



RAPID COMMUNICATION

Referral for anorectal function evaluation is indicated in 65% and beneficial in 92% of patients

Maria M Szojda, Erik Tanis, Chris JJ Mulder, Richelle JF Felt-Bersma

Maria M Szojda, Erik Tanis, Chris JJ Mulder, Richelle JF Felt-Bersma, Department of Gastroenterology and Hepatology, VU University Medical Centre, PO Box 7057, 1007 MB Amsterdam, The Netherlands

Correspondence to: Maria M Szojda, Department of Gastroenterology and Hepatology, VU University Medical Centre, PO Box 7057, 1007 MB Amsterdam, The Netherlands. m.szojda@vumc.nl

Telephone: +31-20-4440613 Fax: +31-20-4440554

Received: October 1, 2007 Revised: November 15, 2007

Key words: Anorectal function evaluation; Fecal incontinence; Anal endosonography; Anal manometry

<http://dx.doi.org/10.3748/wjg.14.272>

Szojda MM, Tanis E, Mulder CJJ, Felt-Bersma RJF. Referral for anorectal function evaluation is indicated in 65% and beneficial in 92% of patients. *World J Gastroenterol* 2008; 14(2): 272-277

<http://www.wjgnet.com/1007-9327/14/272.asp>

Abstract

AIM: To determine the indicated referrals to a tertiary centre for patients with anorectal symptoms, the effect of the advised treatment and the discomfort of the tests.

METHODS: In a retrospective study, patients referred for anorectal function evaluation (AFE) between May 2004 and October 2006 were sent a questionnaire, as were the doctors who referred them. AFE consisted of anal manometry, rectal compliance measurement and anal endosonography. An indicated referral was defined as needing AFE to establish a diagnosis with clinical consequence (fecal incontinence without diarrhea, 3rd degree anal sphincter rupture, congenital anorectal disorder, inflammatory bowel disease with anorectal complaints and preoperative in patients for re-anastomosis or enterostoma, anal fissure, fistula or constipation). Anal ultrasound is always indicated in patients with fistula, anal manometry and rectal compliance when impaired continence reserve is suspected. The therapeutic effect was noted as improvement, no improvement but reassurance, and deterioration.

RESULTS: From the 216 patients referred, 167 (78%) returned the questionnaire. The referrals were indicated in 65%. Of these, 80% followed the proposed advice. Improvement was achieved in 35% and a reassurance in 57% of the patients, no difference existed between patient groups. On a VAS scale (1 to 10) symptoms improved from 4.0 to 7.2. Most patients reported no or little discomfort with AFE.

CONCLUSION: Referral for AFE was indicated in 65%. Beneficial effect was seen in 92%: 35% improved and 57% was reassured. Advice was followed in 80%. Better instruction about indication for AFE referral is warranted.

INTRODUCTION

Anorectal function evaluation (AFE) consists of several tests. Institutions differ in their selection of tests^[1]. At our tertiary centre, anal manometry, rectal compliance measurement and anorectal endosonography are performed as part of our standard procedure^[2]. Defecography and colon transit time are performed on strict indications. Neurophysiological tests of the pelvic floor are performed only for research purposes. Anal manometry establishes anal pressures while rectal compliance measures sensitivity and the volume of the rectum. Anal endosonography visualizes possible defects or atrophy of the anal sphincter complex. AFE is often requested in patients with anorectal symptoms including fecal incontinence, anal soiling, fistulas, anorectal tumours, anal pain, constipation *etc.* AFE is available in a limited number of hospitals, mainly academic centres and some large peripheral clinics.

A clinical referral (no research purposes) is indicated when disease can be demonstrated or excluded on the basis of AFE and when it has further therapeutical consequences. Which patients benefit most from anorectal function tests (by reduction of symptoms or reassurance) is unclear. Literature concerning this issue is scarce. Most studies that mention anorectal function tests in relation to anorectal pathology limit themselves to pre- and post-treatment results. Therefore, it often remains unclear whether AFE leads to relevant findings or subsequent change of therapy^[1-10]. A large multi-centre Dutch study referred to the value of AFE for outcome of physiotherapy in patients with fecal incontinence^[11]. One conclusion was that AFE had no predictive value for outcome of physiotherapy. Further, referral for AFE largely depended on availability of these tests in the referring hospital.

The aim of this study was to determine the indicated referrals to our tertiary center for patients with anorectal symptoms, the effect of the advice on their complaints and the perceived discomfort for the patients during AFE.

MATERIALS AND METHODS

Patients

All patients who were first clinical referrals for AFE between May 2004 and October 2006 were selected from our database. The database contained the complete medical history and extensive data of anorectal symptoms and anorectal test results. Deceased patients were excluded. All patients were sent a questionnaire. Additional data about follow-up in the outpatient clinic, hospital admittance, diagnostic and therapeutic procedures performed in our hospital could be retrieved from the (electronic) patient hospital files.

The Medical Ethical Commission of the VU University Medical Centre granted permission.

The referring doctors

The doctors who referred patients in the study period were also sent a questionnaire.

Anorectal function evaluation (AFE)

This consisted of anal manometry, rectal compliance measurement and anorectal endosonography according to our methods previously described elsewhere^[11].

Indicated referral

A referral is indicated when disease can be demonstrated or excluded on the basis of AFE and when it has further therapeutical consequences. These are patients with fecal incontinence without diarrhea, 3rd degree sphincter rupture with or without fecal incontinence, congenital disorders, patients with inflammatory bowel disease with anorectal complaints and preoperative in patients for re-anastomosis or enterostoma, anal fissure or constipation. In patients with fistula, an ultrasound is always indicated but anal manometry and rectal compliance measurement only on indication regarding fecal incontinence. Test results in all these patients influence management. In patients with constipation, AFE was considered indicated in suspected Hirschsprungs' disease and surgery. AFE was not considered indicated in patients with fissures treated conservatively, soiling (defined as anal discharge without overt fecal incontinence), anal pain and hemorrhoids, since results do not change management.

Questionnaires

The questionnaire for patients^[12] contained questions about the actual received therapy and changes in their symptoms by the received treatment, stated in a Visual Analogue Score (VAS) (score 1-10, 1 = very bad, 10 = very good) and also stated as (1) improved, (2) no change but reassurance or acceptance of situation without further need for seeking other medical advice and (3) worse and/or no reassurance. Discomfort and pain during the examination was scored with VAS (score 1-10, 1 = very

uncomfortable/painful, 10 = no discomfort/pain).

The questionnaire for the referring doctor^[12] consisted of questions about implementing the advice (yes, no), the quality of the advice (good, neutral, poor) and the willingness to refer again (yes, no).

Treatment advice strategy

The patients with symptoms of fecal incontinence were divided into five diagnostic subtypes: incontinence due to a sphincter defect, neurogenic incontinence, combined incontinence (sphincter defect and neurogenic), incontinence due to small rectal capacity and incontinence due to diarrhea. Patients with incontinence due to diarrhea were advised to have the cause of their diarrhea treated by the referring doctor.

All patients with fecal incontinence were prescribed fibres and physiotherapy. When unsuccessful additional therapy was advised depending of the cause. Patients with a sphincter defect > 25% were offered a sphincter repair. In patients with a small rectal compliance an enterostoma was proposed (< 60 mL) or strongly recommended (between 60 and 100 mL)^[12].

Patients with a known 3rd degree sphincter rupture and as a result fecal incontinence were advised as other patients with fecal incontinence and the strong advice for a cesarean section with a next childbirth. If they were not incontinent, depending on the size of the rupture, the possibility of a cesarean section for next childbirth was discussed.

Advising re-anastomosis or enterostoma depended on the total impression of the anorectal function measured with anal pressures, rectal compliance and sphincter defects or atrophy.

In patients with a fistula the extension of the fistula tract(s) with anal ultrasound determined the type of surgery in our hospital (fistulotomy in simple and curettage with mucosal advancement plasty in complicated fistulas).

Patients where AFE was not indicated also received an advice. In patients with constipation a fibre-enriched diet, additional fibres and laxatives were advised. When unsuccessful and not previously attempted, pelvic floor physiotherapy was advised. When constipation coexisted with complaints of prolapse, a defecography was advised. When surgery was considered (rectocele correction or colectomy) besides an AFE, also a colon transit time was performed. Patients with fissures were treated conservatively; when treatment failed they were referred to the surgeon and AFE was indicated. Hemorrhoids and mucosal prolapse were treated with rubber band ligation. A hemorrhoidectomy was advised only in refractory cases. Local causes of anal pain were treated according to their causes. When no local abnormalities were seen in patients with anal pain, fibres and referral to the anaesthesiologist was advised.

Statistical analysis

The results were described as mean with standard deviation. The χ^2 test for independence and for trend, the Kruskal-Wallis test and the Wilcoxon matched-pair test were used when appropriate (GraphPad InStat Software, San Diego, Ca, USA).

RESULTS

Response questionnaires

There were 216 first referrals for AFE, 181 (84%) females, mean age 51 years, (SD 15, range 15-82). Two patients had died. A total of 167 patients [137 females (82%), mean age 51 years, SD 15, range 16-82] returned an adequate (almost all questions answered) questionnaire (78%).

Indicated referrals

Table 1 shows the indicated referrals. Of the 167 referrals, 109 (65%) were indicated. The most frequent referral was fecal incontinence, from which 93% was indicated (7% had diarrhea).

Non-indicated referrals

Two of the 31 patients with constipation had signs of anismus during physical examination and anal manometry. Of the five patients with soiling, four had a mucosal prolapse and/or hemorrhoids. The fifth patient had an anal fissure on inspection, not previously found. In two patients with anal pain a fissure was found, one treated conservatively and one eventually much later with surgery. AFE revealed no abnormalities in all patients besides high rest pressure in the patients with fissures. AFE did not influence therapeutic advice.

Effect of treatment

Symptoms improved in 54 patients (35%). In 88 patients (57%) symptoms were unchanged but patients were reassured. Despite treatment, 12 patients (8%) deteriorated. The whole group improved one point on the VAS scale (5.1-6.1) ($P < 0.0001$), for those improved (35%) this was even 3.2 points (4.0-7.2). Both indicated and non indicated referred patients improved equally.

The causes of fecal incontinence were: sphincter defect (14), neurogenic (37), combined incontinence (10), incontinence due to diarrhea (5) and incontinence due to small rectal capacity (< 100 mL) (5). Within these groups, the largest improvement was seen in the combined incontinence group (1.8 point) ($P = 0.01$). Patients with a small rectal capacity had no improvement at all.

The actual therapies received by the patients according to the reason for referral are mentioned in Table 2. Some patients received several therapies. The most frequent advice was medication, mainly fibres.

Of all referred patients, only 17% were operated. No difference between effectiveness of conservative and surgical treatment could be observed on patient symptoms ($P = 0.09$).

AFE induced little stress, indicated by an average pain score of 7 (SD 2.7) and a discomfort score of 7.2 (SD 2.8). Two patients with fistulas experienced the examination as unpleasant and painful due to the hydrogen peroxide injection in their fistula tract during anal ultrasound. Thirty five females (26%) preferred to be examined by a female doctor while the remaining 102 (75%) had no preference. Twenty six males (93%) had no preference and the remaining two (7%) preferred a male and a female doctor, respectively ($P < 0.0001$). Dutch ethnic minorities did not influence these data.

Table 1 Indicated referrals in the main groups of patients

	All <i>n</i> (% of referrals)	Indicated <i>n</i> (% of that group)
Incontinence	71 (43)	66 (93) ¹
Constipation	31 (19)	6 (19) ²
3 rd sphincter rupture	21 (13)	21 (100)
Pain	9 (5)	0 (0)
Re-anastomosis/enterostoma	8 (5)	8 (100)
Soiling	5 (3)	0 (0)
IBD	4 (2)	4 (100)
Hemorrhoids	3 (2)	0 (0)
Anal atresia	2 (1)	2 (100)
Fistulas	2 (1)	2 (100)
Fissure	1 (1)	0 (0)
Other	9 (5)	0 (0)
Total	167 (100)	109 (65 ³)

¹Five patients with diarrhea not indicated; ²Only patients suspected of Hirschsprung/surgery indicated, IBD-inflammatory bowel disease;

³Percentage of all referrals.

Questionnaires referring doctors

Of the 214 questionnaires, 102 (48%) responses were obtained. The advice was nearly always implemented (96%). The quality of the advice was considered good in 76% and neutral in 24%. All doctors except one (98%) were willing to refer again.

Agreement between proposed and followed advice.

The proposed and followed therapies are shown in Table 3. Therapies could also be a combination of medication, physiotherapy or surgery. Dietary advice was always followed (100%), while surgical advice was generally followed (89%). Less accepted advice included medication (71%) and physiotherapy (73%) ($P = 0.005$, 99% CI).

DISCUSSION

The 78% response to the questionnaires of the patients was good. In our previous study we reported a similar result^[2]. Only 65% of the referrals were indicated. In 35% the diagnosis could have been established by clinical examination or added nothing. This is a signal that more communication and education is warranted, especially in times with restrictions and limited resources. However, many of the referred patients suffered from chronic symptoms, bringing both patient and doctor to despair. The possibility of referring the patients to another centre may come as a welcome alternative. The symptoms of the whole group improved an average of one point from 5.1 to 6.1 on a ten-point scale. Actual improvement took place in 35% of the referred patients; they improved an average of 3.2 points. The moderate improvement might be explained by the fact that it concerned patients with chronic disorders, already treated conservatively for a long time. Success was not related to a specific symptom, diagnosis or treatment, only the five patients with fecal incontinence due to small rectal capacity did not improve. Deterioration in 8% of the patients was mainly due to the fluctuating course of the chronic complaints combined with their reluctance to follow the advice. In 80% of patients, advice was followed. Medication and

Table 2 Reason for referral and effect of treatment on patients

Reason for referral	Patients	Treatment according to the patients						Symptoms change after treatment				
		Treatment ¹	Diet n (%)	Medication n (%)	Surgery n (%)	Physiotherapy n (%)	Expectative n (%)	VAS		Category		
								Before	After	Improved	Reassured	Worse
Incontinence ²	71	100	8	32	12 ³	26	22	5	5.7	20	39	7
Constipation	31	35	3	12	3 ⁴	7	10	5	6.2	11	17	1
3 rd sphincter rupture	21	22	2	1		2	17	7.1	7.2	2	15	1
Anal pain	9	8		1	1 ⁵		6	3.5	5.1	3	5	
Surg/Stoma	8	8			6		2	6.3	7	2	4	
Soiling	5	7	2	3	2			3.4	4.8	3	1	1
IBD	4	4		2			2	4.8	6.5	2	2	
Hemorrhoids	3	6	1	3	2 ⁶			4.3	6.3	2	1	
Anal atresia	2	2		1			1	6	7.5	2		
Fistula	2	2					2	4	5.5	1	1	
Fissure	1	2		1	15			2	8	1		
Pouchitis	1	1					1	8	7			1
Other	9	12	1	1	8	1	1	5.1	6.7	5	3	1
Average (SD)								5.1 ^b (2.4)	6.1 ^b (2.3)			
Total (%)	167	209	17 (8)	57 (27)	35 (17)	36 (16)	64 (31)			54 (35)	88 (57)	12 (8)

¹Treatment as answered by patients, several treatments per patient possible; ²Including all subgroups; ³Sphincter repair; ⁴Rectocele repair; ⁵Fissurectomy; ⁶Hemorrhoidectomy. ^bP < 0.0001.

Table 3 A comparison between the proposed therapeutic advice and followed therapy. A therapy can consist of more components

	All therapies (%)	Diet (%)	Medication (%)	Physiother (%)	Expectative (%)	Surgery (%)
Followed	130 (80)	7 (100)	54 (71)	32 (73)	31 (100)	36 (90)
Not followed	32 (20)	0	22 (29)	12 (27)	0	4 (10)
Total	162 (100)	7 (100)	76 (100)	44 (100)	31 (100)	40 (100)

physiotherapy were the least applied therapies (Table 3). Some disagreement between advised and followed therapy could be explained by the fact that patients considered fibres a diet instead of medication. Physiotherapy was advised in 44 patients (26%) and effectuated in 32 (73%). Ten years ago this was only respectively 18% and 67%^[2]. Increasing interest in pelvic floor disorders and special training for physiotherapists has certainly contributed to the change in attitude towards physiotherapy^[1,13]. Although therapeutic advice was given after AFE, actual improvement in symptoms is not necessarily caused by AFE. A placebo effect due to the referral to a specialized centre and the knowledge present in a 3rd referral centre may play a role. This is comparable with biofeedback studies for fecal incontinence, where the added value of the biofeedback was very difficult to separate from the received specialized care and treatment^[13,14].

The examination was generally well tolerated, except in two patients with fistulas who reported the examination as painful. This was caused by local injection of hydrogen peroxide into the external fistula opening in order to visualize the fistula tract. It was remarkable that ten years ago only 13% of the females^[2] and now 26% of the females preferred a female doctor. The larger number of referred Dutch ethnic minorities could not explain this.

Although the questionnaire was retrospective and has not been officially validated (we had used it before^[2]), it has proven to be very useful. Questions about for instance

surgery or 3-6 mo of physiotherapy could not easily be misunderstood. In patients treated in our own hospital follow up data were also obtained from the (electronic) patient files and no discrepancies were found with the answers provided by these patients.

Our treatment advice strategy is derived from clinical practice and the literature. In patients with fecal incontinence, regulating defecation and thickening of the fecal mass has proven to be effective and should always be tried first^[15-17]. Biofeedback aimed at improving rectal sensation, recto-anal coordination and training external anal sphincter contraction is the next step and has a success rate varying from 40%-85% and is closely related to patient motivation^[18]. Diarrhea should be properly diagnosed and treated before referring the patient for AFE since this overwhelming factor makes it impossible to establish the (possible) importance of anorectal causes. A rectal capacity between 60 and 100 mL will lead to fecal incontinence in 50% and < 60 mL in 100% of patients^[12]; they will often need an enterostoma. Patients with fecal incontinence with a significant sphincter defect (> 25%) without severe neuropathy leading to atrophy can be identified as suitable candidates for a sphincter repair^[1,19-21].

In our group of incontinent patients, only 12 (18%) ultimately underwent sphincter repair. Two patients were later referred for sacral neuromodulation elsewhere and eleven patients^[22] were treated with SECCA[®] (radio frequent energy application to the external sphincter^[23,24]).

Women who experienced a 3rd degree sphincter rupture are indicated for AFE, even without complaints. There is always some damage to the external anal sphincter and appropriate advice concerning defecation regulation, physiotherapy and possible future cesarean section can be discussed.

Most patients with constipation were referred for assessment of anismus/hyper tonic pelvic floor or rectocele. Generally AFE is not needed in these patients. Both anismus and a rectocele can be diagnosed by proper rectal examination^[6,25,26]. When prolapse complaints dominate a defecography is indicated to demonstrate a possible enterocele as this can be corrected surgically. In patients with constipation, correction is not indicated in accidentally found intussusception since the obstructed defecation will not improve^[26-29]. AFE is indicated when (partial) colectomy is considered to be informed about the continence reserve. For patients with fistulas anal endosonography demonstrates the fistula tracts and anal manometry will establish the continence reserve^[21,30-33]. In patients with soiling (anal secretion), medical history, good physical and rectal examination and an additional proctoscopy have proven to be sufficient to establish a diagnosis^[10], without the need for AFE, as was shown again in our patients. For patients with pain, AFE does not contribute^[34]. Suspected discrete abnormalities e.g. an occult abscess, could not be demonstrated in our study as well. Sometimes a fissure is found in these patients, diagnosed on the basis of the medical history and rectal examination. In patients with a fissure, high pressures are usually found using manometry, but this does not alter therapy^[35]. Only in those who where conservative measures have failed and will undergo surgery AFE seems indicated. In patients with haemorrhoids, anal manometry can also reveal high pressures and anal endosonography can demonstrate a thickened mucosa; however, these findings have no influence on therapy^[36,37]. AFE is indicated in patients with an enterostoma when re-anastomosis is considered. In some rare disorders like anal atresia AFE can also be indicated to document anorectal problems and help choose a specific therapy.

In conclusion, referral for AFE was indicated in 65%, communication and education to colleagues seems warranted. Indications are fecal incontinence without diarrhea, 3rd degree sphincter rupture, pre-operative for stoma or re-anastomosis, fistula, fissures or constipation. Anal ultrasound is always indicated in patients with fistula, anal manometry and rectal compliance when impaired continence reserve is suspected. Generally, in patients with constipation and soiling the medical history, physical examination and additional proctoscopy is sufficient and AFE is not necessary.

In 80% of patients, advice was followed. After AFE 92% benefited (35% of the patients improved and 57% was reassured). AFE is well tolerated. Women preferred a female doctor in 26% of cases.

COMMENTS

Background

Anorectal disorders like fecal incontinence, peri-anal fistula, pre-operative

decisions for stoma are distressing and isolating conditions, with a large impact on quality of life. With restricted resources it is important to make a good selection of referrals for anorectal function evaluation, those patients who benefit most. In this study we established the indicated referrals to our tertiary referral centre for patients with anorectal symptoms, the effect of the advised treatment and the discomfort of the tests.

Research frontiers

A clinical referral is indicated when disease can be demonstrated or excluded on the basis of anorectal function evaluation and when it has further therapeutical consequences. Which patients benefit the most from anorectal function tests (by reduction of symptoms or reassurance) is unclear.

Innovations and breakthroughs

Most studies mention anorectal function tests in relation to anorectal pathology and limit themselves to pre- and post-treatment results. Therefore it often remains unclear whether anorectal function evaluation leads to relevant findings or subsequent change of therapy. Literature concerning this issue is scarce. The aim of our study was to determine the indicated referrals to our tertiary center for patients with anorectal symptoms, the effect of advice on their complaints and the perceived discomfort for the patients during anorectal function evaluation.

Applications

It is very important to understand the usefulness of the anorectal function evaluation to provide referrals of those patients, which could benefit the most. Indications for anorectal function evaluation are fecal incontinence without diarrhea, 3rd degree sphincter rupture, pre-operative for stoma or re-anastomosis, fistula, fissures or constipation. Anal ultrasound is always indicated in patients with fistula, anal manometry. Rectal compliance is indicated when impaired continence reserve is suspected. Generally, in patients with constipation and soiling the medical history, physical examination and additional proctoscopy is sufficient and anorectal function evaluation is not necessary.

Terminology

Anorectal function evaluation consists of several tests: (1) anal manometry: establishes anal pressures; (2) rectal compliance: measures sensitivity and the volume of the rectum; (3) anal endosonography: visualizes possible defects or atrophy of the anal sphincter complex.

Peer review

The manuscript presents referral patterns for anal function investigation. Although the study has all limitations of a retrospective study, the authors provide valuable information from their experience as tertiary care center for patients with anorectal symptoms.

REFERENCES

- 1 Deutekom M, Terra MP, Dobben AC, Dijkgraaf MG, Felt-Bersma RJ, Stoker J, Bossuyt PM. Selecting an outcome measure for evaluating treatment in fecal incontinence. *Dis Colon Rectum* 2005; **48**: 2294-2301
- 2 Felt-Bersma RJ, Poen AC, Cuesta MA, Meuwissen SG. Referral for anorectal function evaluation: therapeutic implications and reassurance. *Eur J Gastroenterol Hepatol* 1999; **11**: 289-294
- 3 van Ginkel R, Buller HA, Boeckstaens GE, van Der Plas RN, Taminiou JA, Benninga MA. The effect of anorectal manometry on the outcome of treatment in severe childhood constipation: a randomized, controlled trial. *Pediatrics* 2001; **108**: E9
- 4 Vaizey CJ, Kamm MA. Prospective assessment of the clinical value of anorectal investigations. *Digestion* 2000; **61**: 207-214
- 5 Keating JP, Stewart PJ, Eysers AA, Warner D, Bokey EL. Are special investigations of value in the management of patients with fecal incontinence? *Dis Colon Rectum* 1997; **40**: 896-901
- 6 Bharucha AE. Update of tests of colon and rectal structure and function. *J Clin Gastroenterol* 2006; **40**: 96-103
- 7 Hill K, Fanning S, Fennerty MB, Faigel DO. Endoanal ultrasound compared to anorectal manometry for the evaluation of fecal incontinence: a study of the effect these tests have on clinical outcome. *Dig Dis Sci* 2006; **51**: 235-240

- 8 **Rao SS**, Mudipalli RS, Stessman M, Zimmerman B. Investigation of the utility of colorectal function tests and Rome II criteria in dyssynergic defecation (Anismus). *Neurogastroenterol Motil* 2004; **16**: 589-596
- 9 **Mimura T**, Kaminishi M, Kamm MA. Diagnostic evaluation of patients with faecal incontinence at a specialist institution. *Dig Surg* 2004; **21**: 235-241; discussion 241
- 10 **Felt-Bersma RJ**, Janssen JJ, Klinkenberg-Knol EC, Hoitsma HF, Meuwissen SG. Soiling; anorectal function and results of treatment. *Int J Colorectal Dis* 1989; **4**: 37-40
- 11 **Sloots CE**, Meulen AJ, Felt-Bersma RJ. Rectocele repair improves evacuation and prolapse complaints independent of anorectal function and colonic transit time. *Int J Colorectal Dis* 2003; **18**: 342-348
- 12 **Felt-Bersma RJ**, Sloots CE, Poen AC, Cuesta MA, Meuwissen SG. Rectal compliance as a routine measurement: extreme volumes have direct clinical impact and normal volumes exclude rectum as a problem. *Dis Colon Rectum* 2000; **43**: 1732-1738
- 13 **Ozturk R**, Niazi S, Stessman M, Rao SS. Long-term outcome and objective changes of anorectal function after biofeedback therapy for faecal incontinence. *Aliment Pharmacol Ther* 2004; **20**: 667-674
- 14 **Norton C**, Chelvanayagam S, Wilson-Barnett J, Redfern S, Kamm MA. Randomized controlled trial of biofeedback for fecal incontinence. *Gastroenterology* 2003; **125**: 1320-1329
- 15 **Bliss DZ**, Jung HJ, Savik K, Lowry A, LeMoine M, Jensen L, Werner C, Schaffer K. Supplementation with dietary fiber improves fecal incontinence. *Nurs Res* 2001; **50**: 203-213
- 16 **Hsieh C**. Treatment of constipation in older adults. *Am Fam Physician* 2005; **72**: 2277-2284
- 17 **Khaikin M**, Wexner SD. Treatment strategies in obstructed defecation and fecal incontinence. *World J Gastroenterol* 2006; **12**: 3168-3173
- 18 **Norton C**, Cody JD, Hosker G. Biofeedback and/or sphincter exercises for the treatment of faecal incontinence in adults. *Cochrane Database Syst Rev* 2006; **3**: CD002111
- 19 **Deutekom M**. Faecal incontinence: Impact, treatment and diagnostic work-up. PhD thesis. University of Amsterdam: Buitenvrijn & Schipper, editor, 2005; 1
- 20 **Felt-Bersma RJ**, Cazemier M. Endosonography in anorectal disease: an overview. *Scand J Gastroenterol Suppl* 2006; 165-174
- 21 **Dobben AC**, Terra MP, Deutekom M, Bossuyt PM, Felt-Bersma RJ, Stoker J. Diagnostic work-up for faecal incontinence in daily clinical practice in the Netherlands. *Neth J Med* 2005; **63**: 265-269
- 22 **Felt-Bersma RJ**, Szojda MM, Mulder CJ. Temperature-controlled radiofrequency energy (SECCA) to the anal canal for the treatment of faecal incontinence offers moderate improvement. *Eur J Gastroenterol Hepatol* 2007; **19**: 575-580
- 23 **Efron JE**, Corman ML, Fleshman J, Barnett J, Nagle D, Birnbaum E, Weiss EG, Nogueras JJ, Sligh S, Rabine J, Wexner SD. Safety and effectiveness of temperature-controlled radio-frequency energy delivery to the anal canal (Secca procedure) for the treatment of fecal incontinence. *Dis Colon Rectum* 2003; **46**: 1606-1616; discussion 1616-1618
- 24 **Takahashi T**, Garcia-Osogobio S, Valdovinos MA, Mass W, Jimenez R, Jauregui LA, Bobadilla J, Belmonte C, Edelstein PS, Utley DS. Radio-frequency energy delivery to the anal canal for the treatment of fecal incontinence. *Dis Colon Rectum* 2002; **45**: 915-922
- 25 **Smout AJ**. Manometry of the gastrointestinal tract: toy or tool? *Scand J Gastroenterol Suppl* 2001; : 22-28
- 26 **Savoye G**, Leroi AM, Bertot-Sassigneux P, Touchais JY, Devroede G, Denis P. Does water-perfused catheter overdiagnose anismus compared to balloon probe? *Scand J Gastroenterol* 2002; **37**: 1411-1416
- 27 **Dvorkin LS**, Gladman MA, Scott SM, Williams NS, Lunniss PJ. Rectal intussusception: a study of rectal biomechanics and visceroperception. *Am J Gastroenterol* 2005; **100**: 1578-1585
- 28 **Takahashi T**, Yamana T, Sahara R, Iwadore J. Enterocoele: what is the clinical implication? *Dis Colon Rectum* 2006; **49**: S75-S81
- 29 **Hwang YH**, Person B, Choi JS, Nam YS, Singh JJ, Weiss EG, Nogueras JJ, Wexner SD. Biofeedback therapy for rectal intussusception. *Tech Coloproctol* 2006; **10**: 11-15; discussion 15-16
- 30 **Karlsson U**, Lundin E, Graf W, Pahlman L. Anorectal physiology in relation to clinical subgroups of patients with severe constipation. *Colorectal Dis* 2004; **6**: 343-349
- 31 **West RL**, Dwarkasing S, Felt-Bersma RJ, Schouten WR, Hop WC, Hussain SM, Kuipers EJ. Hydrogen peroxide-enhanced three-dimensional endoanal ultrasonography and endoanal magnetic resonance imaging in evaluating perianal fistulas: agreement and patient preference. *Eur J Gastroenterol Hepatol* 2004; **16**: 1319-1324
- 32 **West RL**, Zimmerman DD, Dwarkasing S, Hussain SM, Hop WC, Schouten WR, Kuipers EJ, Felt-Bersma RJ. Prospective comparison of hydrogen peroxide-enhanced three-dimensional endoanal ultrasonography and endoanal magnetic resonance imaging of perianal fistulas. *Dis Colon Rectum* 2003; **46**: 1407-1415
- 33 **Whiteford MH**, Kilkenny J 3rd, Hyman N, Buie WD, Cohen J, Orsay C, Dunn G, Perry WB, Ellis CN, Rakinic J, Gregorcyk S, Shellito P, Nelson R, Tjandra JJ, Newstead G. Practice parameters for the treatment of perianal abscess and fistula-in-ano (revised). *Dis Colon Rectum* 2005; **48**: 1337-1342
- 34 **Wald A**. Anorectal and pelvic pain in women: diagnostic considerations and treatment. *J Clin Gastroenterol* 2001; **33**: 283-288
- 35 **Ram E**, Alper D, Stein GY, Bramnik Z, Dreznik Z. Internal anal sphincter function following lateral internal sphincterotomy for anal fissure: a long-term manometric study. *Ann Surg* 2005; **242**: 208-211
- 36 **Alper D**, Ram E, Stein GY, Dreznik Z. Resting anal pressure following hemorrhoidectomy and lateral sphincterotomy. *Dis Colon Rectum* 2005; **48**: 2080-2084
- 37 **Holzheimer RG**. Hemorrhoidectomy: indications and risks. *Eur J Med Res* 2004; **9**: 18-36

S- Editor Langmann T L- Editor Roberts SE E- Editor Lu W