Section: Radio-Diagnosis

Original Research Article

A STUDY ON COMPARISON OF ACCURACY OF TRANSPERINEAL ULTRASOUND VERSUS MRI PERINEAL REGION IN PATIENTS WITH ANAL SPHINCTER DYSFUNCTION PRESENTING TO TERTIARY CARE CENTRE

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ABSTRACT

Background: The anal sphincter complex, comprising the internal and external anal sphincters, plays a vital role in maintaining fecal continence, with dysfunction leading to conditions like fecal incontinence and chronic anal pain. Diagnosis and treatment of these dysfunctions are crucial, often involving advanced imaging techniques such as transperineal ultrasonography and MRI. While MRI provides superior soft tissue contrast and detailed anatomical assessments, transperineal ultrasonography offers a cost-effective, non-invasive alternative. The choice between these modalities depends on clinical context, resource availability, and patient-specific factors, highlighting the need for a tailored diagnostic approach.

Materials and Methods: all patients with anal dysfunction aged 18 years and above presenting to the Department of Radiology of Katuri Medical College over 12 months' period were included in the study.

Results: most of the patients belonged to younger age group i.e., between 21-40 years. Females were predominantly involved in both groups. Rectovaginal fistula was the most common abnormality observed in present study. MRI showed higher diagnostic accuracy in comparison with trans-perineal ultrasonography.

Conclusion: The study concluded that MRI provided a slight edge in diagnostic accuracy over trans-perineal ultrasonography in identifying sphincter abnormalities.

Keywords: Trans-perineal ultrasound, MRI perineal area, anal dysfunction, anal sphincter, fistula.

INTRODUCTION

The anal sphincter complex plays a critical role in the human continence mechanism, consisting of two primary muscular structures: the internal and external anal sphincters. The internal anal sphincter is a continuous band of involuntary smooth muscle and the external anal sphincter is comprised of voluntary striated muscle. These sphincters function synergistically to maintain fecal continence and facilitate defecation when appropriate.[1]

Anal sphincter dysfunction encompasses a spectrum of disorders that impair the normal functional integrity of these muscles, resulting in clinical manifestations such as fecal incontinence, chronic anal pain, and anismus. Etiological factors contributing to sphincter dysfunction include obstetric trauma, iatrogenic injury during surgical procedures, neurological pathologies such as pudendal neuropathy, and age-related degenerative changes. Prompt and accurate diagnosis, coupled with effective therapeutic interventions, is paramount to enhancing patient outcomes and quality of life.[2]

Advanced imaging modalities are indispensable in the diagnostic evaluation of anal sphincter dysfunction, with trans-perineal ultrasonography and magnetic resonance imaging (MRI) being two

prominent techniques. Each imaging modality offers distinct advantages and varying degrees of diagnostic accuracy.

Transperineal ultrasonography, a non-invasive and cost-efficient imaging technique, provides real-time visualization of the anal sphincter complex. It is particularly adept at identifying morphological abnormalities and assessing sphincter continuity and integrity. The procedure involves the placement of an ultrasound transducer on the perineum, facilitating detailed imaging of the anal sphincter musculature without significant patient discomfort or the need for invasive measures.[3,4]

Conversely, MRI is renowned for its superior soft tissue contrast resolution and multi-planar imaging capabilities, rendering it highly accurate for comprehensive anatomical assessments. MRI excels in delineating the internal and external anal sphincter muscles, detecting subtle sphincteric injuries, and evaluating adjacent pelvic structures. However, the utilization of MRI is often limited by its higher cost, reduced availability, and longer acquisition times compared to ultrasonography.[5,6]

This study was done with an aim to analyze and compare the diagnostic accuracy of transperineal ultrasonography versus MRI.

MATERIAL AND METHODS

This prospective observational study was conducted in the Department of Radio diagnosis, Katuri Medical College, over 1-year period, i.e., from June 2023 to May 2024. All patients experiencing fecal incontinence due to history of perineal tear or post-partum anal sphincter dysfunction or have fistulas were included in the study. Patients with active infections of the anal canal and perianal mucosa or those patients who did not give consent for participation in the study were excluded.

A written informed consent to participate in the study was obtained from all the patients before enrolling them into the study. A detailed history was taken with special emphasis on the duration of symptoms, any history of trauma; any history of similar complaints and presence of any co-morbid gastrointestinal conditions such as Crohn's disease were taken. A thorough general examination was done. Per rectal examination was done along with systemic examination. The anal sphincter complex was evaluated using trans-vaginal ultrasonography in female patients and trans-perineal ultrasound in male patients. Magnetic resonance imaging (MRI) was subsequently employed to analyze the anal sphincter complex in these patients. A comparative analysis between trans-perineal ultrasonography and MRI was undertaken to evaluate their diagnostic accuracy and respective advantages in assessing the anal sphincter complex.

Ethical committee approval was taken prior to the beginning of the study. Descriptive statistics were employed to summarize the data, including frequency and percentage analysis for categorical variables, and mean and standard deviation calculations for continuous variables. The Chi-Square test was applied to evaluate statistical significance in 2x2 tables with categorical data, while Fisher's Exact test was used for tables with expected cell frequencies below 5. The significance level for all statistical tests was set at 5%.

RESULTS

A total of 100 patients presented with complaints of fecal (Group A) and 50 patients were subjected to MRI of perineal region (Group B). The mean age of the entire study group was 33.4 years. Most of the patients belonged to the age group of 21-30 years. The youngest patient in Group A was 22 years old and the oldest being 72 years old. The youngest patient in Group B was 21 years old and the oldest was 67 years old.

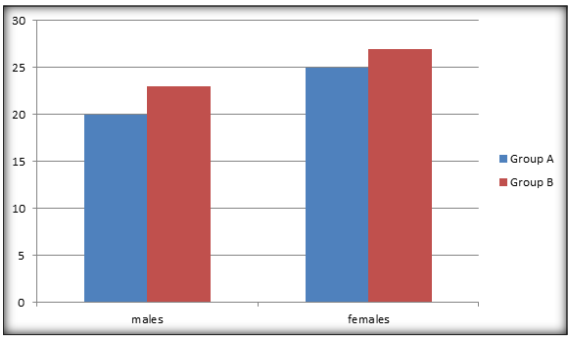

Figure 1: Gender distribution

Males and females were almost equal in both groups. Internal hemorrhoids were the most common cause of anal sphincter dysfunction observed in both groups. [Table 2]

Table 1: Age distribution

Age (in years)	Group A (n = 50)	Group B (n = 50)
21-30 years	20	18
31-40 years	10	12
41-50 years	7	9
51-60 years	6	6
>60 years	7	5

Table 2: Cause of anal dysfunction

	Group A	Group B
Condition	No. of patients	No. of patients
Ano-vaginal fistula	7	8
Rectovaginal fistula	5	6
Internal hemorrhoids	10	12

Perianal complex mass	3	4
Rectocele	4	7
Cystocele	6	1
Enterocele	1	1
fibrosis	2	0

Table 3: Diagnostic comparison of accuracy

	Low		Mid		high	
	USG	**MRI**	**USG**	**MRI**	**USG**	**MRI**
Group A	**4.2**	**4.10**	**4.03**	**4.13**	**3.02**	**2.24**
Group B	**4.02**	**3.98**	**4.15**	**4.42**	**4.14**	**4.08**

DISCUSSION

The study aimed to compare the diagnostic accuracy of trans-perineal ultrasonography (USG) and magnetic resonance imaging (MRI) in evaluating the perineal region in 100 patients with anal sphincter dysfunction. This comparison is crucial as dysfunction of anal sphincter complex can lead to significant clinical issues such as fecal incontinence, chronic anal pain, and anismus.

Our findings indicated a higher prevalence of anal sphincter dysfunction in patients aged 21 to 40 years. However, studies done by Puranik et al,[7] and Jhobta et al8 reported a higher age group. This could be owing to the fact that majority cases of anal dysfunction in present study are in females predominantly due to post-delivery complications.

The study by Singh et al,[9] evaluates the efficacy of transcutaneous perianal ultrasonography (TPUS) in diagnosing perianal fistulae, comparing its findings with those obtained through MRI. It was found that TPUS is highly effective for initial assessments due to its non-invasiveness, cost-effectiveness, and real-time imaging capabilities. MRI, however, offers superior soft tissue contrast and detailed anatomical delineation, making it more accurate for complex cases. The study concludes that combining TPUS with MRI optimizes diagnostic accuracy and management of perianal fistulae. The findings emphasize the complementary roles of both imaging modalities.

In this comparative study between magnetic resonance imaging (MRI) and ultrasonography, TPUS was employed as the reference standard. MRI demonstrated a sensitivity of 89.63% and a specificity of 98.99% in detecting alterations in sphincter thickness, outperforming TPUS. Both two-dimensional (2D) and three-dimensional (3D) ultrasonography, along with MRI, are effective in assessing sphincter anomalies with comparable precision. While ultrasonography is widely recognized as the most accurate technique for evaluating anal sphincter thickness, MRI exhibits equivalent sensitivity at moderate and high stress levels.

The study by Maconi et al,[10] compared trans-perineal ultrasound (TPUS) and magnetic resonance imaging (MRI) in evaluating perianal Crohn's disease. TPUS was found to be a valuable tool for initial assessment due to its non-invasiveness, real-time imaging, and cost-effectiveness. However, MRI provided superior accuracy in detecting complex fistulas and abscesses due to its detailed soft tissue contrast and comprehensive anatomical visualization. The study concluded that TPUS is beneficial for routine follow-ups, while MRI is essential for detailed evaluation and surgical planning. Combining both modalities enhances overall diagnostic efficacy.

The study by Singh et al,[11] meticulously examines the efficacy of magnetic resonance imaging (MRI) in the evaluation of perianal fistulae, correlating imaging findings with surgical outcomes. The research highlights MRI's superior diagnostic capabilities in delineating the anatomy and extent of perianal fistulas, which is critical for preoperative planning. MRI's high-resolution imaging facilitates precise identification of fistulous tracts, secondary extensions, and associated abscesses. The study underscores MRI as an indispensable tool in the preoperative assessment, significantly enhancing surgical precision and patient outcomes. The correlation with surgical findings validated MRI's diagnostic accuracy.

CONCLUSION

The study's comparative analysis demonstrated that while MRI had a marginally superior diagnostic accuracy, USG remained a valuable diagnostic tool, particularly in clinical settings with limited access to MRI or when an expedited assessment was warranted. The detailed imaging capabilities of MRI, combined with its ability to provide three-dimensional reconstructions, contributed to its enhanced diagnostic performance, especially in complex cases involving multiple perineal pathologies.

In conclusion, this study underscores the integral role of advanced imaging modalities in the diagnosis and management of anal sphincter dysfunction. While MRI offers heightened accuracy and detailed imaging capabilities, trans-perineal ultrasonography provides a practical and efficient alternative, particularly in settings where MRI is not readily available. Future research should continue to explore ways to enhance the diagnostic capabilities of both modalities, potentially through technological advancements and improved imaging protocols.

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Conflicts of Interest: Nil.

REFERENCES

1. Bharucha AE. Pelvic floor: anatomy and function. Neurogastroenterol Motil. 2006 Jul;18(7):507-19. doi: 10.1111/j.1365-2982.2006.00803. x. PMID: 16771766.
2. Rao SS. Pathophysiology of adult fecal incontinence. Gastroenterology. 2004 Jan;126(1 Suppl 1): S14-22. doi: 10.1053/j.gastro.2003.10.013. PMID: 14978634.
3. Santoro GA, Wieczorek AP, Dietz HP, Mellgren A, Sultan AH, Shobeiri SA, Stankiewicz A, Bartram C. State of the art: an integrated approach to pelvic floor ultrasonography. Ultrasound Obstet Gynecol. 2011 Apr;37(4):381-96. doi: 10.1002/uog.8816. PMID: 20814874.
4. Albuquerque A. Endoanal ultrasonography in fecal incontinence: Current and future perspectives. World J Gastrointest Endosc. 2015 Jun 10;7(6):575-81. doi: 10.4253/wjge.v7.i6.575. PMID: 26078826; PMCID: PMC4461932.
5. Sudoł-Szopińska I, Santoro GA, Kołodziejczak M, Wiaczek A, Grossi U. Magnetic resonance imaging template to standardize reporting of anal fistulas. Tech Coloproctol. 2021 Mar;25(3):333-337. doi: 10.1007/s10151-020-02384-6. Epub 2021 Jan 5. PMID: 33400032; PMCID: PMC7932983.
6. Wald A, Bharucha AE, Cosman BC, Whitehead WE. ACG clinical guideline: management of benign anorectal disorders. Am J Gastroenterol 2014; 109: 1141-1157; (Quiz) 1058 [PMID: 25022811 DOI: 10.1038/ajg.2014.190]
7. Puranik CI, Wadhwani VJ, Vora DM. Role of transperineal ultrasound in infective and inflammatory disorders. Indian J Radiol Imaging. 2017;27(04):482–487.
8. Jhobta A, Kaur R, Jhobta R, Dabra A, Kochhar S. Fistula in ano role of transperineal and transvaginal sonography. J Diagn Med Sonogr. 2006; 22:375–381.
9. Singh A, Kaur G, Singh JI, Singh G. Role of Transcutaneous Perianal Ultrasonography in Evaluation of Perianal Fistulae with MRI Correlation. Indian J Radiol Imaging. 2022 May 1;32(1):51-61. doi: 10.1055/s-0042-1743111. PMID: 35722645; PMCID: PMC9200491.
10. Maconi G, Tonolini M, Monteleone M, Bezzio C, Furfaro F, Villa C, Campari A, Dell'Era A, Sampietro G, Ardizzone S, de Franchis R. Transperineal perineal ultrasound versus magnetic resonance imaging in the assessment of perianal Crohn's disease. Inflamm Bowel Dis. 2013 Dec;19(13):2737-43. doi: 10.1097/01.MIB.0000436274.95722.e5. PMID: 24193154.
11. Singh K, Singh N, Thukral C, Singh KP, Bhalla V. Magnetic resonance imaging (MRI) evaluation of perianal fistulae with surgical correlation. J Clin Diagn Res. 2014 Jun;8(6):RC01-4. doi: 10.7860/JCDR/2014/7328.4417. Epub 2014 Jun 20. PMID: 25121040; PMCID: PMC4129264.