%) and 6 were female (54.55%). In the age range of 12 months – 18 months, all were male.

According to Wingspread classification, majority spinal anomalies detected in our study belonged to High ARM class, which were 16 (48.48%) , followed by equal number of cases in low and intermediate ARM classes, which numbered 8 each (24.24% each). Only 1 case belonged in the others category.

Amongst the High ARM cases, 10 were male (62.5%) and 6 were female (37.5%). In the cases with spinal anomalies belonging to the low ARM group, equal distribution was seen amongst males and females, with 4 cases each. Similar distribution was noted in case of cases in Intermediate ARM group.

26 cases (78.78%) were found to have only spinal cord anomalies. 6 patients (18.18%) were found to have both spinal cord and vertebral anomalies. Only 1 case was found to have isolated vertebral anomaly.

Amongst the cases with only spinal cord anomalies, 12 were male (46.15%) and 14 were female (53.85%). In cases having both spinal cord and vertebral anomalies, 5 were male (83.33%) and 1 was female (16.67%). The case having only vertebral anomaly is male.

Various types of spinal cord anomalies were detected in this study. Amongst them, the most common spinal cord anomaly detected was the tethered cord, which accounted for 16 cases (50%). The next most common pathological entity detected was the thick filum terminale, which was 5 in number (15.62%). This was followed by Myelomeningocele and Syringomyelia, each of which were 4 in number (12.5%). Less commonly detected spinal cord anomalies include Lipoma of filum terminale (3 in number –9.38%) , filum terminale cyst (2 in number – 6.25%), truncated spinal cord (1 in number) and lipomyelomeningocele (1 in number).

Similarly, amongst the vertebral anomalies detected in our study, the highest number were seen with spina bifida, which were 5 in number (71.43%). Others included a case detected with partial sacral agenesis and another with lumber hemivertebra, each being 1 in number.

In cases with positive findings, majority (60.61%) had no associated clinical finding.

Amongst those with associated clinical findings, 6 had a skin dimple (30%), 5 had a cutaneous lump (25%), and one each had a shallow intergluteal cleft and a tuft of hair.

However, there were two cases with associated clinical findings, which showed no spinal anomalies in Spinal ultrasound or MRI spine. These were both skin dimples. So, majority of cases with positive clinical findings (86.67%) were found to have spinal anomalies.

Spinal ultrasound could detect majority of the spinal anomalies (87.87%), which were corroborated with MRI. However, 4 cases could not be detected on spinal ultrasound, but could be detected with MRI spine, due to overlying clinical findings that were associated with these cases. Out of these, 3 (75%) were cases of tethered cord and one was a case with syringomyelia. In those cases which could not be detected on spinal ultrasound, two of them were in the age range of 6 months – 12 months and 2 were in the age range of 12 months – 18 months.

Cases detected with spinal ultrasound, were found to corroborate well with MRI spine findings (96.67%), except a single instance, where a case of thick filum terminale, as detected on spinal ultrasound turned out to be a false positive, when subsequently imaged on MRI spine.

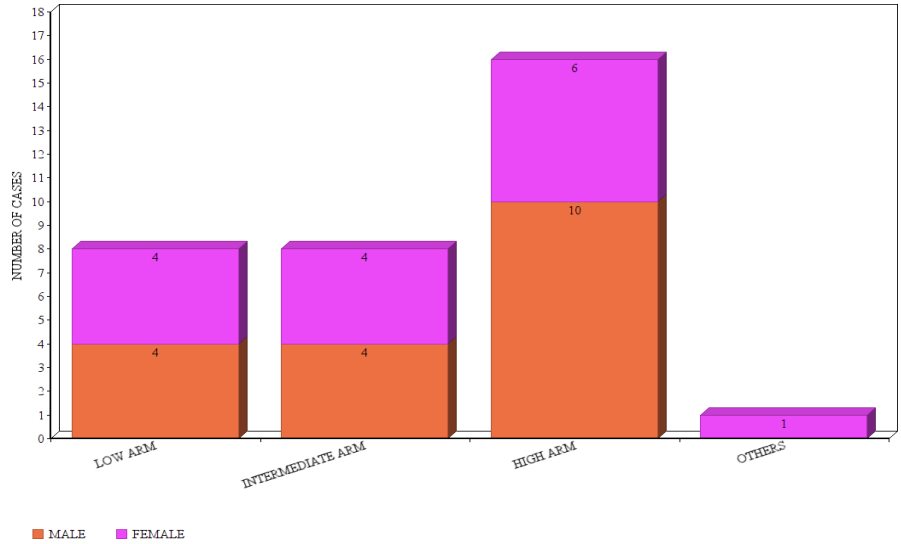

FIGURE: BAR CHART SHOWING DISTRIBUTION OF CASES WITH SPINAL ANOMALIES ACCORDING TO WINGSPREAD CLASSIFICATION.

TABLE: DISTRIBUTION OF VARIOUS TYPES OF SPINAL CORD ANOMALIES

TETHERED CORD	16
FILUM TERMINALE CYST	02
LIPOMA OF FILUM TERMINALE	03
TRUNCATED SPINAL CORD	01
THICK FILUM TERMINALE	05
SYRINGOMYELIA	04
LIPOMYELOMENINGOCELE	01
MYELOMENINGOCELE	04

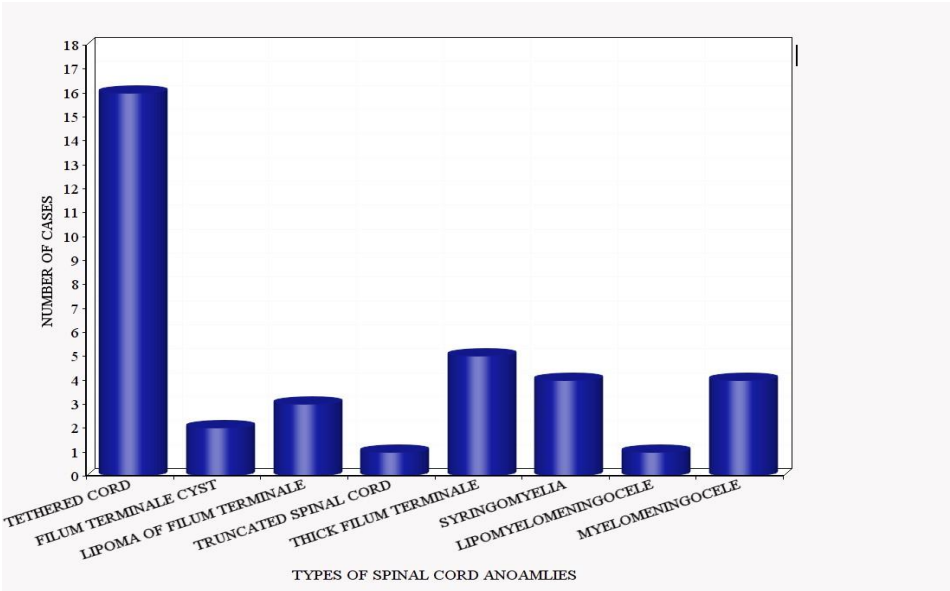

FIGURE: BAR CHART SHOWING DISTRIBUTION OF VARIOUS TYPES OF SPINAL CORD ANOMALIES

DISCUSSION

Imperforate anus is a complex maldevelopment of the anorectal region. This anorectal malformation (ARM) anomaly includes failure of the terminal hindgut to develop and the incomplete division of the cloaca by the urorectal septum that separates the ventral urogenital sinus from the dorsal anorectal canal. Additional congenital anomalies are often present in patients with ARM, coexisting anomalies that account for the high morbidity and mortality associated with this condition.
A total of 202 patients of ARM were studied who were fully investigated for the presence of spinal anomalies. The male: female ratio in this study was 116:86 i.e. 1.2:1 which shows better proportion of males and females in comparison to other large studies (75).

In this study, the associated spinal anomalies were distributed slightly higher in males (54.55%) than in females

(45.45%). This is in contrast with other studies done in our country where associated anomalies were 4 times more common in males as in females (76).

There is wide variation in the type of ARM and the range of associated anomalies (77). The incidence of associated vertebral and spinal anomalies reported in ARM subjects, varies from 16.67% to 38.3% in different series (78). The incidence of vertebral and spinal anomalies in our study was 16.34% which is similar to the data reported above.

Spinal ultrasound could detect majority of the spinal anomalies (87.87%), which were corroborated with MRI. However, 4 cases could not be detected on spinal ultrasound, but could be detected with MRI spine, due to overlying clinical findings that were associated with these cases. Ultrasonography is safe, noninvasive, inexpensive, does not require sedation, and can be performed portably (79). Furthermore, the correlation between spinal USG and MRI has been excellent, as seen in our study and spinal US is currently accepted as an initial screening tool for detecting spinal anomalies in patients with ARM (80-82). Also, the 4 cases of spinal anomaly which could not be detected using spinal ultrasound in our study, were all above the age of 6 months. It is widely accepted that Spinal ultrasound is best before the age of 6 months, after which the posterior element of the vertebral column ossify and hinders accurate detection of underlying spinal cord defects. This might explain the spinal anomalies that were missed on ultrasound. Therefore, it is seen that USG can be used as an ideal screening tool for evaluating the spine in patients with ARM. Although it is widely held that MRI is the gold standard for evaluation of spine and spinal cord. (83).

Heij et al. have demonstrated that the incidence of tethered cord is higher in patients with high lesions (50%) than in patients with low lesions (30%). However, Golonka et al. report that the incidence of tethered cord in children with low lesions is no lower than that in those with high lesions. (84) Vertebral anomalies have been reported to be twice as common in patients with high lesions than in those patients with low lesions. (85)

Although we could not perform MRI spine for all patients, but majority spinal anomalies detected in our study belonged to High ARM class, which were 16 (48.48%), followed by equal number of cases in low and intermediate ARM classes, which numbered 8 each (24.24% each). This is in concordance with previous studies which show higher prevalence of spinal anomalies in HIGH ARMs compared to other classes.

Shenoy et al. found that the most common spino-vertebral anomaly seen in their study was sacral agenesis (50%), spina bifida (29.16%) lumbosacral myelomeningocele (12.5%). The most common spinal cord anomaly seen in the present study was was the tethered cord, which accounted for 16 cases (50%). The next most common pathological entity of the spinal cord detected was the thick filum terminale, which was 5 in number (15.62%). Amongst the vertebral anomalies detected in our study, the highest number were seen with spina bifida, which were 5 in number (71.43%).

Majority of spinal anomalies detected in our study did not have any associated clinical findings, which also suggest the need for imaging in all cases of ARM, in order to rule out abnormalities. Anomalies detected on spinal ultrasound, especially under the age of 6 months, showed excellent correlation with finding on MRI, except a single instance, where a case of thick filum terminale, as detected on spinal ultrasound turned out to be a false positive, when subsequently imaged on MRI spine.

CONCLUSION

The purpose of this study was to evaluate the prevalence of spinal anomalies in cases of anorectal malformation, using spinal ultrasound and MRI.

Reviewing several literature and after completion of our study, we concluded that:

- The overall prevalence of spinal anomalies in cases of anorectal malformation as determined from our study was 16.34%. This is in concordance with previous studies conducted in our country.
- Majority spinal anomalies detected in our study belonged to High ARM class, according to Wingspread classification.
- The most common spinal anomaly detected in our study is tethered cord.
- Spinal ultrasound could detect majority of the spinal anomalies. The anomalies which could not be detected with ultrasound, but could be subsequently detected with MRI Spine, had presented at an age more than 6 months. These, however had associated overlying clinical findings. Thus, spinal ultrasound, in conjunction with clinical findings, can be used as a screening tool for detecting spinal anomalies in patients with ARM, with good correlation to MRI findings.
- Majority of spinal anomalies detected in our study did not have any associated clinical findings, which also suggest the need for imaging in all cases of ARM, in order to rule out spinal abnormalities.

REFERENCES

1. Levitt MA, Peña A. Anorectal malformations. *Orphanet Journal of Rare Diseases*. 2007;2:33.
2. Stephens FD, Smith ED. *Anorectal Malformations in Children: Update 1988*. Birth Defects Original Article Series. 1988.
3. Peña A. Anorectal malformations. *Semin Pediatr Surg*. 1995;4(1):35-47.

4. International Committee on ARM Classification. The Wingspread classification of anorectal malformations. *Pediatr Surg Int*. 1984.
5. Holschneider A, Hutson J, Peña A, et al. Preliminary report on the International Conference for the Development of Standards for the Treatment of Anorectal Malformations. *J Pediatr Surg*. 2005;40(10):1521-1526.
6. Rickham PP. The syndrome of anorectal anomalies and spinal defects. *Prog Pediatr Surg*. 1971;3:122-133.
7. Muensterer OJ, Evans K, Georgeson KE. Spinal cord anomalies in children with anorectal malformations. *J Pediatr Surg*. 2004;39(3):349-352.
8. Heij HA, Nievelstein RAJ, de Jong TPVM. Magnetic resonance imaging of children with anorectal malformations. *Pediatr Surg Int*. 1996;11:401–405.
9. Golonka NR, Arnold MA, Levitt MA. The tethered spinal cord in patients with anorectal malformations. *J Pediatr Surg*. 1995;30(3):450–454.
10. Shenoy MU, Godbole PP, Crabbe DCG. Spinal dysraphism in anorectal malformation. *J Pediatr Surg*. 2003;38(10):1451–1453.
11. Lowe LH, Johanek AJ, Moore CW. Sonography of the neonatal spine: Part 1, normal anatomy, imaging pitfalls, and variations that may simulate disorders. *AJR Am J Roentgenol*. 2007;188(3):733–738.
12. Lowe LH, Johanek AJ, Moore CW. Sonography of the neonatal spine: Part 2, spinal disorders. *AJR Am J Roentgenol*. 2007;188(3):739–744.
13. Cama A, Capra V, Piatelli GL, et al. Spinal and spinal cord malformations in anorectal malformations. *Childs Nerv Syst*. 1999;15(10):552–562.
14. Liptak GS, Revell GM. Assessment of tethered cord syndrome in children with anorectal malformations. *Dev Med Child Neurol*. 1992;34(5):404–411.
15. Baker RJ, Liu T, Mooney DP. Utility of MRI for evaluation of the tethered spinal cord in anorectal malformations. *J Pediatr Surg*. 2002;37(7):1088–1092.