Analysis of the course of the early postoperative period in patients with diastasis of the rectus abdominis after different methods of its surgical correction

C. M. Vasilyuk, A. V. Pettrash
Ivano–Frankivsk National Medical University

Abstract

**Objective.** To compare the indicators of the early postoperative period in patients with diastasis of the rectus abdominis after suture plication and after mesh implantation.

**Materials and methods.** The study included 120 patients with diastasis of the rectus abdominis muscles. In 60 patients (group 1), a suture was used to correct the diastasis, and in another 60 patients (group 2), a prolene mesh was used.

**Results.** The regression of pain in patients of group 1 on the 1st and 3rd postoperative days was more dynamic than in patients of group 2: pain decreased by 3.0 and 2.5 times, respectively. Mesh placement increased the risk of hyperthermia by 61%. The number of patients with complications in the groups was not statistically significant (p=0.265), but the difference between the number of patients with several complications was statistically significant (p=0.018). The use of mesh increased the risk of seroma by 64% (p=0.046), haematoma by 19% (p=0.819), wound infection by 36% (p=0.741), and paresthesia by 64% (p=0.025).

**Conclusions.** The correction of diastasis of the rectus abdominis muscles with a suture is more acceptable than the correction with the help of mesh placement.

**Keywords:** diastasis recti abdominis; surgical correction; mesh; postoperative period.

According to the 2021 guidelines of the European Hernia Society (EHS), the amount of evidence for the accurate determination of diastasis of the rectus abdominis (RAS) is limited, but the difference in the inner edges of these muscles by up to 2 cm can be considered physiologically normal [1].

Most surgeons are of the opinion that it is advisable to surgically correct the PFMJ by suturing the anterior laminae of their vaginas with a continuous suture. However, in patients with severe POP and thinned aponeurotic structures of the anterior abdominal wall, the use of continuous sutures alone may not be sufficient for high–quality pleating [2, 3].

Correct surgical correction of the DPMJ involves reducing the circumference of the abdominal wall in the axial plane, which causes tension of the anterior laminae of the rectus abdominis sheaths and increases the load on the arcuate lines. If the aponeurotic structures of the anterior abdominal wall are thinned, this can lead to suture eruption, which not only worsens the aesthetic and functional components of the operation, but may also be a prerequisite for recurrence of POP [2–4].

Current approaches to the correction of PFMJ include additional strengthening of the anterior laminae of the rectus abdominis with nodal sutures, pleating of the posterior laminae, or subaponeurotic implantation of mesh. Although mesh implantation, which allows tension to be distributed between the implant and multiple knotted transfascial fixation sutures, is more reliable for recurrence prevention and is very common in ventral hernia repair, the use of mesh for the treatment of POP is still controversial due to potential problems associated with the prolene implant: larger volume of tissue separation for complete mesh placement, higher risk of infection and postoperative pain, possibility of extrusion and potential need for mesh removal, and higher cost of surgery [5–7].

In addition, a significant proportion of patients expect the surgeon not only to eliminate the problems associated with POP, but also to provide an excellent aesthetic result of abdominoplasty or lipoabdominoplasty, which is often used to complement surgical correction of POP [8, 9]. For this purpose, suture pleating is more acceptable than the use of a prolene implant.

Thus, there is currently no consensus on a single approach to correcting white line width. Suture pleating, retromuscular or pre–neurotic placement of a mesh implant, or a combination of transfascial sutures and narrow mesh are equally popular.

The aim of the study was to compare the indicators of the early postoperative period in patients with PJM after suture plication and after mesh implantation.
Materials and methods of the study

Clinical examination and surgical treatment of 120 patients with PFD were performed. Depending on the method of surgical correction of PFD, patients were divided into two groups. The first group consisted of 60 patients in whom the correction of VLBP was performed using a continuous suture, and the second group consisted of 60 patients in whom suture correction was supplemented with subaponeurotic placement of prolene mesh (see Table). The course of the postoperative period in patients with VPMI of both groups was assessed by the following indicators: intensity of postoperative pain, temperature response, time to resume physical activity, frequency of early postoperative complications (seroma, haematoma, wound infection, skin flap necrosis, etc.). The level of postoperative pain syndrome was assessed on the 1st, 2nd and 3rd day after surgery using a point scale [10].

Results

In patients of group 1, on the 1st postoperative day, the intensity of pain syndrome was (5.56 ± 1.77) points (median

<table>
<thead>
<tr>
<th>Indicator.</th>
<th>1st (n=60)</th>
<th>2nd (n=60)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women/men (n)</td>
<td>50/10</td>
<td>42/18</td>
<td>0.130</td>
</tr>
<tr>
<td>Age (years), ( \bar{x} \pm \sigma )</td>
<td>46.31 ± 14.0</td>
<td>49.15 ± 13.01</td>
<td>0.113</td>
</tr>
<tr>
<td>Anamnesis of long-term residency (months), ( \bar{x} \pm \sigma )</td>
<td>3.72 ± 1.32</td>
<td>3.95 ± 1.29</td>
<td>0.114</td>
</tr>
<tr>
<td>BMI (kg/m(^2)), ( \bar{x} \pm \sigma )</td>
<td>28.2 ± 7.1</td>
<td>27.5 ± 6.5</td>
<td>0.112</td>
</tr>
<tr>
<td>Physical employment, n (%)</td>
<td>25 (41.7)</td>
<td>19 (31.7)</td>
<td>0.343</td>
</tr>
<tr>
<td>Intellectual employment, n (%)</td>
<td>35 (58.3)</td>
<td>41 (68.3)</td>
<td>0.343</td>
</tr>
<tr>
<td>Concomitant umbilical hernia (&lt;3 cm), n (%)</td>
<td>3 (5.0)</td>
<td>8 (13.3)</td>
<td>0.205</td>
</tr>
<tr>
<td>Correction of the DPM, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>without abdominoplasty</td>
<td>13 (21.7)</td>
<td>11 (18.3)</td>
<td>0.819</td>
</tr>
<tr>
<td>with horizontal abdominoplasty according to Vernon</td>
<td>15 (25.0)</td>
<td>14 (23.3)</td>
<td>1.000</td>
</tr>
<tr>
<td>with horizontal abdominoplasty according to Pitanguy</td>
<td>10 (16.7)</td>
<td>12 (20.0)</td>
<td>0.813</td>
</tr>
<tr>
<td>with vertical abdominoplasty according to Schepelmann</td>
<td>5 (8.3)</td>
<td>10 (16.7)</td>
<td>0.269</td>
</tr>
<tr>
<td>with combined abdominoplasty “Fleur de lys”</td>
<td>8 (13.3)</td>
<td>7 (11.7)</td>
<td>1.000</td>
</tr>
<tr>
<td>with lipoabdominoplasty by Vernon</td>
<td>9 (15.0)</td>
<td>6 (10.0)</td>
<td>0.580</td>
</tr>
</tbody>
</table>

Note. BMI - body mass index.

Fig 1. Diagram of the distribution of pain intensity in patients of group 1 on postoperative days 1 to 3 (\( p_{1-2} < 0.05 \) - statistically significant difference between the indicators on days 1 and 2; \( p_{1-3} < 0.05 \) - statistically significant difference between the indicators on days 1 and 3. (The same in Fig 2).
On the 2nd postoperative day, the pain intensity was statistically significantly (p<0.05) lower than the corresponding indicator on the 1st postoperative day (Fig. 1).

In patients of group 2, on the 1st postoperative day, the intensity of pain syndrome was statistically insignificant (p>0.05) and decreased to (3.92 ± 1.29) points (median 4.0; min. 1.0; max. 6.0). On the 3rd postoperative day, the pain intensity was (1.81 ± 0.65) points (median 2.0; min. 1.0; max. 3.0), which was statistically significantly (p<0.05) lower than the corresponding indicator on the 1st postoperative day (Fig. 2).

There was no statistically significant difference between the intensity of pain in patients of groups 1 and 2 on different postoperative days. The intensity of the pain syndrome did not depend on the method of surgical correction of PJP. Although this indicator was somewhat lower in patients of group 1, it did not differ statistically significantly from the corresponding indicator of patients of group 2. However, it should be noted that the regression of pain in patients of group 1 on the 1st and 3rd postoperative days was more dynamic than in patients of group 2 (reduction of pain level by 3.0 times and 2.5 times, respectively), although the difference between the pain intensity on the 1st and 2nd postoperative days was statistically insignificant.

On the 1st postoperative day, normal body temperature was noted in 36.7% of patients in group 1 and 18.3% of patients in group 2, which was statistically significant (p=0.041). Increase in body temperature was statistically significant (p=0.041) less common in patients of group 1 (63.3%) than in patients of group 2 (81.7%). In the case of mesh implantation, the risk of hyperthermia on the 1st postoperative day increased by 61% (odds ratio 0.39, 95% confidence interval 0.17 – 0.90). Subfebrile body temperature (37–38 °C) was statistically significantly (p=0.035) more common in patients who underwent mesh implant correction of VLBP (75.0%) than in patients who underwent suturing (55.0%). Overall, patients who underwent suture plication were 59% less likely to develop fever after surgery (odds ratio, 0.41; 95% confidence interval, 0.19 to 0.88). Febrile body temperature occurred in a relatively small proportion of patients (8.3% in group 1 and 6.7% in group 2), which was not statistically significant (p=1.000). Of the 87 patients with hyperthermia, 90.8% had their body temperature normalised by postoperative day 3 (Fig. 3).

On the 2nd postoperative day, 34.2% of patients in group 1 and 42.8% of patients in group 2 had fever, which was statistically insignificant (p=0.156) and demonstrated a statistically significant (p=0.001) positive trend compared to the 1st day in patients of both groups. On the 3rd postoperative day, hyperthermia was present in 3 patients of the 1st group and 5 patients of the 2nd group, which was also statistically insignificant (p=0.714) and indicated a positive statistically significant (p=0.001) dynamics compared to the 1st day in patients of both groups.

Another important indicator was the period of recovery of patients' physical activity (Fig. 4). In patients of group 1, the average period of activation was (14.56 ± 4.76) hours (median 14.5; min. 6.0; max. 20.0). In patients of group 2, the period of physical activity recovery was statistically insignificantly longer – (16.43 ± 5.37) hours (median 16.5; min. 7.0; max. 24.0).

Early postoperative complications occurred in patients of both groups: in group 1 – 35 complications in 21 (35.0%) patients, in group 2 – 62 complications in 28 (46.7%) patients, in group 2 – 62 complications in 28 (46.7%) patients.
patients. The number of patients with complications in the groups differed statistically insignificantly (p=0.265), but the difference between the number of patients with a combination of two or more complications in the groups was statistically significant (p=0.018).

The risk of developing postoperative seroma (Fig. 5) was statistically significantly (p=0.046) higher by 64% in patients of group 2 (odds ratio 2.79; 95% confidence interval 1.10 – 7.04). A number of factors contributed to the formation of seroma, which were more pronounced in the correction of POP using mesh than in suture plication: destruction of small blood and lymphatic vessels and lymphatic channels, the presence of a foreign body in the abdominal wall, more aggressive dissection of the subcutaneous base.

Patients in group 2 had a statistically insignificant (p=0.819) higher incidence of haematomas. They had a 19% higher chance of developing this complication (odds ratio 1.23; 95% confidence interval 0.50 – 3.02). The incidence of wound hyperaemia, which indicated wound infection, was not statistically significant between groups (p=0.741), but patients in group 2 had a 36% higher chance of developing this complication (odds ratio 1.56; 95% confidence interval 0.42 – 5.82).

Skin flap necrosis was a rare complication, but important in terms of patients’ emotional satisfaction with the operation. The incidence of this complication was not statistically significantly different between groups, but patients in group 2 had a 51% higher risk of developing it (odds ratio 2.03; 95% confidence interval 0.18 – 23.06).

Paresthesia of the skin of the anterior abdominal wall occurred frequently: in 11 patients in group 1 and 23 in group 2, which was statistically significant (p=0.025). The odds of developing this complication were 64% higher in patients who received a mesh implant than in patients who underwent suture plication (odds ratio 2.77; 95% confidence interval 1.20–6.39).

**Discussion**

Most surgical approaches for moderate LMJ usually include isolated pleating (single, double, or continuous sutures) with absorbable or non–absorbable sutures [11, 12]. If the LMJ is significant, pleating is often supplemented with retromuscular prolene mesh placement [13].

Currently, there is no consensus on the advantages of isolated pleating and pleating with a grid [1]. In 2020, E. Swedenhammar and colleagues [14] reported on a randomised controlled clinical trial to compare double pleating of the anterior fascia of the rectus muscle with 2–0 slow–absorbable self–absorbable PFA sutures using Quill (a bi–directional thread with spikes that evenly distributes tension in the suture area) in 28 patients and retromuscular prolene mesh placement in 29 patients. After a three–month follow–up, the authors concluded that both techniques were equally reliable, although patients who received mesh reported better muscle strength. Patients in both groups were satisfied with the functional outcome, but only a few were satisfied with the aesthetic effect. The placement of prolene mesh requires more extensive surgery than double–row pleating, so the potential risk of complications is higher.

The good short–term results of laparoscopy for the treatment of PCOS are of interest to surgeons. Typically, patients are treated with the venetian blinds technique in combination with prolene mesh placement. However, laparoscopic pleating of the white line without the use of a mesh according to Siddiky is also quite effective. Since this procedure is performed without the use of an artificial prosthesis, it avoids the risks associated with the introduction of foreign material into the tissues [15].

F. F. Fiori and colleagues [16] conducted a retrospective study that demonstrated the effectiveness of different approaches to the correction of VLBP. The study included patients who underwent laparoadominoplasty (39), laparomyeloabdominoplasty (29) and laparoscopy (26). No intraoperative complications or recurrences were reported. Only 3 patients experienced serious complications.

**Conclusions**

1. The intensity of the pain syndrome did not depend on the method of surgical correction of POP (mesh or suture pleating), but the pain in patients who underwent suture pleating on the 1st and 3rd postoperative days decreased by 3.0 times, and in patients who underwent mesh pleating – by 2.5 times, although the corresponding indicators differed statistically insignificantly between the groups on the 1st and 2nd postoperative days.

2. On the 1st postoperative day, a statistically significant (p=0.041) increase in body temperature was less common in patients of group 1 (63.3%) than in patients of group 2 (81.7%). In the case of mesh placement, the risk of hyperthermia on the 1st postoperative day increased by 61% (odds ratio 0.39; 95% confidence interval 0.17 – 0.90).

3. The use of mesh in the correction of VLBP increases the risk of seroma by 64% (p=0.046), haematoma by 19% (p=0.819), wound infection by 36% (p=0.741), skin flap necrosis by 51% (p=1,000), and paresthesia by 64% (p=0.025).

4. The study of the quality of life of patients after the use of various methods of correction of VLBP is promising in terms of further research.
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Authors’ contribution. Vasilyuk S. M. – concept and design of the study, writing the text; Petrash A. V. – collection and processing of materials, analysis of the data.

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References


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