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Proper Surgical Treatment of Small and Medium Size Umbilical Hernias. A Single Surgeon Experience

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ABSTRACT

Introduction: Minimally invasive surgical procedures have become routine interventions nowadays and represent an effective therapeutic option even for small umbilical hernias, providing favorable postoperative and aesthetic results. **Aim of study:** To determine the most appropriate minimally invasive treatment option for small and medium size umbilical hernias. **Materials and methods:** We conducted a prospective study on 50 patients with small or medium umbilical hernia (<4 cm). All patients benefited of minimal invasive surgery with mesh implantation. Depending on the surgical procedure, two major groups were defined: group A – patients with open surgical approach (n = 24) and group B – patients undergoing laparoscopic surgery (n = 26). Clinical, surgical, postoperative, and follow-up data were analyzed. **Results:** Mesh replacement via open approach through the umbilicus was associated with significantly reduced surgical time (p = 0.0359), administration of painkillers (p = 0.0461), and use of anticoagulants (p = 0.0404). Hospital stays (p = 0.0001) and costs (p = 0.0005) were also significantly lower in this group. After 6 months of follow-up, no recurrence was observed, and no significant differences were detected regarding postoperative pain and the patients' professional reintegration. Patient satisfaction regarding postoperative scar was superior in the open group. **Conclusion:** The present study indicates that the ventral patch technique is a safe and effective method for the treatment of small and medium size umbilical hernias.

Keywords: small umbilical hernia, ventral patch, minimally invasive, esthetics

INTRODUCTION

Abdominal wall hernias are quite common surgical conditions affecting all ages and both genders. A hernia represents an abnormal protrusion of a peritoneum-lined sac through the muscular covering of the abdomen. The umbilicus is one of the weak points of the abdominal wall and a relatively common site for herniations. Nowadays, umbilical hernias still represent an important medical issue, affecting a significant part of the population. Because of the increased recurrence rates following suture repair, closure of the abdominal wall defect using a synthetic prosthesis has been shown to be superior to other surgical techniques, even for

small size hernias. The outcome of hernia repair may also be affected by the surgical approach. Minimally invasive techniques for mesh placement have been shown to reduce postoperative complications and may offer a satisfying esthetic result as well. Synthetic patches are particularly suitable for small hernias because they require a smaller dissection; however, it is still unclear whether the results of this procedure are at least equal to other minimally invasive techniques.[1–3]

The aim of the study was to assess the efficacy of two minimally invasive (open versus laparoscopic) surgical options in treating small and medium size umbilical hernias.

MATERIALS AND METHODS

Patient selection

Between January 1, 2018 and June 30, 2019 we conducted a prospective study at the 2nd Department of General Surgery of Mureș County Emergency Clinical Hospital on 50 patients diagnosed with small or midsized umbilical hernias. All patients underwent surgical treatment and benefited of minimally invasive care of the abdominal wall defect.

The laparoscopic approach was performed using the standard three-trocar method, and reinforcement of the abdominal wall was carried out with composite surgical mesh fastened with surgical tacks. For the open surgical procedure, a single microincision was performed at the level of the umbilicus. After careful dissection, the parietal defect was identified, and the hernia content was reintroduced in the peritoneal cavity. Succeeding cautious examination of possible adhesions around the abdominal wall defect, a ventral patch-type synthetic mesh (Figure 1) was introduced through the umbilicus and fastened with two separate sutures. The abdominal wall defect and the skin incision were closed with separate sutures.

FIGURE 1. Ventral patch for hernia repair

The surgical procedures were performed by a single surgeon, with competency and experience in minimally invasive hernioplasty. Follow-up for these patients was performed at 6 months after surgical treatment. Patients requiring hernia repair in emergency conditions, those with increased size umbilical defects, advanced stages of obesity, or undergoing other surgical treatment options than minimally invasive techniques were excluded from the study.

Subdivision of patients and collected data

Based on the surgical intervention performed, the patients were divided into two groups: 1) a study group (SG), with open approach, including 24 patients who underwent open surgical treatment of the umbilical hernia; 2) a control group (CG), with laparoscopic approach, including 26 patients who benefited of reinforcement of the abdominal wall with composite surgical mesh via laparoscopic repair. All patients were carefully questioned and examined. At the same time, data was gathered from medical charts and operatory protocols.

The first subanalysis of the study compared the two surgical procedures analyzing clinical, surgical, and postoperative data. Clinical characteristics included the patients' gender, age, weight, and size of umbilical defect. For interpretation of age, three subgroups were defined: young adults (<44 years), middle-aged adults (45–69 years), and elderly adults (>70 years). For obesity assessment, the internationally applied body mass index (BMI) was calculated. For categorization of the abdominal wall defect, we used the classification proposed by the European Hernia Society: hernias with diameters <2 cm were defined as small sized, and hernias with diameters between 2–4 cm were defined as medium sized. Regarding surgical and postoperative data, the following variables were examined: number of abdominal incisions, mesh fixation method, duration of surgical intervention, mobilization after surgery, postoperative medication (painkillers, anticoagulants, and antibiotics), length of hospital stay, and hospitalization costs. For easier assessment of surgical time, short surgical interventions (<60 minutes) and prolonged operations (>60 minutes) were defined. The early mobilization subgroup contained patients who sustained physical effort (walking) on the day of surgical intervention, while those with delayed mobilization performed physical activity later during the postoperative recovery. Regarding the postoperative medication, three subgroups were distinguished, based on the length of medicine intake (without treatment, treatment only on the day of surgical intervention, and more than one-day treatment).

During the second subanalysis we mainly focused on statistical analysis of data gathered throughout patient follow-up. These aspects included evaluation of postoperative pain, the patients' professional reintegration, and assessment of recurrence rate. For the evaluation of postoperative pain, the following numerical rating scale was applied: 0 = no pain, 1–3 = reduced pain, 4–6 = moderate pain, 7–9 = significant pain, 10 = worst pain ever. Professional reintegration was measured in time (weeks) spent from surgical intervention until return to work.

Esthetic results were assessed in the third subanalysis, through which the following aspects were analyzed: number of abdominal incisions, wound closing methods, and the patients' satisfaction on wound healing. Postoperative scar healing results were analyzed with the Vancouver Scar Scale (VSS), which is widely used in clinical practice and research.

Statistical analysis

The collected information was processed using Microsoft Excel. The statistical analysis of the database was performed using GraphPad InStat software (GraphPad Software, Inc., San Diego, USA). Quantitative variables were presented by mean and median, while qualitative and categorical variables were expressed both as integer and percentage values. A normality test was applied for all variable groups in order to determine the distribution of values. Furthermore, for the quantitative statistical analysis, Student's t-test was applied for groups with Gaussian distribution of values, while the Mann-Whitney nonparametric test was used for groups with non-Gaussian distribution. The level of statistical significance for the present research was set at a p value of 0.05, while the confidence interval was 95% for all calculated parameters.

RESULTS

Basic comparison of the surgical procedures

The results of the first subanalysis comparing patients undergoing the two studied procedures is presented in Table 1, which indicates that male patients were present in a higher proportion in both of the studied groups (SG – 79.17%, CG – 65.38%), but without statistically significant difference. Analysis of age indicated a majority of middle-aged adults (n = 26), followed by young adults (n = 20) and elderly patients (n = 4). However, age-related data did not show any significant differences between the groups. Regarding obesity, the majority of patients (SG – 70.83%, CG – 50%) had a BMI in the normal range; overweight patients were present in a higher proportion in the laparoscopic group, while obese patients were present in just a small percentage. Neither of these data showed significant differences during statistical analysis. The last investigated clinical aspect was the size of the parietal defect. Abdominal wall defects smaller than 2 cm benefited mainly of classic approach (SG – 54.17%, p = 0.0938), while umbilical hernias with

TABLE 1. Clinical characteristics of the study population

	Study group Open approach n = 24 (%)	Control group Laparoscopic approach n = 26 (%)	p value
Gender			
Male	19 (79.17)	17 (65.38)	0.3
Female	5 (20.83)	9 (34.62)	0.3
Age (years)			
25–44	11 (45.83)	9 (34.61)	0.4
45–69	10 (41.67)	16 (61.54)	0.2
>70	3 (12.5)	1 (3.85)	0.5
BMI			
Normal (18.5–24.9)	17 (70.83)	13 (50)	0.2
Overweight (25–29.9)	7 (29.17)	11 (42.31)	0.4
Obese (30–34.9)	0 (0)	2 (7.69)	–
Severely obese (35–39.9)	0 (0)	0 (0)	–
Morbidly obese (40+)	0 (0)	0 (0)	–
Size of hernia defect (cm)			
<2 cm	13 (54.17)	7 (26.92)	0.09
2–4 cm	11 (45.83)	19 (73.08)	

TABLE 2. Surgical and postoperative data in the study population

	Study group Open approach n = 24 (%)	**Control group Laparoscopic approach n = 26 (%)**	**p value**
No. of abdominal incisions			
One	24 (100)	0 (0)	–
Three	0 (0)	26 (100)	–
Wound closing technique			
Simple interrupted suture	24 (100)	8 (30.77)	0.0001
Intradermal suture	0 (0)	18 (69.23)	
Mesh fixation method			
Separate sutures	24 (100)	0 (0)	–
Tacks	0 (0)	26 (100)	–
Duration of surgery (min)			
Average	45 minutes	70 minutes	–
Short (<60 min)	22 (91.67)	15 (57.69)	0.03
Prolonged (>60 min)	2 (8.33)	11 (42.31)	
Mobilization			
Early (Day 0)	23 (95.83)	22 (84.62)	0.4
Delayed (Day 1)	1 (4.17)	4 (15.38)	
Use of painkillers (days)			
Average	1.33 days	2.80 days	
Without treatment	4 (16.67)	0 (0)	0.04
Only one day of treatment	9 (37.5)	1 (3.85)	0.004
More than one day of treatment	11 (45.83)	25 (96.15)	0.0001
Use of anticoagulant (days)			
Average	0.95	2.34	–
Without treatment	13 (54.17)	6 (23.08)	0.04
One day of treatment	0 (0)	0 (0)	–
More than one day of treatment	11 (45.83)	20 (76.92)	0.04
Use of antibiotic (days)			
Average	0.72	0.92	–
Without treatment	0 (0)	5 (19.23)	0.05
One day of treatment	21 (87.5)	18 (69.23)	0.1
More than one day of treatment	3 (12.5)	3 (11.54)	1.0
Average length of hospital stay (days)	2.65	4.19	0.0001
Average hospitalization costs (EUR)	718.23	1185.08	0.0005

diameters between 2–4 cm were predominantly treated via laparoscopic approach (CG – 73.08%, p = 0.0938).

Surgical and postoperative details are presented in Table 2. Patients who benefited of abdominal reinforcement with ventral patch composite synthetic mesh needed a single abdominal microincision, while patients from the CG had at least three abdominal microincisions. For wound closure during classic surgical intervention, exclusively simple interrupted sutures were utilized, while in case of laparoscopic surgery, significantly more patients benefited of intradermal suture (p = 0.0001). In case of the ventral patch method, mesh fixation happened via separate sutures, while in case laparoscopic hernioplasty, metallic or absorbable tacks were used in order to fix the composite surgical mesh. No significant differences were observed during the analysis of these data. Regarding the duration of surgical intervention, patients from the SG had a significantly shorter operation compared to patients who benefited of laparoscopic intervention (p = 0.0359). Early postoperative mobilization was encouraged for all patients, and statistical analysis of these characteristics did not indicate any significant difference for neither of the studied groups.

Postoperative medication represented an important part of our investigation, and we noticed that patients with classic hernioplasty benefited of significantly less painkillers and anticoagulant therapy. There were no statistically significant differences between the study groups in terms of antibiotic

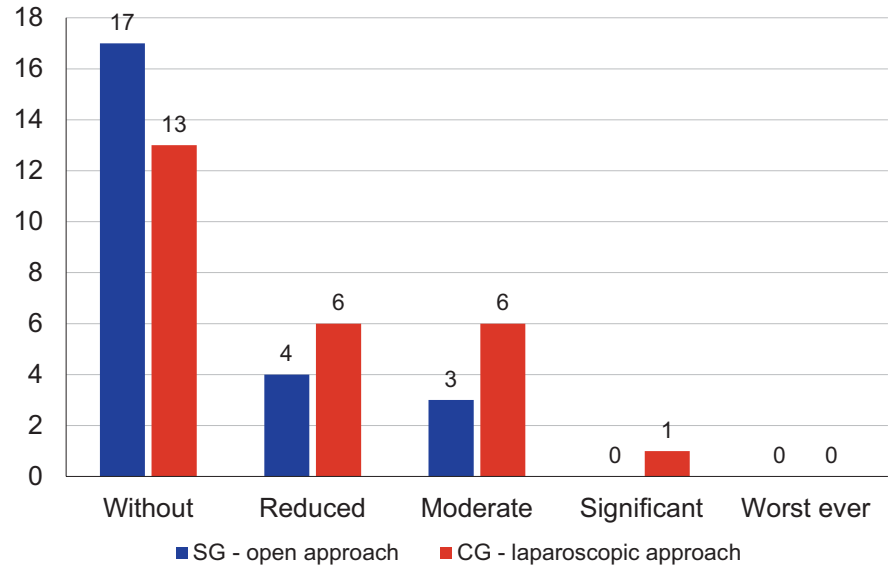

FIGURE 2. Distribution of postoperative pain

use. On the other hand, the length of hospital stay seemed to be significantly longer for patients with laparoscopic hernioplasty ($p = 0.0001$), while hospitalization costs were significantly higher in patients from the CG ($p = 0.0005$).

Follow-up

The second subanalysis in our study focused on patient follow-up. Figure 2 presents the distribution of postoperative pain among patients, which showed no significant differences between the two studied groups. The professional reintegration of the patients is illustrated in Figure 3, where a slightly difference can be observed between the two studied groups. Ventral patch-type hernioplasty seemed to assure faster return to work, but with no statistical significance ($p = 0.0944$). As for hernia recurrence, no reappearance of umbilical defects was registered in neither group during the six months of follow-up.

Esthetic issues after minimally invasive hernioplasty

The open surgical approach required a single incision, while in order to perform laparoscopic hernioplasty, the patients suffered at least three incisions in the abdominal wall. Regarding wound closing technique, the majority of patients from the CG benefited of intradermal suture. Furthermore, VSS assessment indicated a significantly higher

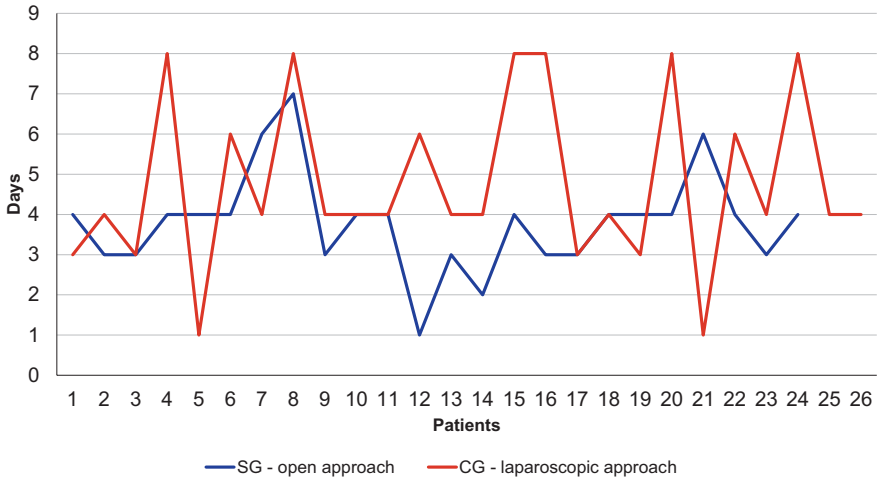

FIGURE 3. The professional reintegration of patients

index for patients from the CG (mean = 4 points), while ventral patch-type hernioplasty seemed to yield higher satisfaction among patients (mean = 2.5 points, p = 0.0109).

DISCUSSION

Primary considerations

There is no consensus on the ideal technique for repairing small and medium size umbilical hernias in adults, both presented surgical procedures representing current options for minimally invasive hernioplasty. The laparoscopic repair of parietal defects has been widely applied, and several studies have confirmed the procedure's benefits; the patch-type surgical mesh represents a new open-technique solution for small and medium size umbilical hernias, with at least similar efficacy as other treatment options.[4,5]

Choosing the right surgical intervention is not always easy, and the surgical decision should be guided by the general condition of the patients, as well as the clinical considerations. Regarding age and gender, the current literature is vague.[6] However, in our experience, advanced age associated with comorbidities requires cautious decision and a careful analysis of the risk-benefit ratio.

Obesity is a well-known risk factor for abdominal wall defects, but an excessive amount of adipose tissue can also cause difficulties during surgical interventions.[7] Therefore, patient selection had an important role in our study. Bonomo *et al.* also highlighted the importance of patient selection during minimally invasive surgery.[8] In many cases, the current literature recommends laparoscopic treatment of umbilical hernia in obese patients; contrariwise, Wassenber *et al.*, in a single center experience, highlighted the benefits of the ventral patch technique.[9,10]

The size of the parietal defect should also be considered when opting for the right surgical technique. Due to the technical difficulty of retro-rectus and preperitoneal dissection for these small abdominal wall defects, effective alternative approaches seem to be the use of a self-expanding mesh device introduced into the peritoneal cavity through a single microincision (open ventral patch method), or laparoscopic abdominal wall reinforcement. Results similar to ours can be found in the literature.[11,12]

Regarding mesh fixation, the two surgical procedures are completely different. During open surgical intervention, the composite patch is fastened with separate sutures in a few key points, while laparoscopic surgery requires surgical tacks in order to secure the composite mesh. Fixation of the synthetic patch seemed more easy to perform, a fact underlined by other researchers as well.[13]

There is a strong relationship between mesh fixation methods and surgical time, since laying and fastening the composite surgical mesh during laparoscopic hernioplasty requires additional minutes. In a multicenter prospective study, Berrevoet *et al.* assessed surgeon satisfaction related to ease of mesh use in 95% of surgeries and reported an average surgical time of 36.2 minutes, favoring the open ventral patch technique.[14]

Both surgical procedures represent minimally invasive techniques, therefore early mobilization of the patients is characteristic for these type of interventions. Vychnevskaia *et al.* and Vorst *et al.* highlighted the benefits of minimally invasive procedures.[15,16] The shorter operation time and the integrity of the abdominal wall allow patients to perform physical effort on the day of surgical intervention.

Medication after surgery is essential in avoiding serious complications and granting comfort in the postoperative period. In the present study, similar medication has been utilized for both of the studied groups, with slightly better results for patients from the open group regarding painkillers and anticoagulant therapy. As for antibiotic use, no differences worth mentioning were registered. The majority of patients benefited of prophylactic, single-dose antibiotic treatment prior to surgical intervention. Prolonged antibiotic intake was registered only in case of patients with high BMI who are more prone to wound complications. In a randomized controlled, multicenter trial, Ponten *et al.* mentioned similar considerations regarding postoperative medication.[17]

Both surgical interventions were generally associated with a short hospital stay. The minimally invasive approach assured patients early hospital discharge after a short postoperative recovery, and the ventral patch technique seems to ensure an even more reduced hospitalization. For instance, Zarmpis *et al.* reported an average hospital stay of 4 days.[18]

In the modern era of medical care, the financial aspects of therapeutic methods cannot be ignored. According to Roumm *et al.*, the costs of laparoscopic surgery are frequently high.[19] The present article identified an average hospitalization cost of 718.23 euro per patient with the composite ventral patch technique, while the mean cost of laparoscopic surgery was 1.65 time higher.

Follow-up

Postoperative pain represented the first aspect followed during the 6-month follow-up. Most of the time, minimally invasive surgical procedures are associated with reduced perioperative pain, a fact also confirmed during the pres-

ent study, both surgical methods being linked with a low pain index during postoperative recovery.

In general, less invasive surgical treatments ensure an early possibility for work resumption. Based on our experience, patients who benefited of the open approach and reinforcement of the abdominal wall defect with the ventral patch technique presented a slightly faster professional reintegration. However, Agca *et al*. found that this type of surgical intervention does not influence postoperative pain and early return to work significantly.[20]

During the follow-up period, no recurrence was registered for either of the studied groups. However, we must underline that the follow-up period was relatively short. Further studies with longer follow-up periods are needed to draw conclusions. Venclauskas *et al*. reported that laparoscopic surgery for umbilical hernia repair can be safely applied with favorable long-term outcomes regarding recurrence.[21] As for open repair with synthetic patch implantation, Ambe *et al*. reported a low recurrence rate for this type of intervention.[22]

Esthetics after umbilical hernioplasty

Nowadays, esthetic results are an important issue in general surgery. During our research, the following aspects were followed for defining an esthetic result: the number of abdominal incisions, wound closure techniques, and patient satisfaction regarding scar healing.

Regarding the number of incisions, the open technique with ventral patch implantation offers a more satisfying result, with a single microincision at the level of umbilicus (Figure 4), compared to laparoscopic hernioplasty, which requires at least three abdominal incisions.

As far as wound closing methods are concerned, the majority of patients from the laparoscopic group benefited of intradermal closure of the incisions. Being a more delicate area, we exclusively used separate surgical sutures for closing umbilical wounds.

Patient satisfaction regarding scar healing was estimated using the Vancouver Scar Scale, our results showing a lower VSS index during follow-up for the open hernioplasty group. In 2019, Berrevoet *et al*. published a large multicenter prospective study about the ventral patch technique, with results similar to our study. They concluded that open hernioplasty with ventral patch implantation offers satisfying results.[23]

LIMITATIONS OF THE STUDY

Our study has several limitations. Firstly, the fact that no recurrence was observed may be related to the relatively short follow-up period of 6 months; a longer follow-up period may identify several long-term complications. Secondly, the sample size was relatively small, and statistical significance had not been reached in several parts of the study. With a larger sample size, probably some of the statistical analysis would have reached significant thresholds.

CONCLUSION

Placement of a synthetic patch through a minimally invasive open approach as treatment for umbilical defects is associated with low recurrence rate, low postoperative pain, lower hospitalization costs, and high esthetic satisfaction. These confirm that hernioplasty with the ventral patch technique via open procedure is an effective option for small and medium size hernia repair.

CONFLICT OF INTEREST

Nothing to declare.

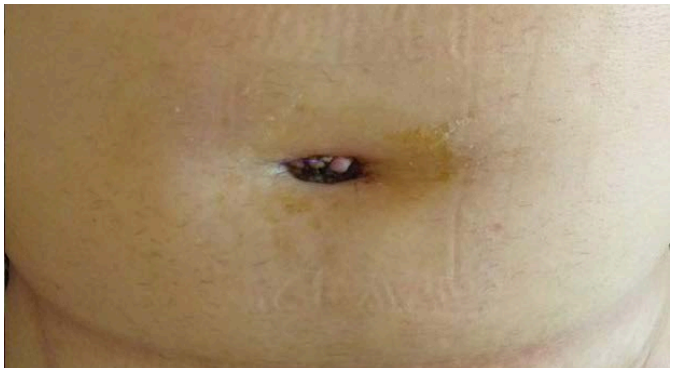

FIGURE 4. Postoperative esthetic results with the ventral patch technique

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