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*Original article*

# Endosonographic findings in patients with fecal incontinence

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## SUMMARY

**Between 1995-2001 79 patients with fecal incontinence (FI) were examined with endorectal ultrasound in our laboratory. There were 56 patients with a definite history of anatomic risk factors (congenital diseases, anorectal operation, difficult delivery, sexual abuse or other trauma). 11 patients had evidence of internal or external rectal prolapse. Endoanal ultrasound revealed sphincter defects in 50 patients (44 internal anal sphincter (IAS) defects and 38 external anal sphincter (EAS) defects). Sphincter defects were found in 47/56 patients with a history of anorectal trauma and in 3/23 patients without a history of trauma. In 14 patients, no risk factor was identified. The etiology of FI was diagnosed as non-traumatic after endoanal ultrasound examination in 34 patients (6 patients with endosonographic evidence of sphincter trauma). The results of endorectal ultrasound had a significant impact in the subsequent management of FI (sphincter repair, muscle transposition, biofeedback training or prolapse repair).**


**Key words:** Fecal incontinence, Anal sphincter, Anorectal operation, Diabetes, Pudendal neuropathy, Endoanal ultrasound, Vector manometry, Congenital, Prolapse, Biofeedback, Sphincter repair, Muscle transposition.

## INTRODUCTION

Endoanal ultrasonic investigation has proved to be a very important diagnostic tool in the investigation of FI and selection of appropriate therapeutic modality.[1] This examination makes feasible the differential diagnosis between traumatic and neurogenic incontinence. Traumatic FI is managed with surgical reconstruction of disrupted sphincters. Patients with non-traumatic incontinence may derive considerable benefit from biofeedback treatment or muscle transposition. Between 1995-2001, 79 patients with FI were evaluated with endoanal ultrasound in our laboratory. The endosonographic findings had a very significant impact in their subsequent management.

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## MATERIAL AND METHODS

Between 1995-2001, 79 patients with FI were evaluated with endoanal ultrasound in our laboratory. There were 22 men and 57 women and their age ranged between 9-81 years.

Before ultrasonic evaluation, the patients were asked about their previous medical history and specifically about any risk factor for incontinence (difficult birth, anorectal operations, diabetes, neurological disease, congenital malformations etc). The severity of FI was classified as mild, medium or severe according to the frequency of episodes and the nature of rectal contents lost. A full clinical examination and a proctoscopy were performed with a meticulous search for internal rectal prolapse.

Endoanal ultrasound was performed with a type 3535 Bruel and Kjaer scanner and 7mHz and 10mHz transducers with a focal range of 15-40 mm rotating inside a water filled hard plastic cone as described previously.[2] During examination, the integrity of the internal and external anal sphincter was examined in the deep, mid and superficial levels of the anal canal (Figure 1). An internal sphincter defect was seen as a gap in the hypoechoic ring representing this muscle (Figure 2). External sphincter defect was defined as a homogenous hypoechoic area relative to the mixed and striated pattern of the rest of the external sphincter (Figure 3). The perineal body thickness was evaluated inserting a finger in the vagina and measuring the distance between IAS and the

ultrasonic reflection of the finger in the mid level of the anal canal (Figure 4).[3]

## RESULTS

36 patients were classified with severe, 20 with medium and 23 with mild FI. 36 patients had in the past, undergone, a major anorectal surgical procedure, 19 women had difficult deliveries, three patients were operated on in the early childhood for congenital disorders (atresia or megacolon) and another two patients had meningomyelocele. Clinical examination or proctoscopy revealed rectal prolapse in 11 patients (external in 2 and internal in 9). In 14 patients no risk factor for FI was identified. The possible causative factors for FI are analyzed in table 1 and 2.

Endoanal ultrasound revealed sphincter defects in 50 patients (44 IS defects and 38 ES defects, Table 1). Sphincter defects were found in 47/56 patients with a history of anorectal trauma Out of 33 patients with a history of anorectal operation 32 had sphincter defects (Figure 5 and 6 - 31 were held responsible for the symptoms). One patient with FI after low anterior resection had no sphincter defects but reduced capacity of the ampulla. Out of 19 patients with a history of difficult delivery, 12

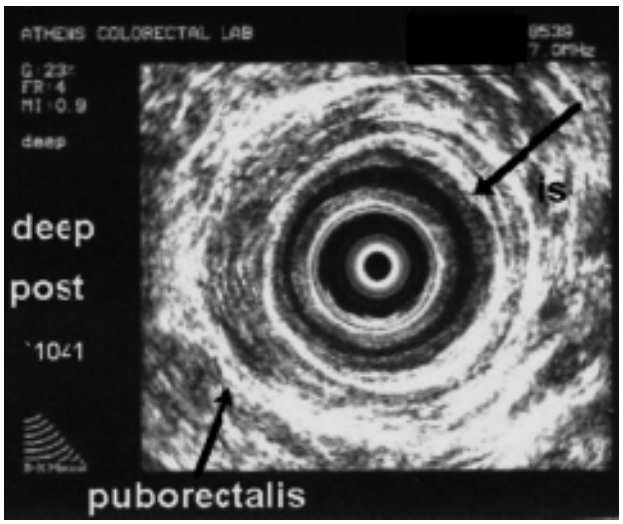


**Figure 1.** Normal endosonogram of anal canal at the deep level. The puborectalis and the internal sphincter are visualized (right side of the figure represents the 6th hour at lithotomy position, upper side represents the 9th hour).

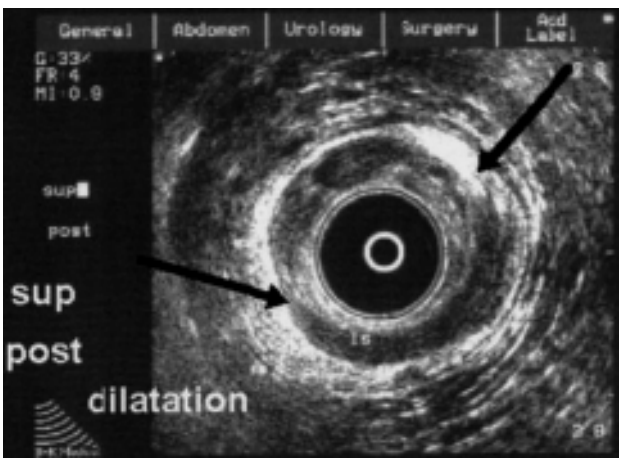


**Figure 2.** IAS defect and thin EAS at the superior and mid level of anal canal after anal dilatation for hemorrhoids (the arrows point to the stumps of IAS).

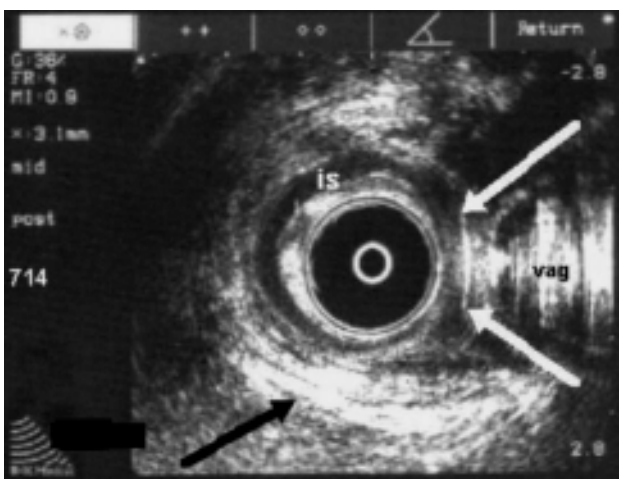


**Figure 3.** Obstetric EAS defect at at the mid level of anal canal. The hyperoic shadows represent a finger in the vagina.

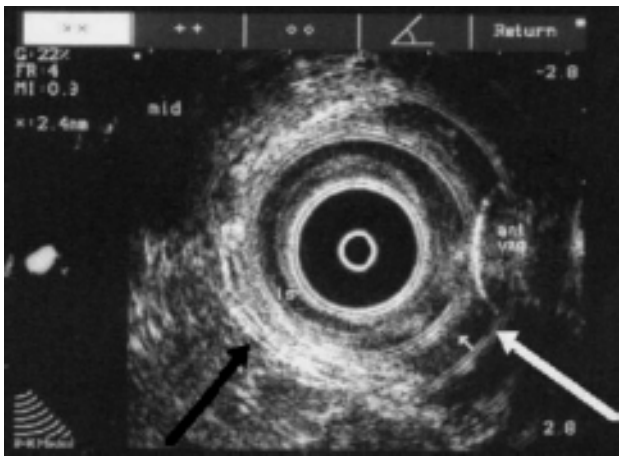


**Figure 4.** Perineal body measurement at the mid level of anal canal. In this patient with obstetric FI the perineal body measures 2,4 mm.

**Table 1.** Analysis of possible etiologic factors and sphincter defects in 79 patients with FI

| Possible Etiolotic factor | No | Total | Sogubcter defects (Significant) | IAS | EAS |
|---|---|---|---|---|---|
| Anorectal operation | 33 | 32 | 31 | 31 | 25 |
| Difficult delivery | 19 | 12 | 9 | 9 | 9 |
| Congenital disorders | 5 | 3 | 3 | 3 | 2 |
| Internal prolapse | 11 | 4 | 0 | 4 | 2 |
| Diabetes | 2 | 1 | 0 | 1 | 0 |
| Sex | 2 | 1 | 1 | 0 | 1 |
| Neurologic disease | 2 | 0 | 0 | 0 | 0 |
| Radiation | 1 | 0 | 0 | 0 | 0 |
| Total | 79 | 50 | 45 | 44 | 38 |

*16 patients had more than one possible causative factor for FI

**Table 2.** Analysis of anorectal operations in patients with FI

| Type of anal operation | No |
|---|---|
| Anal dilatation | 14 |
| Fistula operation | 13 |
| Milligan-Morgan | 6 |
| Internal sphincterotomy | 4 |
| Congenital diseases | 3 |
| Rectovaginal fistula | 2 |
| Low anterior resection | 2 |
| Total | 33* |

*8 patients had undergone more than one surgical procedure

had sphincter defects. (9 held responsible for the symptoms) (Figure 3). 2/3 patients operated on in the early childhood for atresia or megacolon had significant abnormalities of the sphincter musculature (Figure 7). 4/11 patients with rectal prolapse had simultaneous sphincter defects.

In 11 out of 56 patients with a history of anorectal trauma, the etiology of FI was diagnosed as non-traumatic after endoanal ultrasound examination (Figure 8). Non-significant sphincter defects were found in 3/23 patients who did not provide a history of anorectal trauma in the past. In 6/50 patients, the contribution of sphincter injuries to the incontinence symptoms was evaluated as non-significant. The final diagnosis of etiology of FI after endosonographic evaluation is presented in table 3.

Patients with a high incontinence score and significant sphincter defects were considered candidates for sphincteroplasty or muscle transposition. Patients with rectal prolapse but no evidence of significant sphincter defect were offered abdominal or perineal rectal prolapse repair. When no significant sphincter defect was visualized, patients were offered conservative treatment, biofeedback training or muscle transposition.

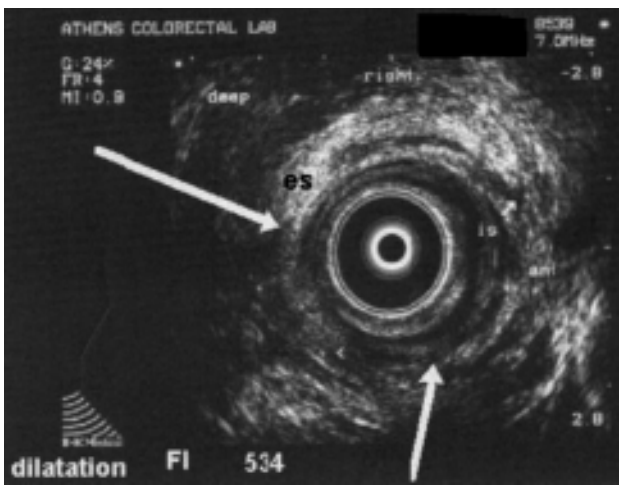


**Figure 5.** EAS and IAS defects in a case with FI after anal dilatation.

## DISCUSSION

Endoanal ultrasound is a modification of rectal ultrasound, where the water-filled balloon is replaced by a hard plastic cone with a diameter of 1.7 cm. This modification facilitates transducer's insertion in the anal canal and makes the examination more comfortable. In the deep layer of anal canal, the sling of puborectalis muscle and internal anal sphincter are seen. In the mid layer, the internal and external anal sphincters and in the superficial layer the external anal sphincter is visualized. In women the external anal sphincter is seen only in the

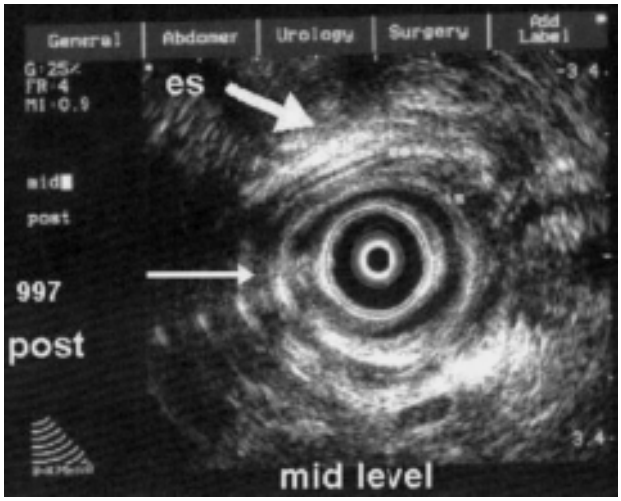


**Figure 6.** EAS and IAS defects in a patient with FI after multiple operations for recurrent perianal fistula.

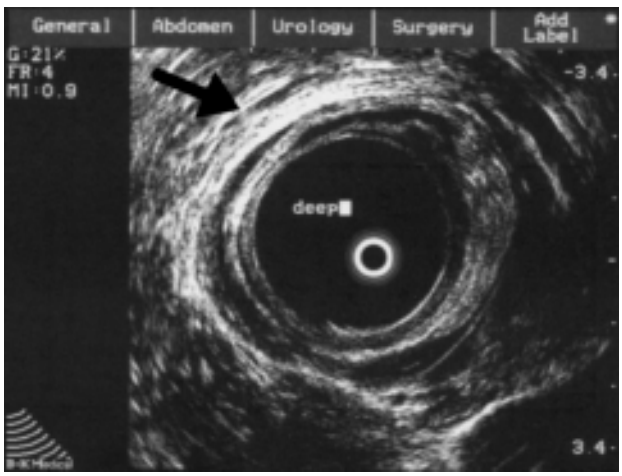


**Figure 7.** EAS and IAS defects after operation for anal atresia. Arrow points to striated sohincter remnant at the right side of anal canal only.

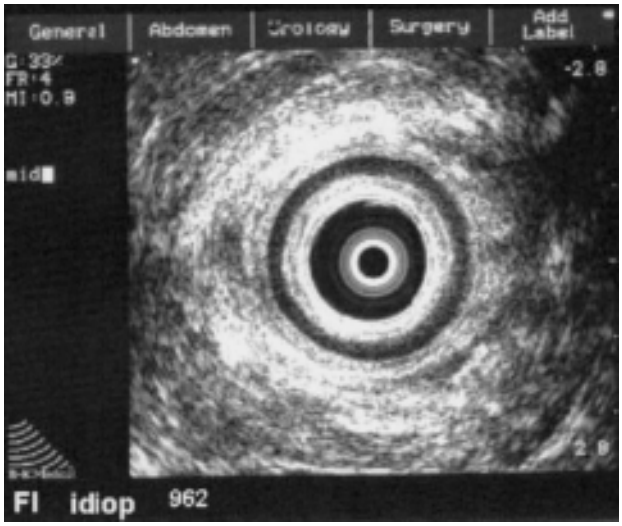


**Figure 8.** Idiopathic FI. No sphincter defect was detected in the endoanal ultrasound.

**Table 3.** Etiology of fecal incontinence after endoanal ultrasound examination

| Cause | No |
|---|---|
| Anorectal operation | 32 |
| Idiopathic | 17 |
| Internal prolapse | 10 |
| Diff. delivery | 9 |
| Congenital disorders | 5 |
| Diabetes | 2 |
| Anal intercourse | 2 |
| Neurologic disease | 2 |
| Radiation | 1 |
| Total | 79 |

*In one patient both prolapse and anal surgery were considered as cause of FI

mid and superficial level anteriorly where the postpartum injuries are found. They do not necessarily coexist with internal anal sphincter injuries. Additionally other perineal anatomic structures as the submucous layer, the transverse perineal muscles, the ischiocavernosus and bulbocavernosus muscles, the internal obturator muscle, the vagina, the urethra and the penis can be visualized.

Endoanal ultrasound has evolved as a very important tool in the investigation and subsequent treatment of FI.[4] The accurate visualization of sphincter defects has a significant impact on the differential diagnosis between traumatic and neurogenic FI and in the selection of subsequent treatment.[5] Non-traumatic FI is usually managed with biofeedback or gracilis muscle transposition.[6-8] Other therapeutic modalities such as neuromodulation, balloon implantation or artificial anal sphincters are not popular.[9,10] The treatment of traumatic FI (postoperative or postpartum) consists in overlapping sphincter repair.[11] Preoperative ultrasonic mapping helps the surgeon locate the stumps of disrupted external anal sphincter. Postoperative endosonographic demonstration of successful approximation of sphincter stumps is predictive of satisfactory clinical outcome (Figure 9).[12] If sphincter damage is extensive, stimulated gracilis muscle transposition is the treatment of choice. In patients operated on

for congenital anal disorders such as atresia, biofeedback treatment of FI may be successful if endoanal ultrasound visualizes a complete striated muscular ring around the anal canal. If sphincter muscle is visualized only in one side of the anal canal, muscle transposition is the only reasonable therapeutic alternative.

Endoanal ultrasound permits recognition of previously unsuspected damage to anal sphincters. This finding is very important in patients presumed to have idiopathic fecal incontinence, because it gives them the chance of a surgical operation. The extent of sphincter disruption (postpartum or postoperative) should be correlated with the severity of FI. Small sphincter defects in patients with severe FI should not be treated aggressively, because postoperative improvement will be minimal. Sphincter thickness, as measured with endoanal ultrasound, has not been constantly correlated with anal rest or squeeze pressures or the severity of idiopathic incontinence (pudendal neuropathy).[13]

Patient history and clinical evaluation provide valuable information concerning the etiology of FI.[14] If there is a history of anal dilatation or multiple operations for perianal fistula, then sphincter damage is most probably the cause of FI.[15] FI is very rare after Milligan-Morgan hemorrhoidectomy.[16] Difficult deliveries are not always complicated with incontinence, although the incidence of subclinical sphincter defects is significant.[17] If there is no history of sphincter trauma, endoanal ultrasound is usually normal. If there is no causative factor such as unstable diabetes, fecal impaction, multiple sclerosis, diarrhea, anal intercourse, radiotherapy, external or internal prolapse, then the incontinence is labeled as neurogenic (idiopathic) due to pudendal nerve degeneration.[18] This can be verified with measurement of pudendal nerve latency with St Mark's device.

Transperineal or transvaginal ultrasound scanning has been used for the visualization of anal tract structures and pathology.[19] The results are poor except for the transvaginal scanning of the anterior anal wall. This approach may visualize anterior sphincter defects in women, especially after obstetric injuries (Figure 10). Other diagnostic modalities that have been used for the diagnosis and mapping of sphincter defects include magnetic resonance imaging and needle electromyography. Magnetic resonance can clearly visualize sphincter defects, but it is not always available and is rather expensive.[20] Electromyogram and pudendal nerve latency measurement provide some valuable information about the integrity of neuromuscular pathways, but it is unlikely that these examinations will alter the therapeutic algorithm.[21] Needle electromyography is a very difficult and painful investigation and has almost completely replaced by endoanal ultrasound.[21] Computerized vector manometry has been used in the investigation of FI. An eight-channel water infusion catheter with radially oriented holes is used. The catheter is pulled through anal canal with simultaneous recording of radial anal pressures at 45°. The data are processed in a personal computer where pressure vector symmetry is evaluated and a three-dimensional pressure vectorgram is produced.[22] In this graphic, the location of decreased rest or squeeze pressures can be clearly seen (Figure 11). Vector manometry can usually differentiate

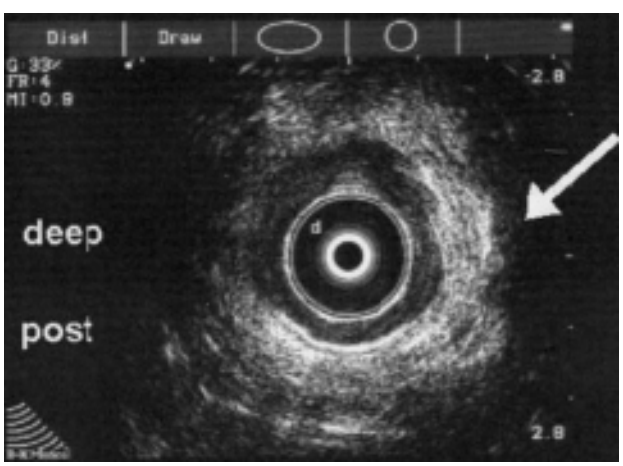


**Figure 9.** EAS approximation after successful anterior overlapping repair for obstetric FI.

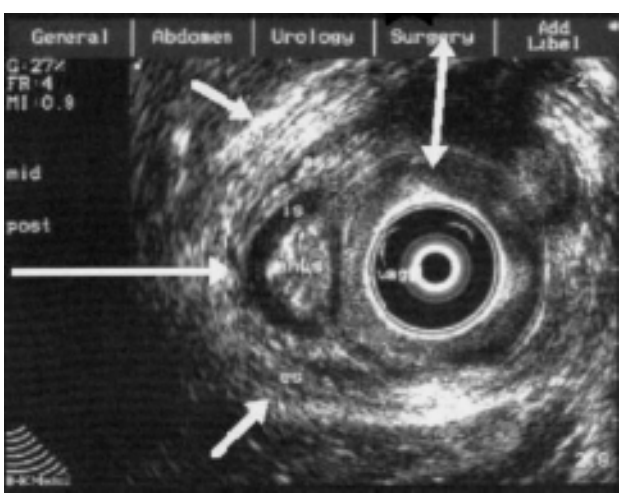


**Figure 10.** Vaginal ultrasonography in a patient with FI after laying open of anovaginal fistula. Anterior EAS defect (Long arrow points to the anal canl, small arrow points to the EAS stumps and double headed arrow points to the vagina).

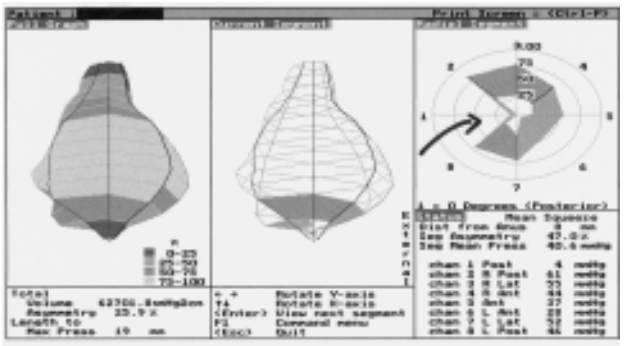

**Figure 11.** Vector manometry in the patient of figure 6. Arrow points to the area of segmental asymmetry of squeeze pressures at the posterior quadrant.

between traumatic and non-traumatic FI but cannot exactly localize the site and extent of sphincter disruption.[23]

## CONCLUSION

Endoanal ultrasound is the examination of choice in the investigation of fecal incontinence. It clearly delineates internal and external anal sphincter defects contributing decisively to the differential diagnosis between traumatic and non-traumatic fecal incontinence. The endosonographic findings had a significant effect on the selection of appropriate therapeutic modality.

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