THE EFFECT OF SURGICAL TREATMENT ON ANAL SPHINCTER FUNCTION IN PATIENTS WITH RECTAL PROLAPSE

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The aim of the study was analysis of an anal sphincter function in patients before and after surgery for rectal prolapse.

Material and methods. Between 1987 and 2005, 49 patients underwent operations for rectal prolapse. The anal sphincter function was analyzed in 17 of these patients. Abdominal approach surgery was performed in 13 patients; this involved rectopexy in 11 and sigmorectal resection in two others. A transanal approach was chosen in four patients, with the Mikulicz technique in two cases, the Delorme procedure in one, and the Altmeier procedure in the remaining case.

Results. In all patients who were operated using the transanal approach, we observed some regression in anal sphincter insufficiency. Among the patients operated using the abdominal approach, first degree incontinence persisted in three cases, second degree in five cases, and third degree persisted in four cases. As a result of the surgical treatment of rectal prolapse by rectopexy and transanal approach, we observed a statistically significant increase in the resting anal sphincter pressure; this increase on average reached 58.8 mm Hg. A statistically significant increase in the average maximum squeeze anal sphincter pressure (95.9 mm Hg) was attained after the surgical procedures were performed on patients with rectal prolapse.

Conclusion. The results suggest that the improvement of anal function in the control of stool and flatus after surgical treatment for rectal prolapse appears to be the result of an increase in the rest and maximal squeeze pressures of the anal sphincters.

Key words: rectal prolapse, anorectal manometry, resting anal sphincter pressure

Rectal prolapse is a pathological state that is characterized not only by the prolapse of a part of the colon through the anal canal but also by some level of dysfunction of the anal sphincter mechanism in most cases.

Insufficiency of the anal sphincter mechanism is defined as a lack of conscious control of defecation. In other words, insufficiency is the aboulia, repeated expulsion of stool that is accompanied by inefficiency in stopping the act of defecation.

According to the literature, symptoms of incontinence appear in 28% to 88% of rectal prolapse patients (1). The insufficiency of the anal sphincter increases with the diameter of the prolapsed colon and its time duration. These patients often suffer from weakened internal anal sphincter and pudendal nerve conduction defects. In some cases, a pelvic nerve fiber neuropathy appears. Therefore, it is often impossible to distinguish between the passing of stool and the intussusceptions of the rectal wall that subsequently fall out through the anus (2-7).

MATERIAL AND METHODS

Between 1987 and 2005 in the Department of General, Gastroenterological, and Endocrine Surgery, 49 patients underwent surgical treatment for rectal prolapse. The anal sphincter function was analyzed in 17 cases. A postoperative evaluation was performed no sooner than six months after the surgical procedure, at which time the inflammation processes connected with the healing process had diminished.
An abdominal approach was performed in 13 cases, with rectopexy in 11 patients and sigmorectal resection in two others. A transanal approach was performed on four patients, with the Mikulicz technique in two cases, the Delorme procedure in one case, and the Altmeier procedure in the last.

The rectopexy procedure consists of attaching the mobilized rectum to the presacral fascia using stitches or mostly prosthetic material (e.g., nonabsorbable polypropylene mesh).

The Mikulicz procedure involves transanal resection of the rectum. In the Altmeier operation, the reconstruction of the anal sphincters is performed in addition to the usual Mikulicz procedure.

The Delorme technique involves folding the prolapsed rectum to form a mucosomascular cuff that is then placed back above the anal canal.

In order to classify the insufficiency of the anal sphincter mechanism, Miller’s incontinence score was used.

Flatus incontinence occurs in the 1st degree (1 to 3 pts), liquid stool and flatus incontinence occurs in the 2nd degree (5 to 9 pts), and formed and liquid stool and flatus incontinence occurs in the 3rd degree (12 to 18 pts).

Anorectal manometry measurements were taken to evaluate the function of the anus. The examination was performed using a Synectics Medical apparatus. This measuring equipment consists of an eight-canal perfusion probe capped with a volumetric balloon, pressure sensors in every canal, and a computer. The analysis of measurements was run on original software. The examination was performed without any special colon preparation. The patients were examined while lying on one side with the knees bent.

The length of sphincters, resting pressure, maximal squeeze pressure, pressure amplitude while coughing, RAIR, rectal volume, and sensory function of the anus were measured.

The results obtained were statistically analyzed using a Student’s t-test as well as Wilcoxon signed-rank and McNemara’s tests for dependent variables. The resting and maximum squeeze pressures of the patients’ anal canals were analyzed with parametric Student’s t-tests and non-parametric Wilcoxon tests, and the significance level was p<0.005. McNemara tests for dichotomic variables were used to analyze the anorectal inhibition reflex and the sensory function of the anorectum.

RESULTS

In the investigated group, fecal incontinence was found in 13 cases. Table 2 shows the preoperative and postoperative evaluations of anal canal function.

In all patients operated using the transanal approach, we observed some regression of anal sphincter inefficiency. Among the patients who underwent operations using the abdominal approach, the first degree of incontinence persisted in three cases, the second degree in five cases, and the third degree in four cases.

In practice, the most significant among the many parameters examined by manometry are the resting and maximal squeeze anal pressure, rectal volume, and RAIR.

Table 1. Miller’s incontinence score

<table>
<thead>
<tr>
<th>Frequency of incontinence</th>
<th>Intestinal contents that the anus does not control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>flatus</td>
</tr>
<tr>
<td>Less then 1 occurrence per month</td>
<td>1</td>
</tr>
<tr>
<td>Between once a month and once a week</td>
<td>2</td>
</tr>
<tr>
<td>More often then once a week</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2 Anal sphincter function according to the Miller score

<table>
<thead>
<tr>
<th>Grade of incontinence</th>
<th>Number of patients</th>
<th>before the operation</th>
<th>after the operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>abdominal approach</td>
<td>transanal approach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>abdominal approach</td>
<td>transanal approach</td>
</tr>
<tr>
<td>I</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>II</td>
<td>7</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>III</td>
<td>6</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
The length of the anal canal may increase in time with the recovery of anus function. This increase of length may also occur as a result of reconstructive procedures of the anal sphincters, perineum, and pelvic floor. In our material, the change in the length of the anal canal was found manometrically in several cases (tab. 3).

Reduced resting pressure of the anal sphincters was found in 16 cases (94%) during the preoperative evaluation. This ranged from 10 to 40 mm Hg. Surgical treatment of rectal prolapse, as well as rectopexy or a transanal approach, resulted in a statistically significant increase in the resting pressure (average: 58.8 mm Hg, tab. 4).

Figure 1 shows the measurement results of the resting anal sphincter pressure before and after the operation. The orange squares depict the measurements from individual patients before the operation, whereas the green dots illustrate the post-operative results. The gray field indicates the normal range of the measured parameter. Pre- and post-operative analyses by Student’s t- and Wilcoxon tests showed that there was a significant difference (at the p<0.05 significance level) between the resting pressure taken before and after the surgery. The average pre-operative mean value was 31.8 mm Hg, whereas the post-operative resting pressure reached 58.8 mm Hg.

In preoperative evaluation of the investigated group of patients, a decreased maximal squeeze anal sphincter pressure was found in 15 cases (88.2%). It ranged from 50 to 110 mm Hg (average 67.6 mm Hg). Surgical treatment of the rectal prolapse resulted in a statistically significant increase in the average value of this parameter (average: 95.9 mm Hg, tab. 5).

Figure 2 illustrates the measurement results of the maximal squeeze anal sphincter pressure before and after the operation. The blue squares depict the measurements for separate patients before the operation, whereas the circular dots depict results after the operation. Navy blue dots illustrate the pressure values after the operation.

The gray field indicates the normal range of the measured parameter. Pre- and post-operative analyses by Student’s t- and Wilcoxon tests showed that there was a significant difference (at the p<0.05 significance level) between the resting pressure taken before and after the surgery. The average pre-operative value was 67.6 mm Hg, whereas the post-operative mean reached 95.9 mm Hg.

### Table 3. The length of the sphincteric zone

<table>
<thead>
<tr>
<th>Sphincter zone in cm</th>
<th>2-3</th>
<th>3-4</th>
<th>&gt;4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AA</td>
<td>TAA</td>
<td>AA</td>
</tr>
<tr>
<td>n before the operation</td>
<td>2</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>after the operation</td>
<td>3</td>
<td>9</td>
<td>1</td>
</tr>
</tbody>
</table>

AA – abdominal approach; TAA – transanal approach; n – number of patients

### Table 4. Evaluation of the resting anal sphincter pressure

<table>
<thead>
<tr>
<th>Rest pressure</th>
<th>Right</th>
<th>Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AA</td>
<td>TAA</td>
</tr>
<tr>
<td>n before the operation</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>after the operation</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>
Examination of the rectoanal inhibition reflex (RAIR) serves to demonstrate the role that the internal sphincter muscle plays in maintaining the anal tone. Absence of this reflex in anally incontinent patients indicates internal sphincter malfunction independent of the state of the sphincter’s skeletal muscles (1).

In the investigated material, RAIR was found in 52.9% of pre-operative cases and 76.5% of cases after the surgery (tab. 6). Fig. 3 shows RAIR occurrence in the pre- and post-operative examinations; it occurred in 52.9% of cases prior to the surgery and 76.5% of cases after the procedure. Statistical analysis using McNemara tests for dichotomic variables revealed no significant difference between pre- and post-operative RAIR occurrence (p = 0.125).

Additionally, examinations of rectal capacity and sensory function failed to show any influence of the chosen treatment on these values. (tab. 7).

Pre- and post-operative analyses by Student’s t- and Wilcoxon tests showed no significant difference between the rectal volume measured before and after the surgery. Statistical significance was assessed at p<0.05 level.

**DISCUSSION**

In the preoperative evaluation, anal insufficiency was found in 75.8% of rectal prolapse...
The effect of surgical treatment on anal sphincter function in patients with rectal prolapse

patients. This figure is similar to those found in the literature (8, 9, 10). The surgical treatment had significant influence on anal function. After the operation, the percentage of patients with sphincter insufficiency decreased to 41.4%. This is a result of both the correction of anatomical sphincter and perineal muscle defects and the remission of chronic anal stretch after proctopexy. It is expected that successive conservative treatment, especially sphincter muscle electrostimulation and biofeedback exercises, would further improve the function of the anal mechanism.

The investigations carried out revealed that the improvement of anal function seen in the control of stool and flatus after surgical treatment appears to be the result of an increase in the resting and maximal squeeze pressures of the patients’ anal sphincters. This seems to concur with other authors’ findings on the subject.

Investigators from Vrije University in Holland noted an increase in the average resting anal sphincter pressure from 20 to 25 mm Hg in patients treated by laparoscopic rectopexy (8). Data gathered from Kurume University in Japan concerning patients after Dexon mesh rectopexy revealed an increase from 20.5±3.7 to 40.5±4.8 cm H₂O (10). Huber and others have written about the increase in maximal resting pressure from 36.5 to 46 mm Hg after rectopexy accompanied by sigmorectal resection (11). All the authors agree that the increase in the resting anal sphincter pressure after variable surgical procedures for rectal prolapse provides substantial rectal function improvement and is indeed statistically significant (7, 9, 12, 13).

A statistically significant increase in the average maximal squeeze anal sphincter pressure to 95.9 mm Hg for the investigated group of 17 surgically treated rectal prolapse patients was observed. Huber and others noted an increase of this parameter from 90.5 mm Hg to 103 mm Hg (11).

Xynos and others observed statistically significant improvement of this parameter after low anterior resection of the rectum. (12) Di Giorgio and others attained similar results after abdominal rectopexy (13).

Schultz and others did not observe an increase in the maximal squeeze anal sphincter pressure after operations were performed (14).

Poen and others have noted some improvement in RAIR occurrence in 7 of 12 patients (p=0.03) who underwent laparoscopic rectopexy (8).

The Helsinki investigators did not find any changes in the reactive internal sphincter or sensory functions of the rectum in their group of 22 patients who underwent rectopexy accompanied by sigmorectal resection (15).

Neither Broden et al. (7) nor Poen (8) found any influence of the performed surgical techniques on the changes in rectal volume and sensory function, but investigators from Heraklion University found a statistically significant increase in rectal volume for a group of ten multiparas who underwent rectopexy accompanied by sigmorectal resection (12).

CONCLUSIONS

The improvement of anal stool and flatus continence after surgical treatment appears to result from an increase in the resting and maximal squeeze anal sphincters pressures.

Frequent occurrence of RAIR after surgical treatment of rectal prolapse has been observed, and thus it is not significantly affected by surgery.

The increase in the length of the anal canal appears mainly after transanal operations.

REFERENCES


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