

Endosonographic and manometric assessment of the anal sphincters in patients operated on for Crohn's disease of the colon

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Background. The aim of this study was to compare endosonography and manometry of the anal sphincters in patients operated on for Crohn's Disease (CD) of the colon.

Patients and methods. Ten patients aged between 21-67 years operated on for CD between 1988 and 1999 were examined with anal endosonography (AES) and anorectal manometry.

Results. AES visualized abnormal image of the internal anal sphincter (IAS) in 8 patients (80%). Defects of the external anal sphincter (EAS) and puborectalis muscle (PR) were shown in 7 patients (70%). Correlation between endosonographic and manometric assessment of the IAS was found in 9 patients (90%). Correlation for the EAS and PR was found in 7 cases (70%).

Conclusions. AES and manometry allow assessing the morphology as well as functioning of the anal sphincters and in most of the patients operated on for CD of the colon show high correlation in the above assessment. Both methods may be very helpful in choosing an optimal surgical procedure in patients with CD.

Key words: Crohn disease - surgery; anus; endosonography; manometry

Introduction

Crohn's Disease (CD) is a progressive disease which diminishes the quality of life. The best results in the treatment of this entity are achieved when there is a good cooperation between gastrologist and surgeon.¹ Unfortunately, pharmacological treatment is not effective enough; therefore, surgical treatment has become the basic method of treatment of CD.² Surgery of CD is a complex procedure. It frequently requires extensive resection of

Received 15 July 2002

Accepted 12 August 2002

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the bowels and, in some patients, it is performed as a multistage operation. In this group of patients, the assessment of the anal sphincters before the decision on reconstructive surgery is of great importance, in particular because CD often affects anorectal function even in the patients without any macroscopic rectal or anal lesions.³ One of the basic methods enabling visualization and assessment of the function of these muscles are anal endosonography (AES) and anorectal manometry. In the present study, we were seeking correlation between the endosonographic and manometric assessment of anal sphincters in the patients operated on for CD in the colon.

Patients and methods

Ten patients (8 women and 2 men) aged between 21-67 years (median age 34.1 years) operated on for CD of large bowel in years from 1988 to 1999 were examined with the use of anal endosonography and anorectal manometry. In 6 patients of this group, hemicolectomy was performed, in 2, colectomy and ileostomy, and the remaining 2, partial resection of the colon with colostomy. Examinations were performed 3-11 years after surgery (mean 5.5 years). Only one woman had an operation on the anal canal prior to surgical treatment of CD for ano-vaginal fistula. Anal endosonography was performed with the use of Bruel and Kjaer scanner, type 1846, with a 7.0 MHz rotating endoprobe 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 being withdrawn from the anal canal, images of the puborectalis muscle (PR), external anal sphincter (EAS) and internal anal sphincter

(IAS) were documented. The endosonographic image of the anal sphincters: thickness, echogenicity, outlines and continuity of the IAS, and echogenicity and continuity 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 positions of the coronal plane of imaging using electronic calipers on the monitor. The normal IAS was defined as a homogenous, hypoechoic ring with the thickness greater than 1mm.³ The increased and non-homogenous echogenicity and ill-defined margins or presence of tear 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.⁴ Dynamic activity of the EAS and PR was assessed as good or as lacking contraction on the basis of a subjective scale which depended on comparing their images at rest and during maximal voluntary contraction.

Anorectal manometry was performed with the patients in the left lateral position with their hips flexed at 90°. No enema was given. 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 at 1 cm intervals and arranged circumferentially. A pressure transducer was incorporated to each perfusion line and connected to a polygraph device. During the study the manometric recordings were displayed on the screen of an on-line computer and were stored for later analysis with the use of a dedicated software program. After positioning at a depth of 6 cm from the anal verge, the catheter was kept at rest for several minutes to accommodate. Maximum resting anal pressure (MRP), maximum voluntary pressure (MVP), sphincter endurance (SE), and maximum tolerated rectal volume (MTRV) were recorded.

Results

The results of anal endosonography and anorectal manometry are presented in the Tables 1, 2 and 3.

In anal endosonography, thinning of the IAS was visible in 4 patients (40%). Increased echogenicity of the IAS in 3 (30%) and ill-defined borders in 3 patients (30%). Tear of the IAS was visible in 4 cases (40%), including 1 woman with a history of operation for anovaginal fistula and 2 following obstetric trauma (non-symptomatic), and 1 man, where the reason of the IAS tear was unclear (congenital?). Defect of echogenicity of the EAS was visible in 5 cases (50%), tear in 1 patient (10%) (following obstetric trauma). Dynamic examination revealed good EAS and PR contraction in 7 patients (70%), and lack in 3 patients (30%).

Manometry revealed decreased maximum resting anal pressure suggesting dysfunction of the IAS in 7 cases (70%). Dysfunction of the EAS and PR was found in 7 patients (70%): decreased maximum voluntary pressure with shortage of sphincter endurance was seen in 6 patients (60%), in one case only decreased maximum voluntary pressure, and in another only shortage of the sphincter endurance indicated a defect of the EAS and PR, as well.

The correlation between AES and manometry for the IAS was found in 9 cases (90%). The correlation for the EAS endosonographic image and its manometric assessment was observed in 7 cases (70%), and the correlation for the endosonographic evaluation of its contraction and manometry in 6 cases (60%).

Full correlation (for all analyzed muscles: the IAS, EAS and PR) between endosonography and manometry was found in 4 patients (40%), in 2 patients (20%) for the IAS only, in 1 (10%) for the EAS only. In the remaining 3 cases, partial correlation was found (Table 1, cases 1, 6, 7).

Table 2. Anorectal manometry in patients operated for CD (sequence of patients as in table 1)

No	MRP	MVP	SE	MTRV
1.	40	53	10	90
2.	25	80	40	350
3.	80	138	15	140
4.	35	67	45	80
5.	50	195	40	80
6.	65	208	65	35
7.	40	92	30	70
8.	25	50	10	40
9.	40	216	42	60
10.	70	210	50	110
Normal values	60-80	100-250	>40	100-300

MRP = Maximum resting pressure [mmHg]; MVP = Maximum voluntary pressure [mmHg]; SE = Sphincter endurance [sec]; MTRV = Maximum tolerated rectal volume [ml]

Table 1. Anal endosonography in patients operated for CD

No	IAS				EAS			Lack of dynamic activity
	Thin [$<1\text{mm}$]	Increased echogenicity	Ill-defined borders	Tear	Thin	Scars	Tear	
1.	+					+		
2.	+	+	+		+	+		+
3.					+			
4.	+	+	+					
5.				+		+		+
6.	+	+	+			+		
7.				+		+		
8.				+			+	+
9.				+				
10.								

Table 3. Correlation between endosonographic and manometric assessment of anal sphincters

No	Correlation for IAS	Correlation for EAS	
		Endosonographic image	Dynamic activity
1	+	+	-
2	+	+	+
3	-	+	+
4	+	-	-
5	+	-	-
6	-	-	+
7	+	+	-
8	+	+	+
9	+	+	+
10	+	+	+

Normal image of the IAS was visible in 2 patients in AES, and manometry confirmed preserved resting pressure. In the remaining 8 cases with abnormal endosonographic image of the IAS, the correlation with manometry was found in 7 cases. In patients with normal image of the EAS (3 patients) manometry confirmed normal pressures in 2 out of 3 cases. Abnormal endosonographic image correlated with manometry in 5 out of 7 cases (71.4%). Lack of dynamic activity of the EAS and PR function found in 3 patient correlated with abnormal result of manometry, on the other hand, normal function of these muscles found in AES correlated with manometry in only 4 cases (4 out of 7; 57.1%).

Discussion

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

In CD of the rectum, AES enables visualization of the abscesses, fistulas, and carcinoma. Thickening of the rectal wall, and non-homogeneity of anal sphincters are well visible in AES, too, and all the above changes are detected earlier by means of AES than by traditional tests (endoscopy, barium studies).⁵

This study, though, presents a group of patients operated on for CD of the colon. Evaluation of anal sphincters in these patients is important before decision on reconstructive surgery. CD may affect anorectal function by impairing anal pressures and functional capacity of the rectum as a reservoir even in patients without any macroscopic rectal or anal lesions.³ Endosonographic assessment of the morphology of the anal sphincters and manometric measurements of their function allow such evaluation.⁶⁻⁹ Defects of anal sphincters were found in most of the patients (up to 80% in AES, and 70% in manometry). Only 2 patients had normal image of the IAS. Manometry confirmed this diagnosis. Even in the patients with abnormal image of the IAS (8 patients), manometry found decreased resting pressure in most of them (7 patients). Thinning of the IAS was the most frequent abnormality we observed in our study (4 patients). There are several causes of the thinning of the IAS, such as denervation, ischemia or a direct trauma to the IAS as a result of obstetric trauma (as it was in 3 of our patients). The possibility of the IAS degeneration, relevant with age and manifested typically as thinning that increased echogenicity and ill-defined borders of the IAS, was excluded because of young age of our patients (mean age 34.1 years). On the other hand, there were predominantly women in our group of patients (8 versus 2) and it has been shown in the literature¹⁰ that a relevant number of women who have had even uncomplicated deliveries endosonographically show sphincter defects.

The lack of dynamic activity of the EAS and PR was observed in 3 patients in AES. It was confirmed by manometry in all cases; however, normal function of these muscles in remaining 7 patients was confirmed manometrically in only 57% of the cases. Therefore, dynamic AES appeared to be a valuable adjunct to the examination at rest, especially sensitive in diagnosing non-functioning muscle.

Assessment of the anal sphincters in both anorectal manometry and anal endosonography in patients operated on for CD enables morphological and functional evaluation of the sphincters. It might be relevant for better patient selection for restoration of large bowel continuity after resection for CD. Incompetence of the sphincter is a contraindication for large bowel restorative surgery. Although our small study does not lead to ultimate conclusions, AES and manometry identified satisfactory correlation in most patients.

Conclusions

Anorectal monometry and anal endosonography are complementary methods in the assessment of the anal sphincters. In most patients operated on for CD of the large bowel, both methods revealed defects of morphology and function of anal sphincters and correlated in 90% of the IAS assessments, and in 70% of the evaluations of morphology and dynamic activity of the EAS. It seems that AES together with manometry may be a good combination for the assessment of the function of the anal sphincters in Crohn's Disease.

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