

## Endosonographic and manometric assessment of the anal sphincters after ileal pouch-anal anastomosis

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**Background.** The aim of this study was to compare endosonography and manometry of the anal sphincters in patients after ileal pouch-anal anastomosis (IPAA).

**Patients and methods.** Ten patients aged between 23 and 50 years with IPAA performed for ulcerative colitis were examined with anal endosonography (AES) and manometry.

**Results.** AES visualised abnormal image of the internal anal sphincter (IAS) in 9 patients (90%). Defects of the external anal sphincter (EAS) and puborectalis muscle (PR) were shown in 4 patients (40%). In 5 patients (50%) correlation between endosonographic and manometric assessment for the all analysed muscles: IAS, EAS and PR was found. In 4 cases (40%) both methods correlated with the evaluation of the EAS only and in 1 patient (10%) no correlation was found. Correlation between both methods for the IAS was found in half of the patients (50%) while in the evaluation of the EAS and PR dynamic activity, it was found in 9 cases (90%).

**Conclusions.** Anal endosonography and manometry allow us to assess the morphology as well as the function of the anal sphincters in patients with IPAA. The methods mentioned above show high correlation in the assessment of the EAS function (9 cases; 90%) whereas in the case of IAS, manometry frequently (5 patients; 50%) does not confirm endosonographically detected defects.

*Key words:* colitis, ulcerative; anus-ultrasonography; manometry; proctocolectomy, restorative

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### Introduction

Ileal pouch-anal anastomosis (IPAA) has become the operation of choice for most patients with ulcerative colitis. Patients prefer this form of therapy to formation of the stoma although it is accompanied by a noticeable percentage of anal incontinence which affects even 84% of patients.<sup>1-4</sup> Anal sphincters defects can be partially responsible for this high incidence of incontinence. The aim

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of this study was to visualise the suspected defects of the anal sphincters on anal endosonography (AES) and to compare them with the results of the ano-rectal manometry.

### Patients and methods

Ten patients (8 women and 2 men) aged between 23 and 50 years (median age 33.2 years) with J - pouch and stapled IPAA performed without mucosal dissection for the ulcerative colitis were examined with the use of anal endosonography and ano-rectal manometry. Examinations were performed after 3-11 years after IPAA formation (mean 5.5 years). None of them had any operation on the anal canal prior to IPAA formation and none of the women had a complicated delivery. In order to assess the severity of anal incontinence, the Jorge- Wexner's grading system was used.<sup>5</sup> Anal endosonography was performed with the use of Bruel and Kjaer scanner type 1846 with a 7.0 MHz rotating endo-probe that provides a 360° image. The probe was covered with a plastic cone with an external diameter of 17 mm, which was filled with degassed water for acoustic coupling. The cone was covered with a condom. Patients were examined in the prone position, and no preparation was required prior to AES. As the probe was withdrawn from the anal canal, images of the puborectalis muscle (PR), external anal sphincter (EAS) and internal anal sphincter (IAS) were documented. The thickness, echogenicity and outlines of the IAS and echogenicity of the EAS were assessed on each level of the anal canal. The thickness of the IAS was measured at 3 and 9 o'clock position of the coronal plane of imaging, using electronic calipers on the monitor. The normal IAS was defined as a homogeneous, hypoechoic ring with thickness greater than 1mm.<sup>6</sup> Increased and nonhomogenous echogenicity and ill-defined margins of the IAS were diagnosed as abnormal. The EAS

was identified as non-homogenous muscle with striated echogenicity and was defined as abnormal if hypoechoic areas were visible within it.<sup>6</sup> Dynamic activity of EAS and PR was assessed as good (++), poor (+) or lack (0) of contraction using a subjective scale which depends on comparing their image at rest and during maximal voluntary contraction.

Anorectal manometry was performed with the patients in the left lateral position. No enema was given. A lower gastrointestinal manometry system (PC Polygraf HR; Synectics Medical Stockholm, Sweden) with four - lumen polyvinyl chloride catheter with rectal distending balloon (AMC4-B; Zinectics Medical, Stockholm, Sweden) was used. Perfusion ports were located in 1 cm intervals arranged circumferentially. After positioning at the depth of 6 cm from the anal verge the catheter was allowed to accommodate for several minutes. Maximum resting anal pressure (MRP), maximum voluntary pressure (MVP) and maximal duration of squeeze (D) were recorded. Pouch capacity was also recorded by distending air-filled, thin-walled balloon positioned 6 cm within the pouch to assess maximal tolerable volume (MTV).

### Results

The results of anal endosonography and ano-rectal manometry are presented in Tables 1 and 2.

In anal endosonography, thinning of the IAS was visible in all but one patient (9 cases; 90%). Increased echogenicity of the IAS in 6 (60%) and ill-defined borders was detected in 3 patients (30%). Echogenicity defect of the EAS was visible in 3 cases (30%).

Dynamic examination revealed good EAS and PR contraction in 6 patients (60%), poor in 3 (30%) and lack in 1 patient (10%).

Manometry revealed decreased maximum resting anal pressure suggesting dysfunction of the IAS in 3 cases (30%), decreased maxi-

**Table 1.** Anal endosonography in patients with IPAA

No	IAS			Echogenicity defect of the EAS	Dynamic exam
	Thickness [mm]	Increased echogenicity	Il-defined borders		
1. BA	<1	+			++
2. EB	<1	+	+		++
3. GP	<1				++
4. ME	<1	+			+
5. NM	2.5				++
6. SK	<1			+	+
7. ST	<1	+	+	+	+
8. WE	<1	+	+		++
9. WM	<1				++
10. Wm	0	+	+	+	0

**Table 2.** Ano-rectal manometry in patients with IPAA (sequence of patients as in Table 1)

No	MRP*	MVP	D	MTV	I
1. BA	30	180	16	150	8
2. EB	60	180	48	100	0
3. GP	60	200	40	190	0
4. ME	60	81	40	150	0
5. NM	80	110	30	200	6
6. SK	45	125	64	120	12
7. ST	60	200	40	350	0
8. WE	60	257	80	/-/	/-/
9. WM	75	148	50	260	0
10. Wm	30	45	/-/	160	9
Normal values	60-80	100-250	>40	>150	0

\*MRP - Maximum resting anal pressure [mmHg],

MVP -Maximum voluntary pressure [mmHg],

D - Maximal duration of squeeze (sec)

MTV- Maximal tolerable volume [ml],

I - Jorge-Wexner's fecal incontinence severity score (points)

/-/ - not assessed: in one patient - MTV and I - because of pouch-vaginal fistula and in one patient - D - because of low MVP

mal voluntary anal pressure in 3 patients (30%), implying dysfunction of the EAS and PR, and in another 2 patients (cases 1 and 5 from the Table 2) the shortage of the maximal duration of squeeze indicating dysfunction of the EAS and PR was revealed as well.

In all cases manometry correlated with clinical examination (Table 2). Correlation between endosonography and manometry was found in 5 patients (50%) for all analysed

muscles (IAS, EAS and PR), and in 4 patients (40%) for the EAS and PR only. No correlation between the methods was found in 1 patient (10%). Although in this case AES showed thin, hyperechoic, with ill-defined marginated IAS, and also poor contraction and scars within EAS, manometry revealed preserved function of the anal sphincters.

The analysis of the each assessed element of the IAS (thickness, echogenicity and bor-

ders) showed that normal image of this sphincter, which was observed in only 1 patient correlated with its preserved function in manometry. However, the abnormal image, which was visible in the remaining 9 patients correlated with its dysfunction in manometry in 4 cases only (44.4%). This included 2 out of 3 patients with thin IAS (66.6% correlation) and 2 out of 6 patients who had thin and hyperechoic IAS (33.4%).

Correlation between AES and manometry in the assessment of the EAS and PR function was found in the majority of the patients (9 cases; 90%). In the remaining one case, endosonographic image of the PR and EAS showing their poor contraction and scars did not corresponded with their preserved function (case 7 from the tables 1 and 2).

### Discussion

Anal endosonography, apart from magnetic resonance imaging using endorectal coil, is the most appropriate method to assess the morphology of the anal sphincters.

Ileal pauch-anal anastomosis has become an operation of choice for most patients with ulcerative colitis.<sup>2,4,7-9</sup> Patients prefer the pelvic reservoir to an ileostomy, although the results of the IPAA formation are not fully satisfactory, its greatest problem being the

loss of continence after treatment.<sup>2,4,7-9</sup> The images of the anal sphincters and their function after IPAA have not been precisely investigated so far. Individual reports in the literature concentrated on the results of anal endosonography and ano-rectal manometry after IPAA and show the thinning of the IAS and the reduction of the maximum anal resting pressure in most of the operated patients.<sup>2,7,9</sup> These disturbances are present after endoanal manipulation (handsewn transanal anastomosis with or without mucosectomy) as well as after stapled anastomosis.<sup>4,7</sup> Nevertheless, avoidance of endoanal procedures and transabdominal anal pursestring placement and stapled IPAA without mucosectomy provides higher anal resting pressure comparing to endoanal manipulations.<sup>4,7</sup> The thinning of the IAS was also the most frequent abnormality we observed in our study in all but one patient (9 patients; 90%). There are several reasons leading to the thinning of the IAS, such as denervation, ischemia or a direct trauma to the IAS as a result of transanal mucosectomy, and also, as mentioned above, hand sewn anastomosis.<sup>2,7,9</sup> During the IPAA, the formation dissection and mobilisation of the anorectum is responsible for the IAS trauma as a result of damage to the extrinsic autonomic nerve supply, which plays an important role in the IAS function.<sup>3</sup> Additionally, the transection of

Table 3. Jorge-Wexner's grading system of anal incontinence

Type of Incontinence	Frequency				
	Never*	Rarely	Sometimes	Usually	Always
Solid	0	1	2	3	4
Liquid	0	1	2	3	4
Gas	0	1	2	3	4
Wears pad	0	1	2	3	4
Lifestyle alteration	0	1	2	3	4

\*Never = 0

Rarely  $\leq 1$ /month

Sometimes  $\leq 1$ /week,  $\geq 1$ /month

Usually  $\geq 1$ /day

the rectal wall at the level of the levator ani muscles may cut through the layer of specialised circular muscle which forms the IAS. This could cause damage of the intramural nerve plexus and blood supply.<sup>2</sup> The sphincter trauma at this level is presumably inevitable.<sup>2</sup>

In our study only one patient had a normal image and pressure of the IAS. In the remaining 9 cases, endosonography suggested its degeneration in 6 out of 9 patients. Correlation with manometry was found in less than half of these patients (4 out of 9; 44.4%). Generally, manometry revealed preserved function of the sphincters in the majority of the patients. Our results were as in other studies, for instance in Stryker et al.,<sup>7</sup> who found no differences in anal canal resting and squeeze pressures between patients with IPAA and controls as well as no correlation between them regarding clinical data. Although our small study does not lead to definite conclusions, such a high incidence of patients with abnormal image of the IAS, but without functional disturbances is striking. Undoubtedly, our group of patients with aged 33.2 years on the average is young, and it is well known that the thickness of the IAS normally increases with age.<sup>10</sup> So in the young population thickness is the smallest. It is expected to be over 1.9 mm at the age of 19-65 years.<sup>10</sup> Norms of the thickness of the sphincter may need to be verified. Increased echogenicity of the IAS was the most likely consequence of surgery and represented fibrosis of the sphincter. The possibility of the IAS degeneration related to age, which manifests typically as thinning, increased echogenicity, and ill-defined borders of the IAS, is excluded because of the young age of our patients. On the other hand, there were predominantly women in our group of patients (8 versus 2) and it has been shown in the literature<sup>11</sup> that a relevant number of women, who have had uncomplicated deliveries, endosonographically show sphincter defects. The results of

the findings would be more reliable if patients had been examined before and after the pauch procedure, which was not the case in our study. Dynamic anal endosonography appeared a valuable adjunct to the examination at rest. Dynamic endosonography is especially valuable in diagnosing anal sphincters trauma, and shows high correlation with electromyography.<sup>10</sup> In our study, correlation between dynamic anal endosonography and manometry was found in 9 cases (90%).

The assessment of the anal sphincters in both ano-rectal manometry and anal endosonography in patients with IPAA enables structural and functional evaluation of the sphincters. The lack of high correlation between these methods in our group of patients emphasizes the complexity of the many mechanisms that contribute to normal continence. One of the examinations of anal sphincter function, besides clinical investigation, is anal manometry, which showed normal function of the anal sphincters in most of our patients. Anal endosonography visualised defects of the IAS in 90% of the patients. They might reflect the presence of subtle (not disturbing the function) changes of the sphincter, as a consequence of surgery, which in the future might predispose to further trauma (for instance obstetric), with the risk of anal incontinence development.

## Conclusions

Ano-rectal monometry and anal endosonography are complementary methods in the assessment of the anal sphincters after IPAA. Although in our study manometry showed preserved function of the IAS in most of the cases, the abnormal image of this sphincter might be indicative of its subtle or imminent dysfunction. Dynamic anal endosonography supplements manometric evaluation of anal sphincters and enables prognosis of the sphincter function.

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