# EVALUATING EXPERIENCE WITH ANORECTAL MANOMETRY IN AN OUTPATIENT SETTING

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**ABSTRACT** — PURPOSE OF THE STUDY: 1) Evaluating application of anorectal manometry in an outpatient setting. 2) Determination of reference manometric and point criteria for normal rectal sphincter indicators and Fecal Incontinence (FI) according to anorectal manometry data using a Peritron anal sensor.
MATERIALS AND METHODS: The retrospective study was based on the results of anorectal manometry using Peritron equipment (Cardio Design Pty Ltd, Australia) on 1200 patients with various proctological diseases, who were examined and treated at the Center for Outpatient Proctology of the surgical department of Railway Clinical Hospital (Rostov-on-Don, Russia) from 2015 to 2020. All patients were divided into 4 groups in accordance with the clinical classification of Fecal Incontinence (FI) developed at the National Coloproctology Research Center and the obtained results. As a subjective assessment, the Cleveland Fecal Incontinence Scale (Wexner) was used, and objectively, the results of anorectal manometry using the Peritron sphinctometer.
RESULTS: Our manometric data enabled to develop a reliable indicator scale of normal sphincter function and various degrees of fecal incontinence according to the Peritron findings and allowed to recommend the device for a wider introduction into clinical practice, in particular in coloproctology, to perform anorectal manometry.

**KEYWORDS** — anorectal manometry (ARM), sphinctometer, rectal obturator, Peritron.

## RELEVANCE

One of the important issues a coloproctologist faces in his clinical practice during the initial, pre and postoperative patient examination is to determine the parameters of the muscular group condition of the pelvic floor, its obturator function, in particular, bowel incontinence with gas and fecal leaks.

Literature references state that the process of retention of gases and feces is multifactorial. It depends on the coordination of the following factors:

— *ideal stool* formation factors: volume and quantitative indicators of feces — diet, adherence to dietary recommendations of meal composition, intake of a sufficient amount of plant fibers, water balance, etc.

— anatomical factors: the geometric position of all parts of the colon and in particular the anorectal angle, etc.;

— motor-evacuation function factors: coordination of peristaltic and antiperistatic waves, sufficient evacuation force, etc.;

— neurological factors: the integrity of the receptor apparatus and the conducting nerve pathways of the rectum and the anal canal, the coordination of spinal cord structures and the brain with the muscular structures of the external and internal rectal sphincters, observance of the temporary fecal flow consistency, the absence of stress effects;

— the presence and severity of proctological diseases of the anal canal and rectum: anal fissures, paraproctitis, cryptitis, sphincteritis, chronic colitis, etc.

But many authors mostly attribute the retention of gases and feces to the proper functioning of the rectal sphincters due to the pressure created by the smooth muscles of the internal sphincter (70–80%), and striated muscles of the external sphincter (20–30%). [2, 3]

Today, there are many scales that allow a subjective assessment of the state of gas and fecal incontinence in proctological patients. Most authors, when interviewing a coloproctological patient for a subjective assessment of incontinence, use the Cleveland Fecal Incontinence Scale (Wexner) (Wexner Anal Incontinence Scale) (Table 1). [4]

But the subjective nature of the indicators, the point-based interpretation of the parameters, ranging from 0 = full control to 20 = complete incontinence, in conjecture with a lack of understanding of intermediate values and their relationship with the degree of incontinence, as well as possible *errors* due to personal parameters such as wearing pads and lifestyle changes, do not always allow to adequately assess the initial state and the conditions after surgical treatment and rehabilitation therapy.

An objective method for assessing the state of incontinence of gases and feces in proctological patients is considered to be instrumental measurement — anorectal manometry. At the moment, there is no list

***Table 1.*** *Interpretation of parameters: 0 = full control, 20 = complete incontinence*

| Cleveland Fecal Incontinence Scale (Wexner) (Wexner anal incontinence scale) | | | | | |
|---|---|---|---|---|---|
| | | Frequency | | | |
| Incontinence type | Never | Rarely (< 1 once a month) | Sometimes (< 1 once a week, but > 1 once a month) | Usually (< 1 once a day, but > 1 once a week) | Always (> 1 once a day) |
| Hard stools | 0 | 1 | 2 | 3 | 4 |
| Loose stools | 0 | 1 | 2 | 3 | 4 |
| Gases | 0 | 1 | 2 | 3 | 4 |
| Wearing pads | 0 | 1 | 2 | 3 | 4 |
| Lifestyle change | 0 | 1 | 2 | 3 | 4 |

*Interpretation of parameters: 0 = full control, 20 = complete incontinence*

of sphincterometry devices recommended for mandatory use in the Russian Federation. Different manufacturers offer their own models for ARM. Currently, 3 devices with sphincterometry functions are registered in the Russian Federation: 1 — sphincterometer SF-01 (Gastroscan-SF), and 2 — multifunctional manometric complex WPM Solar (MMS, Netherlands) and sphincterometer S 4402 MCM "Pro Medica GmbH", Germany [2, 3]. Unfortunately, in spite of the undoubted functionality of these models, an important limiting factor for their widespread use by both doctors and patients remains the cost. One possible way to avoid this situation is using Peritron equipment to perform anorectal manometry. It has all the necessary functionality at a reasonable price. However, there is insufficient reference in available literature about its manometric and point criteria for fecal incontinence [1].



***Fig. 1.*** *Picture of the device for anorectal manometry Peritron (Cardio Design Pty Ltd, Oakleigh, Victoria, Australia)*

## MATERIALS AND METHODS

The retrospective study was based on the results of ARM using the Peritron manometer (Cardio Design Pty Ltd, Australia) in 1200 patients with various proc-tological diseases, The patients were examined and treated at the "Outpatient Proctology Center" of the Railway Clinical Hospital (Rostov-on-Don, Russia) from 2015 to 2020. Their age varied from 30 to 70 years (average age — 47,4±13,6 years). There were 623 women (51,9%), and 577 men (48,1%). Most patients were in the age group from 31 to 40 years (29,3%) and 41 to 50 years (35,4%), which corresponds to the most active, healthy and productive period of life. All patients were divided into 4 groups in accordance with the clinical classification of Fecal Incontinence (FI), developed at Ryzhikh National Medical Research Center of Coloproctology (Moscow, Russia) and the results of measurements. The Cleveland Fecal Incontinence Scale (Wexner) was used as a subjective assessment and the results of ARM using the Peritron were used as an objective assessment.

When clinically examining the muscular bundle of the external rectal sphincter and pelvic floor in patients, we used the Peritron with a built-in biofeedback function (BFF), which can thus be used as a simulator for therapy Biofeedback. Biofeedback therapy or biofeedback rehabilitation is a completely harmless and effective method to restore proper functioning of the pelvic floor muscles by teaching the patient to relax or contract the anal sphincter/pelvic floor muscles when it is necessary. In particular, during a postoperative rehabilitation course for the prevention and treatment of incontinence, the device allows controlling the contractions of the pelvic floor muscles in order to restore or improve existing physiological skills and to assess the strength of muscle contraction further on.

The Peritron sphincterometer consists of three parts: two sensors — anal and vaginal (pneumatic) sensors, which are alternately connected using a flexible hose to a device with a monitor, which dis-

plays data on the contraction force of the pelvic floor muscles: basal tone/resting pressure and tone/pressure when straining. The measurement units can be manually selected on the device from the list of proposed parameters. We used 'centimeter of water column' (cmH$_2$O) as a measurement unit in our study.

***ARM technique using Peritron***: In the supine position on a gynecological chair with the lower body exposed, the rectal probe was inserted 6–8 cm into the anal canal. Next, the patient was asked to relax as much as possible. According to the indications on the device, data on the basal rest tone/pressure of the external sphincter of the rectum were measured. The values were reset to zero by pressing the corresponding button on the device and without changing the position of the rectal sensor, then the patient was asked to squeeze the rectal sphincter as much as possible using the phrase: *Imagine you want to hold gas/feces. Try to squeeze the anal sphincter as tightly as possible or strain so that they do not come out*. The values were measured for 5 attempts with a 10-second relaxation period, the average value is chosen — tone/pressure upon straining. To assess the force of contraction of the external sphincter of the rectum, the obtained data of the sphincterometer were correlated with the assessment on the Wexner scale (in points ranging from 0 to 20) (Table 1).

## RESULTS

To determine the reference manometric criteria of various degrees of anal sphincter insufficiency (fecal incontinence) according to the ARM data using the Peritron, we analyzed the following criteria: mean resting pressure; maximum contraction pressure; average contraction pressure; volitional contraction gradient. All results were split by gender: for men and for women. The results are presented in tables 2 and 3.

Statistical data processing was carried out using the Statistica 10.0 program. (StatSoft, USA). The calculation of the mean value, standard deviation, minimum and maximum values (Me ± SD, min–max) was performed. The analysis used descriptive statistics methods (number of patients, mean, confidence interval, minimum and maximum values, standard deviation, standard error).

When comparing groups of patients, we used nonparametric statistical methods, for example, U — Mann–Whitney test (nonparametric alternative to t-test for independent samples).

A One-way analysis of variance performed according to gender revealed significant differences for all variables. Therefore an additional comparative analysis of variables using Student's t-test was performed for patients with varying degrees of FI . As a result,

significant differences were revealed in all observed variables among all degrees: mean resting pressure, maximum contraction pressure, average contraction pressure, volitional contraction gradient, which made the rendering of reference intervals possible.

A subjective score assessment (Wexner scale) was used to analyze the manometric parameters obtained for all degrees of fecal incontinence. One-way analysis of variance revealed significant differences between various FI degrees according to the FI severity score results (p<0,01). Taking this into account, a comparative analysis of this variable in the observed groups was carried out using the Student's t-test. As a result, significant differences were revealed among all degrees of FI, which made rendering reference intervals possible. For men with first-degree FI on the Wexner scale, a value of ≤4.4 points was obtained. For second-degree FI, the indicator ranged from 4.4 to 10.5 points. In turn, for third-degree FI, the characteristic value was ≥10.5 points. For women with first-degree FI on the Wexner scale, a value of ≤6.7 points was obtained. For the second-degree FI, the indicator ranged from 6.8 to 10.9 points. In turn, for third-degree FI, the characteristic value was ≥11.0 points.

## CONCLUSION

Anorectal manometry using the Peritron equipment is an affordable, simple, reliable, and cost-effective method for determining the norm and different degrees of Fecal Incontinence (FI) at various stages of diagnosis, monitoring the efficiency of surgical treatment and rehabilitation therapy in proctological patients.

The identified manometric reference criteria (based on ARM data using the Peritron) in correlation with the score criteria for fecal incontinence according to the Wexner scale will allow a quantitative analysis of incontinence in patients, which will thus enable its widespread use for screening studies and correctly forming prescriptions for expensive and rare studies to assess the state of the muscular bundle of the pelvic floor, its obturator function with specialized equipment.

Economic affordability and the built-in biofeedback function of the Peritron 9600 sphincterometer also provides a unique opportunity to use it as a home simulator for rehabilitation therapy — biofeedback therapy — in patients with fecal incontinence.

## REFERENCES

1. **Khitaryan A.G., Prazdnikov E.N., Dulierov K.A. et al.** Two-level plastic of the pelvic bottom in the surgical treatment of rectocele. Coloproctology. – 2016. – No. 2 (55). – p. 17–24.

*Table 2. Manometric (the Peritron) and point (Wexner scale) parameters of various degrees of fecal incontinence (FI) in men*

| Degree of FI | Manometric indicators (cmH$_2$0) | | | | Wexner scale score (points) |
|---|---|---|---|---|---|
| | Mean resting pressure | Maximum contraction pressure | Average contraction pression | Volitional contraction gradient | |
| I | 45,9–61,2 | 152,1–154,4 | 123,8–133,5 | >107,9 (normal) | < 4,4 |
| II | 33,7–42,6 | 101,3–148,1 | 72,6–121,5 | 72,6–105,5 | 4,4–10,5 |
| III | <33,6 | <101,2 | <72,5 | <67,8 | > 10,5 |

*Table 3. Manometric (the Peritron) and point (Wexner scale) parameters of various degrees of fecal incontinence (FI) in women*

| Degree of FI | Manometric indicators (cmH$_2$0) | | | | Wexner scale score (points) |
|---|---|---|---|---|---|
| | Mean resting pressure | Maximum contraction pressure | Average contraction pression | Volitional contraction gradient | |
| I | 49,7–54,8 | 133,4–149,3 | 94,2–119,2 | >100,8 (normal) | < 6,7 |
| II | 36,8–49,6 | 84,8–133,3 | 63–94,1 | 49,1–79,5 | 6,8–10,9 |
| III | <36,7 | <84,6 | <62,8 | <49,1 | > 11,0 |

2. SHELYGIN Y.A., FOMENKO O.A., MOROZOV S.V. ET AL. Interdisciplinary consensus on the use of Russian-language terminology for anorectal sphincterometry and profilometry. Therapeutic archive. – 2020. –No. 8 (v. 92). – p. 128–135.

3. SHELYGIN Y.A., FOMENKO O.A., TITOV A.Y. ET AL. Sphincterometric grading of fecal incontinence. Coloproctology. – 2016. – No. 4 (58). – p. 54–59.

4. ARROYO, A. Fistulotomy and sphincter reconstruction in the treatment of complex fistula-in-ano: long-term clinical and manometric results / A. Arroyo, J. Pérez-Legaz, P. Moya // Ann Surg. – 2012. – 255(5). – P. 935–939. – doi: 10.1097/SLA.0b013e31824e9112.

5. BUSSEN, D. Wertigkeit der analen Endosonographie in der Diagnostik anorektaler Fisteln / D. Bussen, M. Sailer, S. Wening, K. H. Fuchs, A. Thiede // Zentralbl Chir. – 2004. – 129. – P. 404–407

6. CAVANAUGH, M. Fecal incontinence severity index after fistulotomy: a predictor of quality of life / M. Cavanaugh, N. Hyman, T. Osler // Dis Colon Rectum. – 2002. – 45. – 349–353.

7. JORGE J.M., WEXNER S.D. Etiology and management of fecal incontinence. Dis. Colon Rectum. – 1993. – № 1 (36): 77–97.

8. MYLONAKIS, E. Quality of life of patients after surgical treatment of anal fistula; the role of anal manometry / E. Mylonakis, C. Katsios, D. Godevenos, B. Nousias, A. M. Kappas // Colorectal Dis. – 2001. – 3. – P. 417–421.