

Long-term follow-up results of umbilical hernia repair

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Abstract

Introduction: Multiple suture techniques and various mesh repairs are used in open or laparoscopic umbilical hernia (UH) surgery.

Aim: To compare long-term follow-up results of UH repair in different hernia surgery groups and to identify risk factors for UH recurrence.

Material and methods: A retrospective analysis of 216 patients who underwent elective surgery for UH during a 10-year period was performed. The patients were divided into three groups according to surgery technique (suture, mesh and laparoscopic repair). Early and long-term follow-up results including hospital stay, postoperative general and wound complications, recurrence rate and postoperative patient complaints were reviewed. Risk factors for recurrence were also analyzed.

Results: One hundred and forty-six patients were operated on using suture repair, 52 using open mesh and 18 using laparoscopic repair technique. 77.8% of patients underwent long-term follow-up. The postoperative wound complication rate and long-term postoperative complaints were significantly higher in the open mesh repair group. The overall hernia recurrence rate was 13.1%. Only 2 (1.7%) patients with small hernias (< 2 cm) had a recurrence in the suture repair group. Logistic regression analysis showed that body mass index (BMI) > 30 kg/m², diabetes and wound infection were independent risk factors for umbilical hernia recurrence.

Conclusions: The overall umbilical hernia recurrence rate was 13.1%. Body mass index > 30 kg/m², diabetes and wound infection were independent risk factors for UH recurrence. According to our study results, laparoscopic medium and large umbilical hernia repair has slight advantages over open mesh repair concerning early postoperative complications, long-term postoperative pain and recurrence.

Key words: umbilical hernia, recurrence rate, laparoscopic repair.

Introduction

The incidence of umbilical hernia (UH) varies from 6% to 14% of all abdominal wall hernias in adults. Umbilical hernia repair is a common surgical procedure in general surgery [1–4]. Multiple suture techniques and various mesh repairs are used in open UH surgery while laparoscopic repair is rapidly increasing in large UH. The recurrence rate after suture repair technique ranges from 10% to 30% compared with

up to 10% in the mesh repair group [3]. There is no discussion as to which technique (suture or mesh repair) we have to use in elective surgery when the UH size is > 3 cm. The optimal choice is mesh technique. However, there is much debate involving surgery for small UH (< 2–3 cm). Only a few randomized controlled trials (RCTs) and prospective studies have analyzed long-term UH treatment results [1, 5–9].

Several factors have been responsible for recurrence after umbilical hernia repair. However, only

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a few studies have presented an independent factor after multivariate analysis [10, 11]. Large seroma, surgical site infection, the patient's body mass index (BMI) > 30 kg/m² and hernia defects > 2 cm have been reported as possible factors for umbilical hernia recurrence.

Aim

To compare long-term follow-up results of UH repair in different hernia surgery groups and to identify risk factors for UH recurrence.

Material and methods

The institutional review board's permission no. BEC-MF-07 was obtained prior to this study. It was a retrospective study of 216 patients who underwent elective surgery for primary UH. Patients were operated on in the Department of Surgery between 1st January 2002 and 31st December 2012. We tried to contact all treated patients by phone. All contacted patients were invited to attend the physical examination in our outpatient department. Hernia recurrence diagnosis was based on the patient's physical examination and paraumbilical area ultrasound, performed by an experienced radiologist. If the ultrasound examination could not identify hernia recurrence (obese patient or uncertain image), an abdominal wall computed tomography (CT) scan was performed. The patient's age, gender, hospital stay, hernia size, BMI, postoperative general and wound complications, recurrence rate, risk factors for hernia recurrence, postoperative pain and patient's assessment of surgery outcome were analyzed. Postoperative pain was evaluated by patients themselves according to two criteria: any pain or discomfort in the surgery area at rest and during physical activity.

Patients assessed their surgery outcome according to the following evaluation criteria: excellent, very good, good, satisfactory, poor and very poor.

All the patients were divided into three groups according to hernia repair technique: suture repair, mesh repair and laparoscopic repair. Umbilical hernias were divided into three groups based on their size according to the European Hernia Society (EHS) recommendations: small UH (< 2 cm), medium (2–4 cm) and large (> 4 cm) [12].

Surgical techniques

The type of UH hernia repair technique was chosen independently by the operating surgeon. The su-

ture repair was performed using the Keel technique: the hernia defect was closed using interrupted inverted monofilament slowly absorbable sutures.

The onlay and sublay techniques were used for open mesh repair surgery. The appropriate size Optilene mesh (by B/Braun) was used for both techniques. The mesh was secured with a few non-absorbable sutures on the posterior sheet of aponeurosis in the sublay technique. The mesh was fixed with interrupted, non-absorbable sutures on the superior sheet of aponeurosis in the onlay technique. The need for wound drainage in open mesh repair surgery was chosen independently by the operating surgeon.

Three trocars (one 10 mm and two 5 mm in size) were used for laparoscopic hernia repair. Appropriate size Physiomesh (by Johnson & Johnson) was used for defect closure. The mesh was secured with titanium tacks (ProTack, Covidien). The hernia defect was not closed before the mesh placement. The mesh size in all open and laparoscopic techniques was chosen so that it overlapped by 5 cm in all directions beyond the outer border of the fascial defect.

Statistical analysis

Statistical analyses were performed using SPSS Statistics 20.0 for Windows. Student's *t*-test was used to compare parametric variables. χ^2 test and Kruskal-Wallis one-way analysis of variance were used to compare nonparametric variables between groups. Logistic regression analysis was used to assess the risk factors for hernia recurrence. Data were expressed as mean and standard deviation. The value of $p < 0.05$ was considered statistically significant.

Results

Two hundred and sixteen patients underwent elective surgery for UH over a 10-year period. The mean patients' age was 54.3 ± 15.7 years. Most of them were female ($n = 137$, 63.4%). From 52 patients who underwent open mesh repair, in 39 (75%) the onlay technique and in only 13 (25%) patients the sublay technique was used. Patients' general characteristics and distribution between the groups are summarized in Table I.

Patients' BMI was significantly higher in the open mesh repair group compared with open suture ($p < 0.001$) and laparoscopic repair ($p = 0.004$) groups. Average defect size in the open mesh repair group

Table I. Patient general characteristics

Variable	Suture repair	Open mesh repair	Laparoscopic repair	P-value
N (%)	146 (67.6)	52 (24.1)	18 (8.3)	–
Age [years]	54.5 ±16.8	54.9±12.7	51.1 ±14.3	NS
Gender, n (%):				
Male	49 (33.6)	24 (46.2)	6 (33.3)	NS (between gender gr.)
Female	97 (66.4)	28 (53.8)	12 (66.7)	
Median ASA score (range)	2 (1–3)	2 (1–4)	2 (1–3)	NS
Smoking history, n (%)	29 (19.9)	11 (21.2)	3 (16.7)	NS
Medical history, n (%):				
Cancer	3 (2.1)	2 (3.8)	0	NS
Diabetes	8 (5.5)	4 (9.6)	3 (16.7)	NS
Steroid use	1 (0.7)	1 (1.9)	0	NS
Other hernia	4 (2.7)	2 (3.8)	0	NS
BMI [kg/m ²]	30.4 ±7.0	36 ±6.9	28.9 ±6.6	< 0.001 NS 0.004
Umbilical hernia size [cm]	2.69 ±1.21	4.64 ±4.36	3.12 ±1.22	< 0.001 NS 0.024

was significantly larger than in the suture ($p < 0.001$) and laparoscopic repair ($p = 0.024$) groups (Table I). Mesh repair technique was used significantly more often when the hernia defect was > 4 cm ($p = 0.001$). The relation between hernia repair technique and hernia defect size is demonstrated in Table II.

One hundred and sixty-eight (77.8%) patients attended our outpatient clinic in the late follow-up period and were examined during their outpatient visit: 115 patients – suture repair group, 38 patients – open mesh repair group (30 patients – onlay, 8 patients – sublay) and 15 patients – laparoscopic repair group. Median follow-up time was

56 months with no significant difference between the groups. Forty-eight (22.2%) patients were lost to follow-up: 4 patients changed their residence with no forwarding address present, 2 patients refused to participate in the study and 42 patients gave no response.

The overall postoperative complication rate was 12% in the early follow-up period. This rate was higher in the open mesh repair group than in the laparoscopic and suture repair groups (26.9% vs. 11% vs. 6.8%; $p > 0.05$). Most of the complications occurred in patients with hernia defect size > 4 cm, but with no significant difference.

Table II. Relation between hernia repair technique and hernia size

Surgery technique	Hernia size [cm]		
	< 2	2–4	> 4
Suture repair (146)	28 (19.2%)	103 (70.5%)	15 (10.3%)
Mesh repair (52)	4 (7.7%)	25 (48.1%)	23 (44.2%)
Laparoscopic repair (18)	2 (11.1%)	12 (66.7%)	4 (22.2%)
Total (216)	34 (15.8%)	140 (64.8%)	42 (19.4%)

Four patients in the open mesh group and 1 patient in the suture group had a subcutaneous fistula which existed up to 3 weeks after surgery (Table III) and closed spontaneously after some time.

Long-term follow-up results demonstrated that pain or discomfort in the umbilical region was more often present in the open mesh repair group as well as at rest or during physical activity (Table IV) compared with suture and laparoscopic repair groups.

About half of all patients (47–67%) assessed the surgery outcome as excellent or very good, while only a few of them (2–6%) assessed it as poor or very poor, without any significant difference between the groups (Table IV).

The overall umbilical hernia recurrence rate was 13.1% ($n = 22$) in our study. The recurrence rate was slightly higher in the open mesh repair group with no significant difference (Table IV). Only 2 (1.7%) patients with small hernias (< 2 cm) had hernia recurrence in the suture repair group. The recurrence rate was significantly higher in patients whose BMI was > 30 kg/m² ($p = 0.026$). The average BMI of patients with recurrence was 34.9 ± 6.6 vs. 31.8 ± 7.2 in patients who had no hernia recurrence ($p = 0.037$). We did not find any significant difference in recurrence rate between different hernia size groups.

Logistic regression analysis showed that only BMI > 30 kg/m² and BMI > 30 kg/m² with diabetes,

Table III. Early follow-up results (up to 2 weeks after surgery)

Variable	Suture ($n = 146$)	Mesh ($n = 52$)	Laparoscopic ($n = 18$)	P-value
Operating time [min]	68.6 ±34.1	107.9 ±55.7	87.9 ±55.5	< 0.001 NS NS
Postop. hospital stay [days]	3.1 ±2.2	5.4 ±3.3	2.7 ±1.6	< 0.001 NS < 0.001
Seroma	5 (3.4%)	4 (7.7%)	1 (5.5%)	NS
Hematoma	2 (1.4%)	1 (1.9%)	0	NS
Wound infection	2 (1.4%)	5 (9.6%)	1 (5.5%)	< 0.05 NS NS
Subcutaneous fistula	1 (0.7%)	4 (7.7%)	0	NS

Table IV. Long-term follow-up results

Variable	Suture ($n = 115$)	Mesh ($n = 38$)	Laparoscopic ($n = 15$)	P-value
Median follow-up time [months]	58.0 (21–151)	59.5 (21–139)	56.5 (21–103)	NS
Patient evaluation:				
Excellent/very good	77 (67.0%)	17 (44.7%)	7 (46.7%)	
Good/ satisfactory	36 (31.3%)	20 (52.6%)	7 (46.7%)	NS
Poor/very poor	2 (1.7%)	1 (2.7%)	1 (6.6%)	
Pain at rest	5 (4.3%)	6 (15.9%)	0	0.027 NS 0.039
Pain during physical activity	27 (23.5%)	18 (47.4%)	3 (20%)	0.018 NS NS
Recurrence	14 (12.2%)	7 (18.4%)	1 (6.7%)	NS

Table V. Risk factors for umbilical hernia recurrence

Factor	Odds ratio	95% CI	P-value
BMI > 30 kg/m ²	3.54	1.10–11.35	0.034
BMI > 30 kg/m ² and diabetes	3.59	1.11–11.67	0.033
BMI > 30 kg/m ² and wound infection	3.67	1.13–11.89	0.03
BMI > 30 kg/m ² and wound seroma	3.58	1.12–11.51	0.032
Hernia size > 2	2.59	0.33–20.69	0.369
ASA > 2	3.60	0.99–13.13	0.052
Cancer	2.72	0.51–14.56	0.242
Diabetes	1.59	0.17–14.64	0.682
Age > 60 years	1.60	1.10–2.33	0.051

Logistic regression analysis.

wound seroma or wound infection are independent risk factors for UH recurrence. All analyzed risk factors are presented in Table V.

Discussion

There are four possible locations for mesh placement in umbilical hernia repair: preaponeurotic (onlay technique), on the fascial layer (fixed to the ring), in the retromuscular space (sublay technique) or on the preperitoneal space [13]. In our study we analyzed the long-term follow-up results of the three most popular umbilical hernia operating techniques (Keel, open mesh repair and laparoscopic).

In a randomized, controlled study, conducted by Arroyo *et al.* [6], the umbilical hernia recurrence rate after suture repair was 11% and was significantly higher than after mesh repair (1%). The analysis of the Denmark Nationwide Registry specified [3] that the combined cumulated recurrence rate after 55 months including both mesh and sutured repairs was 18%. They also stated that for sutured repair, the cumulative recurrence rate after 55 months was 21% (9% reoperations for recurrence and 12% clinical recurrences) and 10% for mesh repair (3% reoperation for recurrence and 7% clinical recurrence) ($p = 0.001$). In our study, the overall recurrence rate after 56 months including open mesh, laparoscopic and suture repairs was 13.1%. This is an acceptable number, which does not differ from the data published in the literature. However, we had only a 1.7% recurrence rate for small hernias (< 2 cm) in the suture repair group. The Denmark Nationwide Registry showed a significantly higher recurrence rate ($p = 0.001$) for

small hernias in the suture repair group (5.6%) compared with the open mesh repair group (2.2%) [2]. The recurrence rate after open mesh (onlay and sublay) umbilical hernia repair was 18.4% in our study. Of course, it is striking to observe such a high rate of recurrence, which markedly differs from the numbers (1–10%) published in literature [1–3, 6, 14]. It is difficult to explain such results. First of all, this is a retrospective study, which has its limitations in design, and this should be a matter of concern. The patients in this study were not randomized, and the type of operation was chosen by the operating surgeon independently. Concerning this, 90% of patients in the suture repair group had small or medium umbilical hernias and, conversely, 91% of patients in the open mesh repair group had medium or large umbilical hernias (these patients' average BMI was more than 36 kg/m²) – these were factors which may have influenced the results of hernia recurrence. Another possible bias in this study is the “learning curve” issue. Earlier, our group of surgeons mainly used the Keel technique as well as the onlay technique in umbilical hernia repair. Therefore, the results in these groups might be superior to those of the sublay and especially the laparoscopic group, a technique with which the authors were not familiar.

There is one more limitation – the power of this retrospective study is insufficient, with low numbers in both the open mesh and especially the laparoscopic arms, and therefore the results should be interpreted with caution.

We had only 13 patients in the open mesh repair sublay technique group in our study, so we could not

reasonably identify the most appropriate open mesh technique for umbilical hernia repair. On the other hand, the Denmark Nationwide Registry obtained similar recurrence rate results comparing onlay (2.2%) vs. sublay (2.5%) techniques [2]. Berrevoet *et al.* observed a higher recurrence rate after intraperitoneal mesh placement (8.3%) compared with retromuscular mesh repair (3.6%) but with no significant difference [1]. We need more RCTs with low risk of bias and a higher level of evidence to determine the most appropriate open surgery technique for umbilical hernia. One of them may be the continuous MORPHEUS study (RCT) from the Netherlands, which compares different open mesh repair techniques for small umbilical and epigastric hernias [15].

The recurrence rate after laparoscopic hernia repair in our study was 6.7%. On the other hand, only one patient developed hernia recurrence in the laparoscopic repair group, and the recurrence rate is relatively high due to the small number of patients in this group. Eriksen *et al.* [8] in their controlled double-blinded study with 17 patients in each arm also found a 6% recurrence rate after laparoscopic umbilical hernia repair in the tack group, and even a 17% recurrence rate in the fibrin sealant group.

Despite its popularity, laparoscopic umbilical hernia repair continues to have recurrence. Several surgeons prefer closure of the abdominal wall defect with nonabsorbable sutures prior to the placement of the mesh in selected cases. This technical modification is guided by the notion that appropriate fascial edge approximation might ensure satisfactory overlap of the defect with the mesh, even in the event of mesh shrinkage. Banerjee *et al.* [16] in their retrospective study compared the postoperative results of two laparoscopic techniques (only mesh placement vs. primary repair with mesh placement) for epigastric, parastomal, umbilical and incisional hernia treatment. Their results demonstrated that the rate of recurrence in those treated with laparoscopic primary suture repair + mesh underlay was 3% in comparison with 4.8% associated with laparoscopic mesh alone ($p = 0.54$) [16]. There were no recurrences in either surgical technique group for primary umbilical hernia patients – the authors did not find any advantage of defect closure prior to mesh placement in laparoscopic umbilical hernia surgery. We did not close the defect in laparoscopic umbilical hernia repair, but we used a sufficient mesh size – the overlap of 5 cm was achieved in all directions

beyond the outer border of the fascial defect. On the other hand, we had only one patient with infected seroma in the laparoscopic repair group.

The complication rate in our study was higher in open mesh repair and large hernia (> 4 cm) groups. One reasonable explanation is that almost all large umbilical hernias were operated on using the open mesh (onlay) repair technique, and this was the main reason for postoperative wound seroma and infection. Secondly, we had significantly more postoperative complaints after the open mesh repair technique. In our opinion, the main reason for pain is also the onlay repair technique. The non-absorbable sutures were used to fix the mesh on the superior sheet of aponeurosis in this technique, and this factor could be the main cause of postoperative pain and remaining complaints. However, the retrospective study of Erritzoe-Jervild *et al.* [9] reported that 10% of patients had moderate or severe pain or discomfort with no hernia recurrence and 31% of patients with hernia recurrence. The most frequent causes of pain or discomfort were in onlay and suture repair groups compared with the intraperitoneal mesh group [9].

More than 95% of patients were satisfied with the operation results after a 56-month follow-up period with no significant difference between the groups.

We also tried to identify the independent risk factors for umbilical hernia recurrence. Based on the meta-analysis on primary umbilical hernias performed by Aslani *et al.* [17], mesh repair patients have a ten-fold decreased recurrence rate compared to suture repair patients. Eriksen *et al.* [8] found umbilical hernia size to be an important risk factor for recurrence. The Denmark Nationwide Registry [3] stated that sutured repair, patients younger than 52 years, smoking and surgical site infection were independent risk factors for recurrence. Other authors reported smoking, cirrhosis and ascites as independent risk factors for umbilical hernia recurrence [11].

The results of our study, in which the number of cases is considerably smaller, demonstrated patient's BMI > 30 kg/m² with diabetes or wound seroma, and BMI > 30 kg/m² with surgical site infection to be independent risk factors for umbilical hernia recurrence. We did not find the umbilical hernia size to be an independent risk factor for hernia recurrence, although the recurrence rate was slightly higher with hernia size > 2 cm.

Conclusions

The overall umbilical hernia recurrence rate was 13.1% in our study. Body mass index > 30 kg/m², diabetes and wound infection were independent risk factors for UH recurrence. According to our study results, laparoscopic medium umbilical hernia repair has slight advantages over open mesh repair concerning early postoperative complications, long-term postoperative pain and recurrence. Which technique (open suture or mesh repair) is acceptable for small (< 2 cm) and (open mesh or laparoscopic) for large (> 4 cm) umbilical hernias is still the subject of discussions. We need more randomized controlled trials to find the answer.

Conflict of interest

The authors declare no conflict of interest.

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