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Original Research Article

Transperineal ultrasound versus MRI for anal sphincter dysfunction: accuracy and benefits

[1]Dr. Sri Pavani B, [2]Dr. PVN Murthy

[1]Assistant Professor, Department of Radiology, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India
[2]Professor & HOD, Department of Radiology, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India
Corresponding Author:
Dr. Sri Pavani B

Abstract
Introduction: When working in tandem with the anal sphincter, the pelvic floor muscles facilitate both defecation and continence. Therefore, faecal incontinence or blocked defecation are the clinical manifestations of anal sphincter dysfunction. The unintentional loss of flatus, liquid or solid stool is known as faecal incontinence and it is both an embarrassing social problem and a health risk.
Materials and Methods: Between September 2021 to August 2022, at the Department of Radiology, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India. We treat everyone who has faecal incontinence due to an injury to the anal sphincter. Experiment with a Cross-Sectional Design and Prospective Analysis.
Results: For most people, having a vaginal delivery is the primary cause of faecal incontinence. Postpartum faecal incontinence has a complex aetiology, but the most common cause is damage to the anal sphincters. Postpartum may also result from damage to the anal sphincter complex, the puborectalis muscle, or the pudendal nerve.
Conclusion: These patients choose this non-invasive, inexpensive and readily available technique. MRI is useful for secondary fistula and supra and extra levator evaluation. MRI can detect extensions, extent, length, secondary tracks and perianal abscess. TPUS detects perineal descent and rectocele better than MRI. TPUS and MRI detect sphincter abnormalities equally well.
Keywords: Sphincter, vaginal delivery, MRI, postmartum

Introduction

The pelvic floor and anal sphincter control faeces and continence. Anal sphincter dysfunction causes faecal incontinence or blocked defecation. Faecal incontinence the unintentional loss of flatus, liquid, or solid stool is a social and hygienic issue. Obstetric anal sphincter damage causes 2% of adult faecal incontinence (OASIS) [1, 2]. Pelvic injury and anal sphincter disorders induce faecal incontinence. Perianal inflammatory illnesses include perianal abscess, pilonidal sinus, ano-vaginal fistula, recto-urethral fistula, and sinus. Postpartum obstetric injury and road traffic accidents cause pelvic damage. The root reason must be assessed methodically. Anal sphincter dysfunction evaluation requires a complete history, a rectal examination, radiological imaging, and physiological tests [3-5]. Sonography (Transperineal/Transvaginal), Endo anal sonography (3D), CT pelvis, and MRI (Magnetic Resonance Imaging) anal sphincter can be used to assess its anatomy (External phased array and endoanal) [6-8].

These tests evaluate anal sphincter function. Defecogram, electromyography, and anorectal manometry. Transperineal ultrasound (TPUS) is easy, inexpensive, safe, and painless for anorectal structural evaluation. Urology, gynaecology and gastroenterology use transperineal

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ultrasonography. Anal sphincter evaluation in gastroenterology is usually for obstructed defecation syndrome and inflammatory perianal illness [9-11]. It helps identify, classify, and monitor inflammatory perianal illnesses by evaluating these structures during faeces. It helps faecal incontinence sufferers locate sphincter damage. MRI can assess anal sphincter complex disorders. MRI can show the sphincter and defecation to check muscle integrity [12, 13]. External phased MRI examines the anal sphincter and pelvic floor without endoluminal coil. Correct diagnosis is crucial for Perianal illness since it improves and maintains patient quality of life. MRI and transperineal ultrasonography can diagnose perianal abcess and fistula. Before surgery, post-trauma patients must examine the location and severity of internal and exterior sphincter abnormalities.

Materials and Methods

Between September 2021 to August 2022, at the Department of Radiology, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India. We treat everyone who has faecal incontinence due to an injury to the anal sphincter. Experiment with a Cross-Sectional Design and Prospective Analysis.

Inclusion criteria

1. Patients who have a history of perineal injury or postpartum anal sphincter dysfunction and who present with faecal incontinence or constipation.
2. People who have fistulas and perianal diseases like Crohn's illness.

Exclusion criteria

1. Patients who have an infection of the anal canal mucosa and perianal skin.
2. Disobedient patients.

Our Institutional Ethics Committee approved this prospective study and we followed all of the required protocols for gaining informed permission. Prospective Cross-Sectional Study best describes this investigation. In order to take part in the trial, all patients had to give their written consent first. Per rectal examination was performed on patients who complained of faecal incontinence, sphincter tears, or perianal disorders. Anal sphincter complex was studied in detail by using transvaginal ultrasound in females and transperineal ultrasound in males. The anal sphincter complex of each of these patients was then analysed using magnetic resonance imaging. Transperineal ultrasound was compared with magnetic resonance imaging (MRI) for the study of the anal sphincter complex in terms of both diagnostic accuracy and benefits.

Statistical analysis

The data was described using descriptive statistics, including frequency analysis and percentage analysis for categorical variables, and the mean and Standard Deviation for continuous variables. The unpaired t-test was used to determine if there was a statistically significant difference between the bivariate samples of the two separate groups. The Sensitivity and Specificity were determined using a Receiver Operating Characteristic (ROC) curve analysis. The Chi-Square test was employed to determine statistical significance in 2x2 tables with categorical data, while the Fisher's exact test was utilised for those tables when the predicted cell frequency was less than 5. The significance level used by the aforementioned statistical methods is 5.

Observation & Results

Age distribution

Patients between the ages of 20 and 40 were found to have a higher prevalence of anal sphincter dysfunction.

ISSN 2515-8260 Volume 09, Issue 07, 2022

Table 1: Mean age range of individuals with anal sphincter dysfunction in study group A and normal adults in group B

	A Group	B Group
Up to 20	8.3%	7.1%
21 to 40	62.7%	84.8%
41 to 60	21.5%	8.9%
61 to 80	8.9%	0.1%

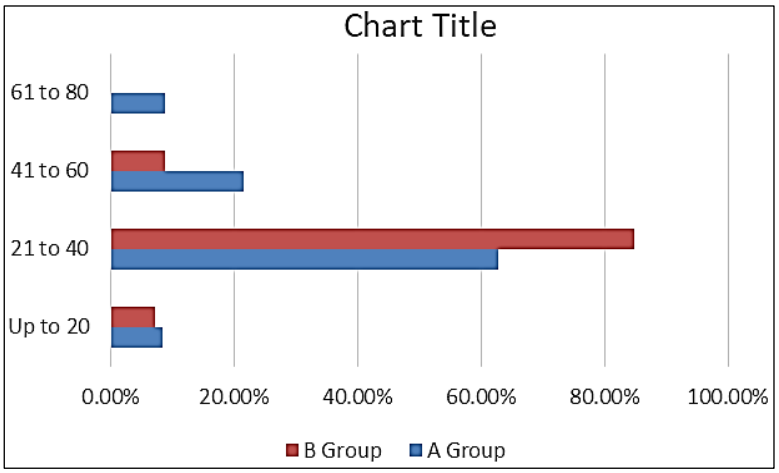

Fig 1: Mean age range distribution of patient

Table 2: Cross-tabulation Mean age of research group A's anal sphincter dysfunction patients and group B's normal adults

Crosstab				
Age in yrs.		Groups		Total
		Group A	Group B	
Up to 20 yrs.	Count	6	2	08
	% Groups	15%	5%	20.0%
21 to 40 yrs.	Count	10	12	22
	% Groups	25%	30%	55.0%
41 to 60 yrs.	Count	04	04	08
	% Groups	10%	10%	20.0%
61 to 80 yrs.	Count	1	1	02
	% Groups	2.5%	2.5%	5%
Total	Count	20	20	40
	% Groups	100.0%	100.0%	100.0%

ISSN 2515-8260 Volume 09, Issue 07, 2022

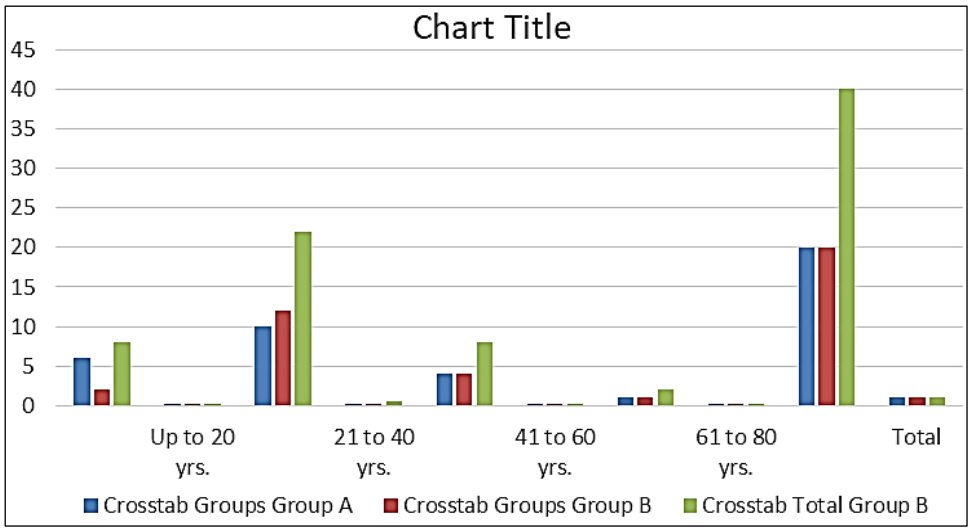

Fig 2: Cross table showing Mean age range distribution

Gender distribution

In this study of group, A, out of 40 patients, 20 were females and 20 were males.

Tables 3: Gender distribution of group A patients with anal sphincter dysfunction and group B normal adults

Gender		Groups		Total
		A Group	B Group	
Female	Count	20	20	40
	% Groups	50.0%	50.0%	100.0%
Male	Count	20	20	40
	% Groups	50.0%	50.0%	100.0%
Total	Count	40	40	40
	% Groups	100.0%	100.0%	100.0%

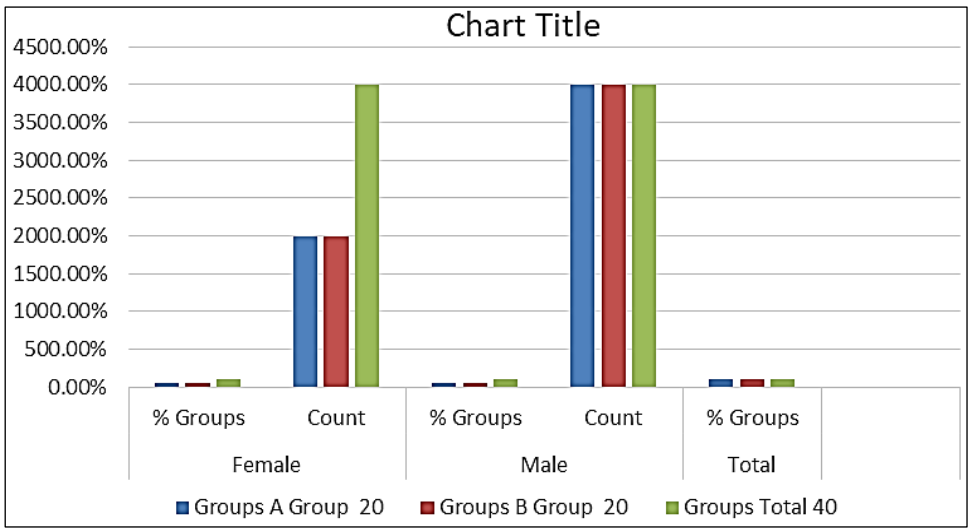

Fig 3: Tables show gender distribution of patients

ISSN 2515-8260 Volume 09, Issue 07, 2022

Frequency distribution of abnormalities on imaging

Table 4: Distribution of results by frequency in the research population

Sr. No.	Findings in patients	Frequency
1.	Altered spintered thickness	20
2.	Fibrosis	06
3.	Fistula	02
4.	Perineal descent	01
5.	Rectocele	03
6.	Cystocele	01
7.	Enterocele	02
8.	Prolapse	01
9.	Normal	04
	Total	40

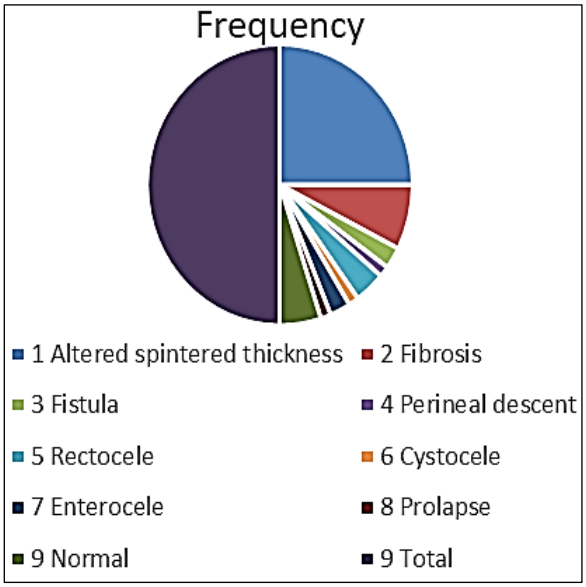

Fig 4: Table showing overall frequency distribution in patients

Table 5: Analysis of USG and MRI in a Randomized Controlled Trial T-test

	Low		Mid		High	
	USG	**MRI**	**USG**	**MRI**	**USG**	**MRI**
Group A	4.31	4.01	4.20	4.21	3.10	2.32
Group B	4.10	3.89	4.41	4.14	4.31	4.00

ISSN 2515-8260 Volume 09, Issue 07, 2022

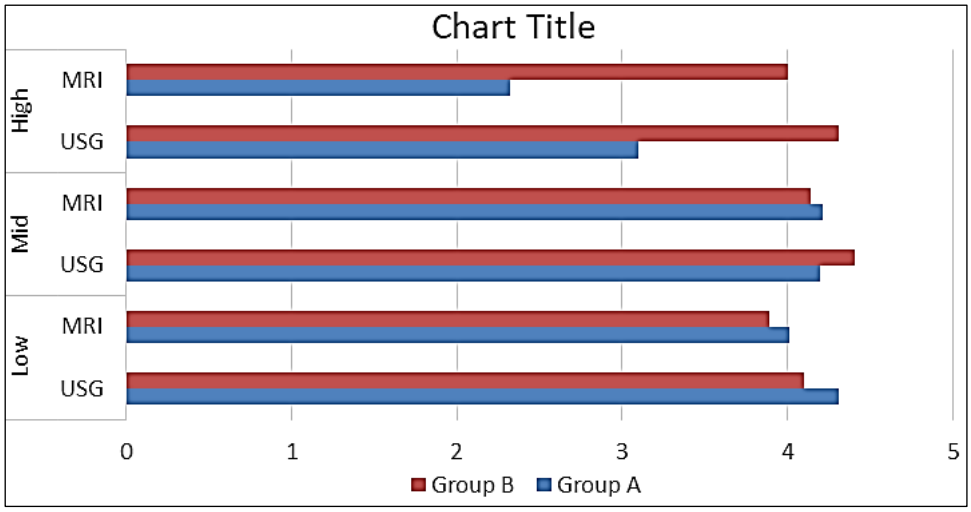

Fig 5: Table showing comparison of USG and MRI

Discussion

For most people, having a vaginal delivery is the primary cause of faecal incontinence. Postpartum faecal incontinence has a complex etiology, but the most common cause is damage to the anal sphincters. Postpartum may also result from damage to the anal sphincter complex, the puborectalis muscle, or the pudendal nerve. Women with obstetric anal sphincter injury (OASI) had a higher chance of developing faecal incontinence compared to those without such an injury, even after successful initial healing of the sphincter lesion. A history of OASI, like a history of FI, can have a deleterious impact on sexual function. Women having a history of OASI have been found to be less likely to plan future pregnancies. Worldwide, perineal tears are thought to occur of vaginal births due to complications. In 2016, there were 53,614 births recorded, and those were accompanied by a perineal tear of grade III or IV [14-16].

Endoanal ultrasonography offers good sensitivity and specificity and is currently the gold standard for detecting sphincter injury. Some women show signs of concealed structural damage to the anal sphincter following their first vaginal delivery, according to a review article. Several writers, however, have pointed out the limitations of this imaging technique, including its inability to evaluate the anal sphincter's exterior aspect, the anal sphincter's distortion by the transducer and patient discomfort. For this reason, they advise a transvaginal or transperineal ultrasound, both of which can be conducted with the patient in a comfortable supine position [17, 18].

Two-dimensional transperineal/transvaginal ultrasonography has been compared to magnetic resonance imaging for anal sphincter dysfunction in a limited number of investigations. Our research was undertaken at a tertiary care teaching hospital in South India because transperineal ultrasound has shown to be a useful technique in evaluating disorders of the anal sphincter. Twelve of the 40 patients were considered to be "normal," twenty-one had abnormal sphincter thickness, twelve had fibrosis, five had fistula, four had perineal descent, one had enterocele, and two had rectocele, cystocele, or prolapse [19, 20].

Transperineal ultrasonography provides a higher sensitivity of 64% and a higher specificity of 85% than endoanal ultrasound in evaluating sphincter atrophy, according to the PREDICT trial. Our research compared MRI to ultrasound using TPUS as the reference standard. The sensitivity of MRI in evaluating changed sphincter thickness compared to TPUS was 86.36% and the specificity was 96.97% correspondingly. Both 2D/3D ultrasound and MRI can be used to evaluate sphincter abnormalities with equivalent accuracy. Despite the fact that USG is the gold standard for measuring anal sphincter thickness, MRI is just as sensitive at

intermediate and high levels. There was a huge disparity between the average thickness of the internal sphincter at moderate and high stress [21-23].

Meyer *et al*., both TPUS and MRI show a good and comparable outcome in researching perianal diseases. However, our research showed that MRI was both sensitive and specific in detecting fistulas. In comparison to TPUS, MRI is superior for evaluating fistulas because it more clearly defines secondary tracks and the overall extent of the fistula. 2 D has inherent constraint of diagnosing high degree fistulas. Rania A. Marouf found that MRI was very sensitive for detecting both healing fibrosis and active lesions. Ultrasound (USG) findings of hypoechoic areas or other changes in echogenicity were interpreted as fibrosis, whereas MRI findings of T1, T2 hypointensity were also interpreted as fibrosis in our study [24, 25].

Findings from our research showed that MRI was only 60% sensitive, but 100% specific, for detecting fibrosis. Currently, there are no studies comparing the accuracy of USG and MRI in assessing perineal decease, enterocele, or rectocele. But there has been a research by Perniola *et al*., saying that ultrasound failed to detect rectocele and perineal ultrasound compared to evacuation proctography. We found that ultrasonography was more accurate than MRI at detecting perineal descent. The sensitivity of MRI to detect perineal descent was barely half. This may have occurred because the ultrasound was applied dynamically and repeated numerous times until the patient exerted sufficient force. However, in contrast to ultrasonography, MRI is a time-consuming operation, thus repeated straining is not feasible [24-26].

Conclusion

When evaluating sphincter abnormalities in postpartum or posttraumatic individuals, or screening for fistulas in patients with perianal discharge, TPUS/TVS should be the primary imaging modality used. Since it does not involve any risk to the patient, costs nothing, and is widely available, it is a popular modality among those in need. The secondary track of a fistula and the supra and extra levator muscles are best evaluated with magnetic resonance imaging (MRI). The MRI scan clearly showed the extension's location, size, length, secondary tracks, and perianal abscess. When compared to MRI, transvaginal ultrasound (TPUS) is more adept in identifying perineal descent and rectocele. In evaluating sphincter abnormalities, MRI and TPUS both have similar sensitivities.

Competing interests: None.

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