CHANGES IN THE FUNCTION OF THE ANAL SPHINCTER COMPLEX AND GENERATED ANAL PRESSURE AT DIFFERENT ANATOMICAL LEVELS AFTER ELASTIC LIGATURE APPLICATION IN PATIENTS WITH ANAL FISTULA

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ABSTRACT

PURPOSE: The purpose of the present study was to measure by means of especially developed apparatus the anal and intrarectal pressure before and after different operations for perianal fistulas as well as to correlate the degree of incontinence evaluated by Fecal Incontinence Severity Index (FISI) with changes in the measured pressures and type of operation used.

MATERIAL AND METHODS: The study covered 311 patients with perianal fistulas who were operated with several methods. Anal canal pressures at 5 different levels were measured by the especially developed apparatus at rest, squeezing and cough, before and after 6 months of operation. FISI form was used for incontinence detection.

RESULTS: Resting, squeezing and cough pressures were higher in men before and after operations. Average reduction of anal rest pressure by 10-15%, at contraction by 20-25% and at cough by 5-10% resulted in mild incontinence according to FISI score. Average reduction of anal rest pressure by 20-25%, at contraction by 30-40% and at cough by 20-25% correlated with postoperative moderate degree of incontinence according to FISI score. No severe incontinence was registered by FISI examination. Usage of the method of elastic ligation of perianal fistulas, i.e. the method of Hippocrates-Thoma Junescu caused the highest percentage of postoperative mild degree incontinence (15,9%) and moderate one (4,3%) by FISI. No patients presented with severe degree of incontinence.

CONCLUSION: The method of anal sphincter tonometry demonstrated a significant reduction of anal pressure after surgery for anal fistulas. This objective decrease of anal sphincter tone correlated with the higher FISI score arguing of postoperative incontinence. The method of Hippocrates-Thoma-Junescu resulted in the highest rate of incontinence (around 20%) and anal pressure reduction.

Key words: *anal fistula, anal canal pressure, anal sphincter tonometry, postoperative anal incontinence, fecal incontinence severity index, elastic ligature*

INTRODUCTION

A method for gradually cutting the anal sphincter for treatment of complete anal fistulas has been introduced by Hippocrates and is widely used today. The operative intervention results in damage to the sphincter cuff with subsequent development of fibrosis and altered tone of the sphincter groups accompanied by changes in the continence with early

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Table 1. Inquiry form for degrees of severity by FISI

Fecal incontinence	two or more times a day	once a day	two or more times a week	once a week	one-three times a month	never
gas	12	11	8	6	4	0
mucus	12	10	7	5	3	0
liquid stool	19	17	13	10	8	0
solid stool	18	16	13	10	8	0

or late clinical manifestation. Changes in pressure generated by the sphincter cuff after treatment can be objectively monitored through anal tonometry. A significant decrease in rest anal pressure after incision of the lower half of the internal sphincter after treatment of simple intersphincteric fistulas along with a disturbed continence was registered in one patient (1). The risk of anal incontinence increased in patients undergoing transsphincteric fistulotomy (1) with a level of anal rest pressure below 50% of that registered preoperatively. A manometric study demonstrated a reduction in anal rest pressure in the distal 1-2 cm of the anal canal after treatment of intrasphincteric fistulas (2). Disturbed anal continence was found out in 38% of the cases (2).

It is accepted that application of an elastic ligature sphincter transsection for a period of one to four weeks does not affect the sphincter function due to slow cutting of the sphincter with the simultaneous formation of fibrous tissue (3,7,9). Other studies indicate low recurrence rates and a different frequency of continence violation (5,7,8).

Anal tonometry provides objective data about the functional status of the anal sphincter, the degree of continence and represents the basis for assessing the impact of the treatment on anal function.

MATERIAL AND METHODS

The prospective interventional study covered 311 patients with anal fistulas treated from 2001 to 2011 in the First Clinic of Surgery, Division of Coloproctology and Septic Surgery, Georgi Stranski University Hospital of Pleven. The patients with secondary anal fistulas as a consequence of another disease were excluded. Elastic ligature for slow sphincter transsection was applied in 164 patients (52,7%). In the control group of 147 patients (47,3%) a different type of surgical treatment such as discision, excision, curettage, plasty, or perineoplasty alone and in combination was administered. Preoperatively five-channel anal sphincter tonometry was performed in all the patients using the device for ambulatory sphincter tonometry on five anatomical levels (4) in order to establish baseline data about the functional status of the anal sphincter complex. After the treatment, a control sphincter tonometry was performed on the sixth postoperative month for detecting any changes in the tone of the sphincter complex due to the operative intervention.

Criteria for incontinence were based on inquiry form proposed by the Fecal Incontinence Severity Index (FISI) (3). This index was used by the patients and surgeons to rank the severity of symptoms related to fecal incontinence (10). The inquiries were conducted preoperatively as well as on the first and sixth postoperative months (Table 1).

The maximum amount of points was 61, which is the highest level of registered incontinence. The severity of incontinence was divided into three groups:

1. mild - from 0 to 10 points;
2. moderate - from 11 to 30 points, and
3. severe - from 31 to 61 points.

Data were processed with SPSS 12.0.1 statistical package using appropriate methods of descriptive statistics, differences of the means, paired samples tests, chi-square test, etc. The level of significance for rejecting the null hypothesis was chosen as $p < 0,05$.

RESULTS

The results from the preoperative sphincter tonometry are systematized in graphic descriptions of

the mean pressure in the anal canal at subcutaneous, superficial, median sphincter muscle, puborectal muscle and rectum in cm water column according to gender (Fig. 1, 2 and 3).

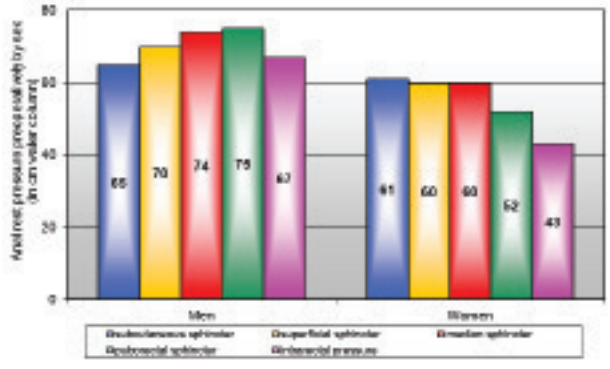

Fig. 1. Preoperatively registered average values of anal rest pressure by sex (in cm water column)

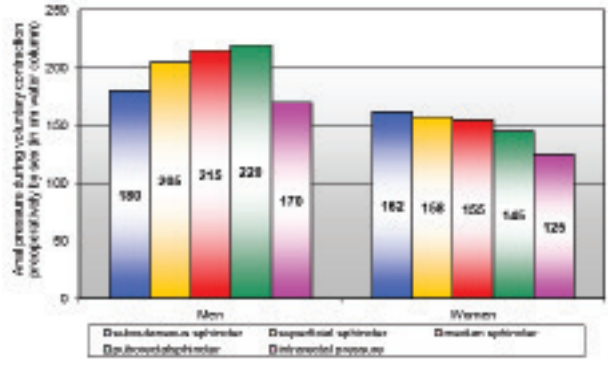

Fig. 2. Preoperatively registered average values of anal pressure during voluntary contraction by sex (in cm water column)

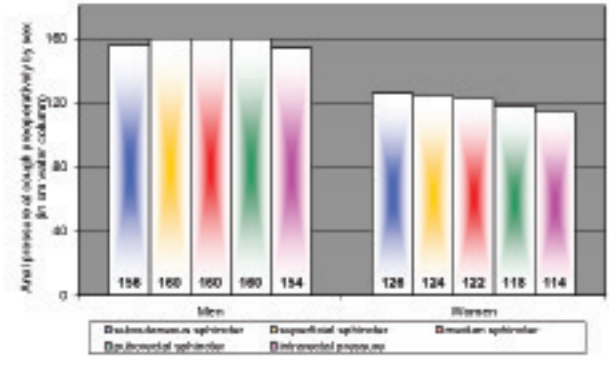

Fig. 3. Preoperatively registered average values of anal pressure at cough by sex (in cm water column)

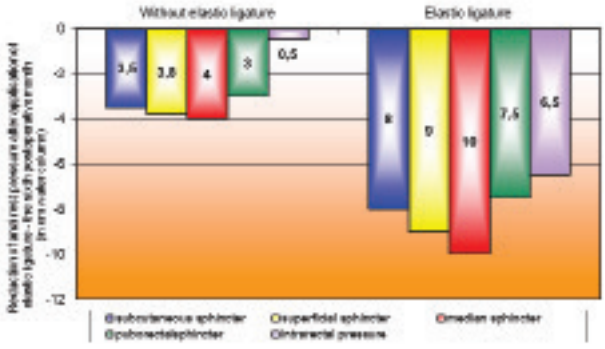

Fig. 4. Reduced average values of anal rest pressure after elastic ligature application six months postoperatively (in cm water column)

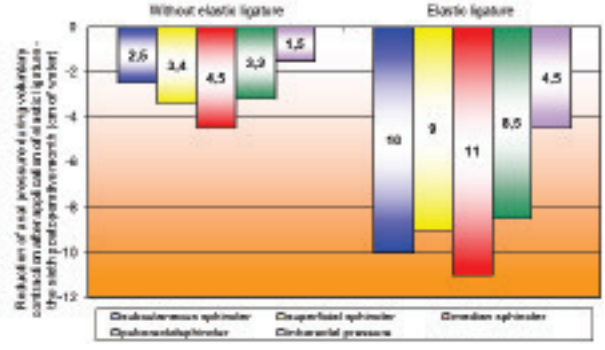

Fig. 5. Reduced average values of anal rest pressure during voluntary contraction after elastic ligature application six months postoperatively (in cm water column)

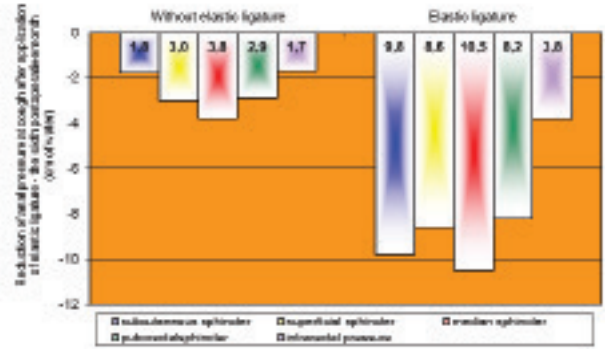

Fig. 6. Reduced average values of anal rest pressure at cough after elastic ligature application six months postoperatively (in cm water column)

The reduced pressure values in the patients with elastic ligation and in the control ones after the sixth postoperative month at rest, with voluntary

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contraction and at cough are displayed on Fig. 4, Fig. 5 and Fig. 6.

The results from the analysis of the inquiry cards for the sixth postoperative month indicate a mild degree of incontinence severity by FISI in 14,1% and a moderate one - in 1,9% of the patients.

There are statistically significant differences between the postoperative incontinence (p=0,005) concerning the types of operating technique used. The usage of the method of Hippocrates-Thoma Junescu results in the highest percentage of postoperative mild degree incontinence (15,9%) and moderate one (4,3%) by FISI. There is no severe degree of incontinence at all (Table 2).

Table 2. Patients' distribution according to surgical technique and degree of incontinence severity by FISI

Surgical technique	Degree of incontinence		
	mild (%)	moderate (%)	severe (%)
discision	6,5	3,2	0
excision	11,6	3,2	0
mucosal flap-plastics	0,7	0	0
elastic ligature	15,9*	4,3	0
sealing with fibrin glue	0	0	0
perineoplasty	8,3	8,3	0

** p=0,005*

DISCUSSION

The reduction of the average anal canal pressure values is clearly expressed in the patients who have undergone elastic ligature mainly at subcutaneous, superficial and medial sphincter. This correlates with the higher rates of postoperative anal incontinence in several clinical studies (1,2,5-8). This reduction is significantly lower among the cases without any elastic ligature, which correlates with the low percentage of postoperative anal incontinence in this group.

The integrity of the anal sphincter complex and its generated pressure in the anal canal are the factors that determine the anal continence. The risk of anal incontinence is increased in patients following transsphincteric fistulotomy with anal rest pressure below 50% of the preoperative values.

Anal tone was pre- and postoperatively examined in patients with fistulotomy with low transsphincteric fistulas followed-up for one year (6). There was a transient anal pressure reduction at rest for three months and a persistent one at voluntary contraction for the entire period. These data are associated with a significant breach of patient's ability to control the discharge of liquid that correlates with episodes of spotting and expressed anal canal deformation.

In our study, the application of the apparatus for sphincter tonometry constructed by us in continent patients revealed preoperatively the average anal canal pressure values at the level of subcutaneous, superficial, median, and puborectal sphincters as well as in the rectum at rest, under voluntary contraction and cough. These data allowed us to identify the influence of the different types of surgical intervention on the sphincter cuff and the level of anal pressure reduction and to correlate it with the severity of postoperative incontinence.

The average anal pressure values in our continent patients were the following: at rest: males - 65 to 75 cm H_2O and females - 43 to 61 cm H_2O; voluntary contraction: males - 170 to 220 cm H_2O and females - 125 to 162 cm H_2O, and cough: males - 154 to 160 cm H_2O and females - 114 to 126 cm H_2O. The area of maximum pressure in the anal canal in men was 1-2 cm proximally from the anal edge, at the level of medial and deep muscle sphincter and puborectal muscle. In women, the maximal pressure zone started from at the anal edge, at the level of subcutaneous, superficial and medial sphincter and decreased in the proximal direction. In continent patients, the average intrarectal pressure values were lower from those generated by the anal sphincter at rest, during voluntary contraction and cough. This illustrated the preoperative continence of the anal sphincter complex.

Average reduction of anal rest pressure by 10-15%, at contraction by 20-25% and at cough by 5-10% resulted in mild incontinence according to FISI score. Average reduction of anal rest pressure by 20-25%, at contraction by 30-40% and at cough by 20-25% correlated with postoperative moderate degree

of incontinence according to FISI score. No severe incontinence was registered by FISI examination.

Our results are comparable with other results (2) reporting a reduction of the postoperative anal pressure by 20-25% from the preoperative one and thus correlating with a postoperative incontinence of 38%.

The results from the application of the sphincter tonometry in the patients with a mild degree of anal incontinence at rest, during voluntary contraction and at cough demonstrated a minimal decrease of the average rectal pressure values and an expressed diminution of the average anal canal pressure values. In the cases of anal incontinence, the intrarectal pressure was higher than the anal canal pressure at cough, which explained the mechanism of sphincter insufficiency. The average intrarectal pressure values at cough in the patients with a moderate degree of incontinence according to FISI score significantly exceeded the pressure generated by the anal sphincter complex that determined the occurrence of anal incontinence.

The high incidence rate of postoperative anal incontinence and the variable relative share of reported relapses after surgical treatment of anal fistulas are a challenge to the surgeon. A proper selection of a patient-consistent therapeutic approach aiming at eradicating the fistula canal with minimal risk of postoperative incontinence is needed.

CONCLUSION

The method of anal sphincterotonometry demonstrated a significant reduction of anal pressure after surgery for anal fistulas. This objective decrease of anal sphincter tone correlated with the higher FISI score arguing of postoperative incontinence. The method of Hippocrates-Thoma-Junescu resulted in the highest rate of incontinence (around 20%) and anal pressure reduction.

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