

# World Journal of *Gastroenterology*

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2014-2017

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## Retrospective Cohort Study

**Hypothesized summative anal physiology score correlates but poorly predicts incontinence severity**

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**Abstract****AIM**

To explore the relationship between such a construct and an existing continence score.

**METHODS**

A retrospective study of incontinent patients who underwent anal physiology (AP) was performed. AP results and Cleveland Clinic Continence Scores (CCCS) were extracted. An anal physiology score (APS) was developed using maximum resting pressures (MRP), anal canal length (ACL), internal and external sphincter defects and pudendal terminal motor latency. Univariate associations between each variable, APS and CCCS were assessed. Multiple regression analyses were performed.

**RESULTS**

Of 508 (419 women) patients, 311 had both APS and CCCS measured. Average MRP was 51 mmHg (SD

23.2 mmHg) for men and 39 mmHg (19.2 mmHg) for women. Functional ACL was 1.7 cm for men and 0.7 cm for women. Univariate analyses demonstrated significant associations between CCCS and MRP ( $P = 0.0002$ ), ACL ( $P = 0.0006$ ) and pudendal neuropathy ( $P < 0.0001$ ). The association between APS and CCCS was significant ( $P < 0.0001$ ) but accounted for only 9.2% of the variability in CCCS. Multiple regression showed that the variables most useful in predicting CCCS were external sphincter defect, pudendal neuropathy and previous pelvic surgery, but only improving the scores predictive ability to 12.5%.

### CONCLUSION

This study shows that the ability of AP tests to predict continence scores improves when considered collectively, but that a constructed summation model before and after multiple regression is poor at predicting the variability in continence scores.

**Key words:** Incontinence; Anal physiology; Anal canal; Anal ultrasound; Manometry; Electromyography

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**Core tip:** This study explored the relationship between a hypothesized anal physiology score combining rankings from maximal manometric resting pressures and anal canal length, ultrasound proportions of anal canal length of internal and external anal sphincters which were intact, and bilateral pudendal nerve terminal motor latencies; with the Cleveland Clinic Continence Score. The association between physiology and continence scores was significant but accounted for only 9.2% of the variability. The most useful variables predicting continence score were proportion of external sphincter intact, pudendal neuropathy and previous pelvic surgery. This study shows anal physiology tests predict continence scores better when considered collectively.

Young CJ, Zahid A, Koh CE, Young JM. Hypothesized summative anal physiology score correlates but poorly predicts incontinence severity. *World J Gastroenterol* 2017; 23(31): 5732-5738 Available from: URL: <http://www.wjgnet.com/1007-9327/full/v23/i31/5732.htm> DOI: <http://dx.doi.org/10.3748/wjg.v23.i31.5732>

## INTRODUCTION

The extent of anal incontinence often determines the most appropriate treatment and facilitates monitoring treatment response<sup>[1]</sup>. Measuring anal incontinence severity is complex and requires considering the separate elements of gas, liquid, and solid, the frequency, the circumstances (*e.g.*, diarrhea), and impact on lifestyle and pad use<sup>[2-4]</sup>. Since the first grading

system described by Browning and Parks, numerous grading scores have been developed, each with varying utility<sup>[5,6]</sup>. The importance of subjective assessments in a symptom-based condition such as incontinence is well established<sup>[1,6]</sup>.

The preponderance of available continence scores indicates that none is perfect. Incontinence is a heterogeneous condition including groups of patients with soiling rather than frank liquid stool incontinence, yet few continence scores make that distinction between the two<sup>[6,7]</sup>. Though continence scores are often taken as surrogate measures of anorectal function with higher continence scores associated with worse anorectal function, they usually correlate poorly with anorectal physiology<sup>[6,8]</sup>. Continence scores reflect patient perception of the severity and burden of incontinence, but are often unhelpful in guiding treatment choice<sup>[8]</sup>.

An objective measure that quantifies anal function and could be extrapolated to incontinence was considered as being desirable in providing clinicians with an alternative grading scale, which could also be useful in guiding treatment selection or predicting treatment response. Since no single anal physiology (AP) test is capable of thoroughly assessing anorectal function, such a measure could be derived using several different anal physiology tests. It is important to note that such a measure does not replace continence scores but serves to complement in the assessment of incontinence.

It was hypothesized that a summation measure that considered anal physiology tests collectively would correlate with continence scores better than when they were considered individually.

## MATERIALS AND METHODS

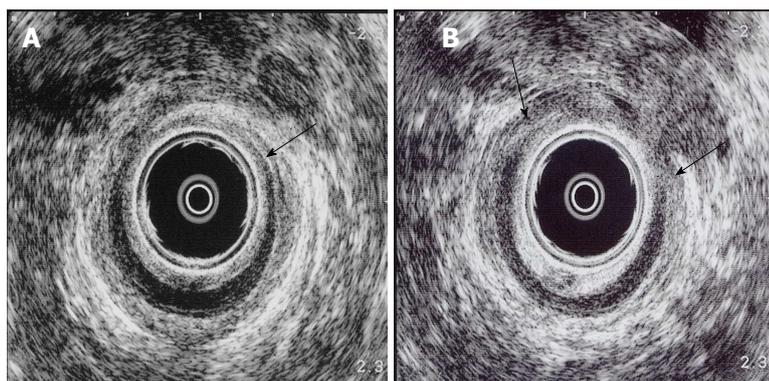
### Study design

A retrospective study of consecutive patients presenting for anal physiology with a single colorectal surgeon for anal incontinence at the Royal Prince Alfred Hospital between 1999 and 2006 was carried out. All patients routinely underwent anorectal manometry, endoanal ultrasound (EUS) and pudendal terminal motor latency (PNTML).

Anal physiology study results and continence scores were extracted from a prospectively maintained electronic database and medical records. Data collection began after written approval from the local human research and ethics committee was obtained.

### Anorectal manometry

Anorectal manometry was performed using a Stryker manometer (Stryker Corp, San Jose, CA, United States) with a station pull-through technique. After a thorough inspection of perineum for surgical scars or asymmetry in skin corrugations, the catheter is gently introduced into the anal canal before digital examination to avoid pressure artifacts. Six resting pressures were measured at 1 cm intervals in a craniocaudal direction. The point with the highest resting pressure was taken



**Figure 1** All internal and external anal sphincter lengths found on endoanal ultrasound. A: Internal anal sphincter defect (arrowed) of the mid anal canal on endoanal ultrasound; B: External anal sphincter defect (arrowed) of the mid anal canal on endoanal ultrasound.

Table 1 Hypothesized anal physiology score					
	Maximum resting pressure (mmHg)	Anal canal length (cm)	Internal sphincter defect	External sphincter defect	PNTML
0	> 40	> 3	Intact	Intact	Normal
1	> 30, ≤ 40	> 2, ≤ 3	≤ ¼ defect	≤ ¼ defect	-
2	> 20, ≤ 30	> 1, ≤ 2	> ¼, ≤ ½	> ¼, ≤ ½	Unilateral neuropathy
3	> 10, ≤ 20	> ½, ≤ 1	> ½, ≤ ¾	> ½, ≤ ¾	-
4	≤ 10	≤ ½	> ¾	> ¾	Bilateral neuropathy

PNTML: Pudendal terminal motor latency.

as the site of the high-pressure zone and this was the position at which squeeze pressures were measured.

### Endoanal ultrasound

EUS was performed using a 10 MHz Bruel and Kjaer rotating endoprobe with the patient in left lateral position. Sphincter defects were graded according to the longitudinal extent of sphincter defect. Sphincter quality is graded as either homogeneous or heterogeneous. Hard copies of sonographic images at the level of puborectalis, upper anal canal, mid anal canal and lower anal canal were also obtained so that sphincter thickness could be measured.

### Pudendal nerve terminal motor latency

PNTML was measured using a glove mounted St. Mark's electrode with the patient in left lateral position. Three readings on each side with a satisfactory electrical tracing were taken with the shortest latency being recorded as the PNTML. Prolonged latency was defined as PNTML ≥ 2.2 ms.

### Anal physiology score

The hypothesized anal physiology score (APS) consisted of variables derived from manometry, EUS and PNTML. Manometry, EUS, and PNTML were chosen because these are the most commonly used anorectal physiology tests for incontinence investigation and the

most likely to be informative and incorporated into clinical practice<sup>[8,9]</sup>.

The five variables in the hypothesized APS were maximum resting pressure, anal canal length, internal sphincter defects, external sphincter defects and PNTML (Table 1). Individual variables were rated from zero to four; giving a possible APS value that ranged from zero to twenty where zero was hypothesized as associated with continence and twenty with incontinence. The worse the resting pressure, the shorter the anal canal length, the worse the sphincter defects and the worse the neuropathy, the higher the APS and therefore the worse the incontinence was anticipated to be.

Anal canal length was calculated using the technique described by Hool *et al*<sup>[10]</sup> using 30 mmHg as a cutoff. Although a study by Morgado *et al*<sup>[11]</sup> found mean pressures to be a better measure than maximum pressures, using mean resting pressures and anal canal length as variables would have led to repeated use of the same measurements. Choices of variables with EUS were sphincter defects, sphincter thickness, and sphincter morphology. Internal and external sphincter defects were chosen as the third and fourth variables because the main strength of EUS is its ability to detect sphincter defects<sup>[3,12]</sup>. All internal and external anal sphincter lengths found on EUS, specifically designation as fully intact or the proportion intact and proportion non-intact due to defects, were recorded by Author (Young CJ) at the time of EUS (Figure 1). This was measured relative to the length of anal canal found at EUS, whether intact or not, from the lower anal canal to puborectalis, allowing for rank classification of 0-4 as shown in Table 1. External anal sphincter thickness was explored as a potential variable but was considered difficult because the outer boundary of the external sphincter is often difficult to discern as it merges with surrounding fibro-fatty tissue. Its utility remains controversial<sup>[13-17]</sup>. Sphincter morphology was not chosen because the value of sphincter morphology remains to be determined in the available literature<sup>[18]</sup>. Finally, PNTML was included to complement manometry and EUS in the global assessment of anal function.

**Table 2 Cleveland Clinic Continence Score<sup>[4]</sup>**

	Never	Rarely < 1/mo	Sometimes ≥ 1/mo	Usually ≥ 1/wk	Always ≥ 1/d
Gas	0	1	2	3	4
Liquid	0	1	2	3	4
Solids	0	1	2	3	4
Pads	0	1	2	3	4
Lifestyle	0	1	2	3	4

**Table 3 Patient demographics for 508 patients presenting with faecal incontinence *n* (%)**

	Men	Women
<i>n</i>	89 (17.5)	419 (82.5)
mean Age	57.8 (SD 15.1)	60.3 (SD 14.1)
Diabetes		
Yes	10 (11.2)	17 (4.1)
No	72 (80.9)	362 (86.4)
Irritable bowel syndrome		
Yes	9 (10.1)	16 (3.8)
No	73 (82.0)	363 (86.6)
Urinary incontinence		
Yes	9 (10.1)	42 (10.0)
No	73 (82.0)	365 (87.0)
Previous pelvic surgery		
Yes	13 (14.6)	197 (47.0)
No	70 (78.7)	184 (43.9)
Hysterectomy	-	148 (35.3)
Anterior resection	8 (9.0)	11 (2.6)
Rectopexy	3 (3.4)	15 (3.6)
Zaccharin's procedure	-	45 (10.7)
Bladder procedure	-	45 (10.7)
Previous OSR	-	12 (2.9)
Other gynae surgery	-	48 (11.5)
Prostatectomy	6 (6.7)	-
Anorectal surgery		
Yes	37 (41.6)	85 (20.3)
No	45 (50.6)	373 (89.0)
Hemorrhoidectomy	17 (19.1)	34 (8.1)
Sphincterotomy	4 (4.5)	9 (2.1)
Anal dilatation	0 (0)	6 (1.4)
Fistulotomy	8 (9.0)	13 (3.1)

Total percentages may not add up to 100% because of missing data, other categories which have not been included in this table for simplicity or because patients might have had more than one procedure.

**Continence scores**

Cleveland Clinic Continence Scores (CCCS) were also collected (Table 2)<sup>[3]</sup>.

**Statistical analysis**

The analysis was performed using SAS (SAS Institute Inc, 2005). APS variables were expressed as means with standard deviations and medians with inter-quartile ranges. Univariate associations between individual APS variables and CCCS were first analyzed using an ANOVA procedure. The association between APS and CCCS was assessed next. In order to determine whether different combinations of variables could provide a more predictive model and to adjust for potential confounding variables, multiple regression was undertaken. All variables (including clinical information) that were

significant or near significant (*P* < 0.1) in univariate analyses were included in the full base model. A manual backwards stepwise approach was then used to eliminate variables from the model in order of least significance. R<sup>2</sup> values were used to calculate the proportion of variability in CCCS that was explained by the model. Gender differences were analyzed using Wilcoxon rank sum test for the continuous variables and chi-square tests for categorical variables.

**RESULTS**

**Patients**

There were 508 (419 females) patients over the eight-year study period with a mean age of 57.8 for men and 60.3 for women (Table 3). The prevalence of urinary incontinence was similar between men and women in our cohort and was 10%. Women were much more likely to have had pelvic surgery with the most common procedure being hysterectomy followed by a range of gynecological procedures mainly for pelvic prolapse. Men were much more likely to have had anorectal surgery with hemorrhoidectomy being the most common procedure (Table 3).

Manometry and EUS results were available in all 508 patients. PNTML was unavailable in 34 patients due to faulty software resulting in PNTML being available in 474 patients. CCCS was available in 397 patients. Of 508 patients, 311 patients had adequate data to derive both APS and CCCS. The distribution for each APS variable is shown in Table 4. All APS variables were significantly different between men and women, except for internal sphincter defect. Almost 80% of men had normal pudendal nerve function while only 46% of women did. Women were at least four times more likely than men to have unilateral or bilateral neuropathy.

**Univariate associations**

Univariate associations between each APS variable and CCCS is shown in Table 5. Maximum resting pressures, anal canal length, and pudendal neuropathy were all significantly associated with CCCS but the associations between internal or external sphincter defects and CCCS were not statistically significant.

The mean APS value was 7.2 (SD 4.1). The association between the derived APS and CCCS was also highly significant (*P* < 0.0001) with a Pearson correlation coefficient of 0.3. However, the R<sup>2</sup> was 0.092 meaning that APS was only able to explain 9.2% of the variability in CCCS.

**Multiple regressions**

Following multiple regression modeling, only external sphincter defect, pudendal neuropathy and previous pelvic surgery were significant and independent predictors of CCCS (Table 6). After adjusting for the other variables in the model maximum resting pressure and anal canal length were not significantly associated with CCCS, whereas external sphincter became significant.

**Table 4** Distribution of anal physiology score variables by gender

	Men	Women	P value	Mean reference range
Maximum RP (mmHg)				Men: 50-80 Women: 30-60
Mean	51.0 (SD 23.2)	38.8 (SD 15.6)	< 0.0001	
Median	52.0 (IQR 33.5)	38.0 (IQR 22.5)		
ACL (cm)				Men: 2.5-3.5 Women: 2.0-3.0
Mean	1.7 (SD 1.4)	0.7 (SD 0.8)	< 0.0001	
Median	2.0 (IQR 2.8)	0.5 (IQR 1.0)		
IAS defect				
Intact	61 (68.5)	286 (68.3)	0.7	-
≤ ¼ defect	0 (0.0)	4 (1)	(c2 = 2.4, df = 4)	
> ¼, ≤ ½	12 (13.5)	49 (11.7)		
> ½, ≤ ¾	2 (2.2)	21 (5.0)		
> ¾	14 (15.7)	59 (14.1)		
EAS defect				
Intact	85 (95.5)	305 (73.0)	< 0.0001	-
≤ ¼ defect	0 (0.0)	2 (0.5)	(c2 = 21.7, df = 4)	
> ¼, ≤ ½	2 (2.2)	62 (14.8)		
> ½, ≤ ¾	1 (1.1)	36 (8.6)		
> ¾	1 (1.1)	13 (3.1)		
Pudendal Neuropathy				
Normal	70 (78.7)	191 (45.6)	< 0.0001	2.20 ms
Unilateral	3 (3.4)	67 (16.0)	(c2 = 43.1, df=2)	
Bilateral	6 (6.7)	137 (32.7)		
Mean CCCS	5.9	8	0.001	-

CCCS: Cleveland Clinic Continence Scores; ACL: Anal canal length.

In combination, external sphincter defect, pudendal neuropathy and previous pelvic surgery accounted for 12.5% of the variability in CCCS.

## DISCUSSION

This study shows that anal physiology tests can predict continence scores better when considered collectively rather than individually. While aiming to develop an objective score quantifying anal function and thereby incontinence, we showed that the APS only accounted for 9.2% of the variability in CCCS. The remaining variability suggests that there are many other factors in the anal incontinent population to account for it.

The five APS variables were chosen based on our understanding of the strengths and weaknesses of each variable, and because they are the most commonly used tests in our unit. Anal manometry squeeze pressures rely on patient effort and the ability of patients to squeeze their sphincters and pelvic floor. Many were found to adjunct this with "buttock squeeze", and potentially the measurement obtained may not be adequately representative of the actual sphincter function. The large overlap in squeeze pressures between incontinent and healthy individuals also means that squeeze pressures were inadequately discriminatory and therefore not

**Table 5** Univariate associations between individual anal physiology score variables and Cleveland Clinic continence scores

	F value	df	P <sup>1</sup> value	Proportion variability in CCCS explained
Maximum RP (mmHg)	13.8	1, 395	0.0002	3.10%
ACL	12.1	1, 395	0.0006	2.70%
IAS defect	2.2	4, 392	0.07	1.20%
EAS defect	2.3	4, 392	0.06	1.30%
Pudendal neuropathy	11.7	2, 394	< 0.0001	5.10%

<sup>1</sup>Based on ANOVA procedure. CCCS: Cleveland Clinic Continence Scores; ACL: Anal canal length.

**Table 6** Multiple regression analyses

Variable	Classification	Change in CCCS	P value
EAS defect	Intact	-	0.01
	¼	4	
	½	0.3	
	¾	1.5	
	> ¾	5.1	
PNTML	Normal	-	< 0.0001
	Unilateral neuropathy	1.2	
	Bilateral neuropathy	2.6	
Previous pelvic surgery	Yes	-	0.0007
	No	-1.6	

CCCS: Cleveland Clinic Continence Scores; PNTML: Pudendal terminal motor latency.

chosen as a variable<sup>[19]</sup>. Maximum resting pressure reflects pressure generated by the high-pressure zone, and has been shown to be significantly different between incontinent and continent subjects<sup>[20]</sup>. Functional anal canal length was chosen due to its importance as a marker of continence<sup>[10,11]</sup>.

Normal continence is a complex interaction of several factors including the rectum, pelvic nerves, pelvic floor, anal sphincters, colonic motility and stool consistency<sup>[1]</sup>. Anorectal function and incontinence can only be fully assessed when each of these elements has been evaluated and included within the APS model respective to their importance to continence. The APS model may then appear very sphincter-centric because manometry, EUS, and PNTML each assess a separate aspect of the sphincter. If APS is found to be helpful in guiding treatment selection or predicting treatment outcome, it is more likely to be incorporated into routine clinical practice as the tests are commonly performed. Further, it is fruitless to subject patients to time-consuming and potentially uncomfortable or embarrassing and costly investigations (such as defecography, colonic transit study) if clinical assessment can provide the required answer and when their relative importance to sphincter function is unknown. The role of stool consistency in aggravating incontinence or causing incontinence in an individual with compromised

anorectal function is well known<sup>[21]</sup>. While information on stool consistency using the Bristol chart was collected, this data was only available for 20% of the subjects and could not be included for analysis<sup>[22]</sup>. Because each physiology parameter has contributed less than 5% each to the predictive ability of CCCS, we doubt that inclusion of stool consistency to the APS would have made a dramatic difference to the predictive ability of the APS.

Because of the poor predictive ability of APS, analysis of variables that may influence continence was carried out using multiple regression. These included gender, age, parity and previous pelvic surgery<sup>[23-25]</sup>. Using multiple regression, we found that external sphincter defect, pudendal neuropathy, and previous pelvic surgery were most useful in predicting CCCS. Although external sphincter defect was not found to be significantly associated with continence scores on univariate associations, it was significant using multiple regression. This apparent initial lack of association between external sphincter defect and continence scores is assumed to be due to masking by other variables. Conversely, maximum resting pressures and anal canal length were significantly associated with continence scores on univariate associations but not multiple regression. This apparent effect was the result of confounding due to the differences in the distribution of external sphincter defect, pudendal neuropathy and previous pelvic surgery between men and women. Similarly, the strong apparent gender influence was also a confounder due to the much higher prevalence of external sphincter defect, pelvic surgery and pudendal neuropathy amongst females. The predictive ability of this new model improved marginally to account for 12.5% of the variability in CCCS.

The association between bilateral pudendal neuropathy and continence scores has previously been shown by Ricciardi *et al.*<sup>[26]</sup> but not the relationship between unilateral neuropathy and continence score. This study demonstrated an almost linear relationship between neuropathy and continence scores. The same could not be demonstrated for external sphincter defect and is likely related to the small sample size in this study, and the results should be confirmed using a larger sample size. The role of pelvic surgery in incontinence had been controversial. Hysterectomy was the most widely studied pelvic procedure, and conflicting results have been reported<sup>[27,28]</sup>. Due to the relatively small numbers of each procedure except hysterectomy, all those involving pelvic viscera (uterus, rectum) and the pelvic floor were classified as pelvic surgery. The results of this study indicate that previous pelvic surgery was associated with greater incontinence.

In this study, the gender difference in CCCS was highly significant suggesting that women had more severe incontinence than men. A meta-analysis by Pretlove *et al.*<sup>[23]</sup> reported that more women experienced severe incontinence than men because of the higher prevalence of solid and liquid incontinence among women. All APS variables were significantly different

between men and women, except for internal sphincter defect, and this may be a clue as to why there is a gender difference in CCCS.

Given that the majority of CCCS is unexplained by clinical or anal physiology data, we believe that although continence scores and anorectal physiology are both used in incontinence, they measure different aspects of incontinence. The clinical utility of this newly developed measure in guiding treatment selection or predicting treatment response needs to be determined in a prospective clinical study.

In conclusion, anal physiology tests correlate better with continence scores when considered collectively rather than individually. Our APS model was only able to predict 9.2% of the variability in CCCS, suggesting that continence scores and physiology measure different aspects of incontinence. These aspects are likely to be complementary in the assessment of incontinence, with the clinical utility of the APS derived using multiple regression requiring prospective assessment in a clinical setting.

## COMMENTS

### Background

Anal physiology tests involving manometry, ultrasound and electromyography are routine in the investigation of fecal incontinence. Continence scores are also routinely assessed. This study aimed to research the connection between anal physiology and continence score as a means of correlating and subsequently applying the findings to the diagnosis, management and understanding of fecal incontinence.

### Research frontiers

The ongoing relevance of anal physiology tests and their role in the diagnosis and management of fecal incontinence continues to require clarification and validation, to bring a clearer understanding of when and why they are beneficial.

### Innovations and breakthroughs

The innovation of this study is the way the anal physiology data has been combined to create a summative anal physiology score, much in the same vein as a continence score, which can shed new insights into the diagnosis and management of fecal incontinence.

### Applications

The novel summative anal physiology score presented and studied in this research can be used for future research projects involving the diagnosis and management of fecal incontinence. That will potentially open an entire new field of assessment of fecal incontinence in line with quality of life measures also.

### Terminology

There are no terms that the authors do not believe are unfamiliar to most readers.

### Peer-review

Authors established the anal physiology score model and it is helpful to assess the incontinence.

## REFERENCES

- 1 Saldana Ruiz N, Kaiser AM. Fecal incontinence - Challenges and solutions. *World J Gastroenterol* 2017; **23**: 11-24 [PMID: 28104977 DOI: 10.3748/wjg.v23.i1.11]
- 2 Stanley TH, Webster LR. Anesthetic requirements and car-

- diovascular effects of fentanyl-oxygen and fentanyl-diazepam-oxygen anesthesia in man. *Anesth Analg* 1978; **57**: 411-416 [PMID: 568401 DOI: 10.1007/BF02049407]
- 3 **Jorge JM**, Wexner SD. Etiology and management of fecal incontinence. *Dis Colon Rectum* 1993; **36**: 77-97 [PMID: 8416784 DOI: 10.1007/BF02050307]
  - 4 **de la Portilla F**, Calero-Lillo A, Jiménez-Rodríguez RM, Reyes ML, Segovia-González M, Maestre MV, García-Cabrera AM. Validation of a new scoring system: Rapid assessment faecal incontinence score. *World J Gastrointest Surg* 2015; **7**: 203-207 [PMID: 26425269 DOI: 10.4240/wjgs.v7.i9.203]
  - 5 **Parks AG**. Royal Society of Medicine, Section of Proctology; Meeting 27 November 1974. President's Address. Anorectal incontinence. *Proc R Soc Med* 1975; **68**: 681-690 [PMID: 1197295]
  - 6 **Takács L**, Debreczeni LA. Circulatory regulation in pregnant rats: pregnancy and haemorrhagic hypotension. *Acta Physiol Acad Sci Hung* 1972; **42**: 345-365 [PMID: 4668583]
  - 7 **O'Brien PE**, Skinner S. Restoring control: the Acticon Neosphincter artificial bowel sphincter in the treatment of anal incontinence. *Dis Colon Rectum* 2000; **43**: 1213-1216 [PMID: 11005485 DOI: 10.1007/BF02237423]
  - 8 **Whitehead WE**, Wald A, Norton NJ. Treatment options for fecal incontinence. *Dis Colon Rectum* 2001; **44**: 131-142; discussion 142-144 [PMID: 11805574 DOI: 10.1007/BF02234835]
  - 9 **Terra MP**, Deutekom M, Dobben AC, Baeten CG, Janssen LW, Boeckxstaens GE, Engel AF, Felt-Bersma RJ, Slors JF, Gerhards MF, Bijnen AB, Everhardt E, Schouten WR, Berghmans B, Bossuyt PM, Stoker J. Can the outcome of pelvic-floor rehabilitation in patients with fecal incontinence be predicted? *Int J Colorectal Dis* 2008; **23**: 503-511 [PMID: 18228027 DOI: 10.1007/s00384-008-0438-8]
  - 10 **Hool GR**, Lieber ML, Church JM. Postoperative anal canal length predicts outcome in patients having sphincter repair for fecal incontinence. *Dis Colon Rectum* 1999; **42**: 313-318 [PMID: 10223749 DOI: 10.1007/BF02236345]
  - 11 **Morgado PJ Jr**, Wexner SD, Jorge JM. Discrepancies in anal manometric pressure measurement--important or inconsequential? *Dis Colon Rectum* 1994; **37**: 820-823 [PMID: 8055728 DOI: 10.1007/BF02050148]
  - 12 **Andromanakos N**, Filippou D, Skandalakis P, Papadopoulos V, Rizos S, Simopoulos K. Anorectal incontinence. pathogenesis and choice of treatment. *J Gastrointest Liver Dis* 2006; **15**: 41-49 [PMID: 16680232]
  - 13 **Gantke B**, Schäfer A, Enck P, Lübke HJ. Sonographic, manometric, and myographic evaluation of the anal sphincters morphology and function. *Dis Colon Rectum* 1993; **36**: 1037-1041 [PMID: 8223056 DOI: 10.1007/BF02047296]
  - 14 **Schäfer R**, Heyer T, Gantke B, Schäfer A, Frieling T, Häussinger D, Enck P. Anal endosonography and manometry: comparison in patients with defecation problems. *Dis Colon Rectum* 1997; **40**: 293-297 [PMID: 9118743 DOI: 10.1007/BF02050418]
  - 15 **Voyvodic F**, Rieger NA, Skinner S, Schlothe AC, Saccone GT, Sage MR, Wattoo DA. Endosonographic imaging of anal sphincter injury: does the size of the tear correlate with the degree of dysfunction? *Dis Colon Rectum* 2003; **46**: 735-741 [PMID: 12794574 DOI: 10.1007/s10350-004-6650-x]
  - 16 **Prichard D**, Harvey DM, Fletcher JG, Zinsmeister AR, Bharucha AE. Relationship Among Anal Sphincter Injury, Patulous Anal Canal, and Anal Pressures in Patients With Anorectal Disorders. *Clin Gastroenterol Hepatol* 2015; **13**: 1793-1800.e1 [PMID: 25869638 DOI: 10.1016/j.cgh.2015.03.033]
  - 17 **Gurland B**, Hull T. Transrectal ultrasound, manometry, and pudendal nerve terminal latency studies in the evaluation of sphincter injuries. *Clin Colon Rectal Surg* 2008; **21**: 157-166 [PMID: 20011414 DOI: 10.1055/s-2008-1080995]
  - 18 **Lam TJ**, Kuik DJ, Felt-Bersma RJ. Anorectal function evaluation and predictive factors for faecal incontinence in 600 patients. *Colorectal Dis* 2012; **14**: 214-223 [PMID: 21689265 DOI: 10.1111/j.1463-1318.2011.02548.x]
  - 19 **McHugh SM**, Diamant NE. Effect of age, gender, and parity on anal canal pressures. Contribution of impaired anal sphincter function to fecal incontinence. *Dig Dis Sci* 1987; **32**: 726-736 [PMID: 3595385 DOI: 10.1007/BF01296139]
  - 20 **Osterberg A**, Graf W, Pählman L. The longitudinal high-pressure zone profile in patients with fecal incontinence. *Am J Gastroenterol* 1999; **94**: 2966-2971 [PMID: 10520853 DOI: 10.1016/S0002-9270(99)00429-3]
  - 21 **Read NW**, Bartolo DC, Read MG. Differences in anal function in patients with incontinence to solids and in patients with incontinence to liquids. *Br J Surg* 1984; **71**: 39-42 [PMID: 6689968 DOI: 10.1002/bjs.1800710112]
  - 22 **Lewis SJ**, Heaton KW. Stool form scale as a useful guide to intestinal transit time. *Scand J Gastroenterol* 1997; **32**: 920-924 [PMID: 9299672 DOI: 10.3109/00365529709011203]
  - 23 **Pretlove SJ**, Radley S, Toozs-Hobson PM, Thompson PJ, Coomarasamy A, Khan KS. Prevalence of anal incontinence according to age and gender: A systematic review and meta-regression analysis. *Int Urogynecol J Pelvic Floor Dysfunct* 2006; **17**: 407-417 [PMID: 16572280 DOI: 10.1007/s00192-005-0014-5]
  - 24 **Bharucha AE**, Zinsmeister AR, Locke GR, Seide BM, McKeon K, Schleck CD, Melton LJ 3rd. Risk factors for fecal incontinence: a population-based study in women. *Am J Gastroenterol* 2006; **101**: 1305-1312 [PMID: 16771954 DOI: 10.1111/j.1572-0241.2006.00553.x]
  - 25 **Lunniss PJ**, Gladman MA, Hetzer FH, Williams NS, Scott SM. Risk factors in acquired faecal incontinence. *J R Soc Med* 2004; **97**: 111-116 [PMID: 14996955 DOI: 10.1258/jrsm.97.3.111]
  - 26 **Ricciardi R**, Mellgren AF, Madoff RD, Baxter NN, Karulf RE, Parker SC. The utility of pudendal nerve terminal motor latencies in idiopathic incontinence. *Dis Colon Rectum* 2006; **49**: 852-857 [PMID: 16598403 DOI: 10.1007/s10350-006-0529-y]
  - 27 **Forsgren C**, Zetterström J, Lopez A, Nordenstam J, Anzen B, Altman D. Effects of hysterectomy on bowel function: a three-year, prospective cohort study. *Dis Colon Rectum* 2007; **50**: 1139-1145 [PMID: 17587089 DOI: 10.1007/s10350-007-0224-7]
  - 28 **Altman D**, Zetterström J, López A, Pollack J, Nordenstam J, Mellgren A. Effect of hysterectomy on bowel function. *Dis Colon Rectum* 2004; **47**: 502-508; discussion 508-509 [PMID: 14994113 DOI: 10.1007/s10350-003-0087-5]

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