

## CASE SERIES

# Trocar umbilical hernia repair by open suture repair and open suture–mesh repair in an ambulatory setting in comparison to recurrent and primary umbilical hernia repair

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## Abstract

Reports on the ambulatory open repair of umbilical trocar hernias are missing. Patients with trocar, primary and recurrent umbilical hernia open suture and open suture–mesh repair with prospective follow-up were retrospectively evaluated. Patients received perioperative antibiotic prophylaxis, preemptive analgesia and modified anesthesia. In total, 171 patients with umbilical hernia (51 years, female 14%; male 86%) were treated with open suture ( $n = 29$ ; 17%) and suture–mesh ( $n = 142$ ; 83%) repair. In total, 10% of patients were treated for trocar hernia (late onset), 5% for recurrent hernia and 85% for a primary umbilical hernia. In total, 29% of trocar hernia repairs had minor complications associated with obesity (40%) and comorbidity (80%). Age, suture and suture–mesh repair were not associated with complications. According to guidelines for umbilical hernia repair open flat mesh may be useful in the treatment of trocar hernia.

## INTRODUCTION

Umbilical hernia repair is a common surgical procedure with ~175 000 repairs/year in the USA. Treatment of umbilical hernia is under debate. Recurrence, reoperation, minor complications (seroma, hematoma, wound healing) and pain are the leading factors for comparing techniques for umbilical hernia repair. However, it remains open for a final decision which technique should be the preferred procedure [1]. Most studies and systematic reviews pool the data of ventral hernia repair studies, including epigastric and umbilical hernia and incisional hernia. Since significant differences are identified in the treatment of each of these hernias, trials in various techniques should be

conducted for a single hernia type [2]. However, there are only a few studies that focus on umbilical hernia repair and less on trocar hernia repair. Especially in the ambulatory setting, reports are missing [3]. Open mesh repair (OMR) may be associated with a lower risk of recurrence, but a higher risk of seroma formation when compared with suture repair. The risk for surgical site infection (SSI), hematoma or chronic pain may be similar [4]. The purpose of this study was to analyze the data of open suture repair (OSR) or open suture–mesh repair (OSMR) in trocar (T) umbilical hernia in an ambulatory setting in comparison to primary (P) and recurrent (R) umbilical hernia, which is not yet available in the literature.

Received: May 12, 2020. Revised: June 22, 2020. Accepted: June 29, 2020

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## CASE SERIES

Data of patients (2007–20) admitted for the first time with T, P, R were prospectively recorded. Procedures for umbilical hernia were OSR in defects  $\leq 1$  cm and OSMR (lightweight polypropylene/titan-coated mesh) in the umbilical ring in defects 1–3 cm. Operations were performed in an ambulatory setting American Society of Anesthesiologists (ASA I–II) in modified anesthesia without neuromuscular block and intubation (spontaneous breathing) with perioperative antibiotic prophylaxis and preemptive analgesia until 3 days after the operation. In the case of pain, patients were allowed to have additional treatment (metamizole). Incidences after umbilical hernia repair with no treatment were short-term seroma. Minor complications demanding treatment were wound-healing disturbances or complications (hematoma, wound healing disturbances, SSI) or foreign body reaction (suture granuloma, mesh incompatibility). Patients were regularly asked for clinical and duplex ultrasound control several times during the first 4 weeks after the operation, after 3, 6 and 12 months after the operation. Recurrence is considered on a clinical basis and duplex ultrasound scan. Data were retrospectively in P, R, T analyzed. Due to small numbers in subgroups, statistical analysis was not performed.

In 171 patients (age 51 years; mean 5–80; female  $n = 24$ ; male  $n = 146$ ) of P ( $n = 146$ ; 85%), R ( $n = 8$ ; 5%) and T ( $n = 17$ ; 10%) OSR ( $n = 29$ ; 17%) in defects  $< 1$  cm and OSMR ( $n = 142$ ; 83%) in defects 1–3 cm were performed with one recurrence in P.

Trocar hernias (all late-onset hernias) after laparoscopic procedures (hernia six, gynecological two, fundoplication one, laparoscopy two, cholecystectomy four, appendectomy one, umbilical hernia repair two) in 7 females (41%) and 10 males (59%) (age 48 years; mean; 36–65) were treated by OSR (4; 24%) and OSMR (13; 76%). Two patients (12%) suffered from obesity and eight patients (47%) from comorbidity. Five patients (29%) had minor postoperative complications (hematoma one, wound healing three, suture granuloma one, unclear pain one). Four out of five (80%) patients with complications had comorbidity (cardiovascular two, urogenital one, endocrine one, coagulation one, gastrointestinal 3, metabolism 2) and two out of five (40%) patients with obesity had wound-healing disturbances.

Two out of eight (25%) patients with recurrent umbilical hernia suffered from complications: one out of two (50%) had obesity and one out of two (50%) had comorbid disease. In total, 30/146 (21%) patients with primary umbilical hernia showed minor complications: 8/30 (28%) had obesity and 17/30 (57%) had comorbidity.

Follow-up in trocar hernia repair was 23 months, in recurrent umbilical hernia 11 months and primary umbilical hernia repair 17 months (Table 1).

## DISCUSSION

There is no study comparing T to P and R results in OSR or OSMR in an ambulatory setting. We discuss the results of this study in comparison to the available umbilical hernia repair studies and nationwide analyses of umbilical hernia repair outcomes.

Trocar hernias are considered to be a complication of laparoscopic procedures.

The incidence of trocar hernia is 1–6% [5]. The incidence may be higher as not all surgeons report their complications, patients with a trocar hernia may be asymptomatic and cases may occur after the routine follow-up.

In this study, trocar hernia occurred as late-onset hernia according to the classification of Tonouchi *et al.* [6]. The

underlying procedures were mainly laparoscopic hernia repair [6] and laparoscopic cholecystectomy [6].

Risk factors for the development of trocar hernia may be age  $> 60$ , connective tissue disease, umbilical trocar location, postoperative infection, diabetes, chronic cough, steroids, smoking, previous hernia repair, prolonged and extensive manipulation at the trocar location, size and construction of the trocar [7].

Age, diabetes, chronic cough, steroids and smoking were not a risk factor in this study. However, umbilical trocar location is an evident risk factor. Information on the manipulation and form of the trocar was not available to us.

In umbilical hernia studies, there are 60% females and 40% males [8]. In this study, the ratio is male 58–90% and female 11–42%. This difference in gender distribution and age, the small numbers in subgroups with complications and the retrospective evaluation could be a cause of bias.

The management of umbilical hernia, port-site hernia depends on the local clinical situation. There are only a few studies comparing laparoscopic umbilical hernia repair to open umbilical hernia repair. In trocar hernia, the majority of reports are case reports. Laparoscopic umbilical hernia repair of trocar involves the additional insertion of ports, which may be a disadvantage [9]. Overall complications, hernia recurrence, wound infection, hematoma/seroma, suture granuloma and chronic pain may not be different in laparoscopic and open umbilical hernia repair [10]. OSR and OMR were accompanied by similar seroma, hematoma and wound infection rates [8]. Onlay mesh may have more complications than sublay mesh in umbilical hernia repair [11]. Lau and Patil [12] reported an overall morbidity rate after OSR of 33.3% and after mesh repair of 33.3%.

In this series, 5/17 (29%) of trocar hernia repairs had minor complications, 3/9 (33%) of recurrent umbilical hernia repairs and 29/145 (20%) of primary umbilical hernia repairs. Obesity and comorbid disease account for complications: 2/5 (40%) trocar hernia complications were associated with obesity and 4/5 (80%) with comorbidity; 1/3 (33%) recurrent umbilical hernia repair complications were associated with obesity and 2/3 (67%) with comorbidity; 8/29 (28%) of primary umbilical hernia complications with obesity and 16/29 (55%) with the comorbid disease. There is an association between obesity and wound-healing disturbance.

The recurrence rate after OSR (6.3–12%) may be higher than after OMR (1–4%) [8, 13–15]. In this series, there was only one recurrence in primary umbilical hernia repair with OSMR with three defects periumbilical. Defect size may influence the outcome of umbilical hernia repair. Predictors of recurrence are smoking, diabetes, concomitant laparoscopic inguinal hernia repair and infection but not mesh type [16].

Reoperation rate after suture/non-mesh repair may be 1.2–4.8% and after mesh 1–4.8% [17, 18, 19]. The cause for reoperation, e.g. bonus reward, type, location of foreign material, is unclear.

Considerations on complications after OSR and OMR are premature at the present status [19]. In the case of laparoscopic umbilical hernia repair, increased respiratory and cardiac and intra-abdominal complications have been reported [20, 21].

Current practice patterns for umbilical hernia repair are: mesh 33% defect  $< 1$  cm and 82% in defect  $> 1$  cm; in 75% open umbilical hernia repair, 13% laparoscopic, 12% robotic and mesh in 65% of cases [22]. The most reliable approach should be based on the surgeon's experience, clinical setting, patients' age and size, hernia defect size, anatomical characteristics. Especially an open flat mesh procedure should be used combined with defect closure and mesh fixation with non-absorbable suture [23, 24]. Due to increasing cases of laparoscopic surgery, port-site

**Table 1.** Results of OSR and OSMR in trocar hernia repair compared with primary and recurrent umbilical hernia repair

	Gender	Mean age (range)	Type of repair	Obesity	Comorbidity	Complication rate	Follow-up
All trocar hernias N = 17	Female 7 (41%) Male 10 (59%)	48 (36–65)	Suture 4 (24%) Suture mesh 13 (76%)	2/17 (12%)	8/17 (47%)	5/17 (29%)	703 (11–4203)
Trocar hernia without complication 12/17 (71%)	Female 5 (42%) Male 7 (58%)	49 (36–60)	Suture 3 (25%) Suture mesh 9 (75%)	0/12 (0%)	5/12 (42%)	0/12 (0%)	597 (11–2647)
Trocar hernia with complication 5/17 (29%)	Female 2 (40) Male 3 (60%)	48 (37–65)	Suture 1 (20%) Suture mesh 4 (80%)	2/5 (40%)	4/5 (80%)	5/17 (29%)	937 (84–4203)
Recurrent umbilical hernia N = 8	Female 1 (13%) Male 7 (87%)	53 (25–74)	Suture 0 Suture mesh 8 (100%)	2/8 (25%)	3/8 (38%)	2/8 (25%)	347 (34–565)
Recurrent umbilical hernia without complication 6/8 (75%)	Female 1 (17%) Male 5 (83%)	47 (25–69)	Suture 0 Suture mesh 6 (100%)	1/6 (17%)	2/6 (33%)	0/6 (0%)	254 (34–565)
Recurrent umbilical hernia with complication 2/8 (25%)	Female 0 Male 2 (100%)	73 (71–74)	Suture 0 Suture mesh 2 (100%)	1/2 (50%)	1/2 (50%)	2/8 (25%)	527 (512–542)
Primary umbilical hernia N = 146	Female 16 (11%) Male 130 (89%)	52 (5–80)	Suture 25 (17%) Suture mesh 121 (83%)	16/146 (11%)	47/146 (32%)	30/146 (21%)	506 (1–4203)
Primary umbilical hernia without complication 116/146 (79%)	Female 12 (10%) Male 104 (90%)	52 (5–80)	Suture 23 (20%) Suture mesh 93 (80%)	8/116 (7%)	33/116 (28%)	0/116 (0%)	462 (1–3879)
Primary umbilical hernia with complication 30/146 (21%)	Female 4 (13%) Male 26 (90%)	52 (28–79)	Suture 2 (7%) Suture mesh 28 (93%)	8/30 (27%)	17/30 (57%)	30/146 (21%)	677 (13–4203)

hernia may become clinically relevant. Reduction and resection of contents and fascial closure have been reported as the main technique in the late-onset hernia [25]. However, in the present time, there are no guidelines for the treatment of trocar and recurrent umbilical hernia.

## CONFLICT OF INTEREST STATEMENT

There is no conflict of interest for both authors.

## FUNDING

None.

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