



Port-site incisional hernia – A case series of 54 patients



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HIGHLIGHTS

- This study is one of the largest series concerning port-site incisional hernia (PIH) regarding the current literature.
- In Port sites of 10 mm and larger diameter fascia should be closed by suture the current literature.
- PIH should be treated by suture or mesh repair depending on fascial defect size and the patients' risk factors.

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ABSTRACT

Background: The increased use of laparoscopy has resulted in certain complications specifically associated with the laparoscopic approach, such as port-site incisional hernia (PIH). Until today, it is not finally clarified if port-site closure should be performed by fascia suture or not. Furthermore, the optimal treatment strategy in PIH (suture vs. mesh) is still widely unclear. The aim of this study was to present our experience with PIH in two independent departments and to derive possible treatment strategies from these results.

Methods: Between 2003 and 2013, 54 patients were operated due to port-site incisional hernia in two surgical centres. Their data were collected and retrospectively analyzed depending on surgical technique of port-site hernia repair (Mesh repair group, $n = 13$ vs. Suture only group, $n = 41$).

Results: Port site incisional hernia occurred in 96% (52 patients) after the use of trocars with 10 mm or larger diameter. Patients treated with mesh repair had significantly higher *body mass index* (BMI) (32 ± 9 vs. 27 ± 4 ; $p = 0.023$) and significantly higher rates of cardiac diseases (77% vs. 39%; $p = 0.026$) than patients in the suture only group. Mean fascial defect size was significantly larger in the *Mesh repair group* than in the *Suture only group* (31 ± 24 mm vs. 24 ± 32 mm; $p = 0.007$) and mean time of operation was significantly longer in patients operated with mesh repair (83 ± 47 min vs. 40 ± 28 min; $p < 0.001$). There were no significant differences in mean hospital stay (3 ± 4 days; $p = 0.057$) and hernia recurrence rates (9%; $p = 0.653$) between study groups. Mean time of follow up was 32 ± 35 months.

Conclusions: In Port sites of 10 mm and larger diameter fascia should be closed by suture, whereas the risk of hernia development in 5 mm trocar placements seems to be a rare complication. Port-site incisional hernia should be treated by suture or mesh repair depending on fascial defect size and the patients' risk factors regarding preexisting diseases and *body mass index*.

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1. Introduction

Laparoscopic surgery is widely practiced and in many cases, it

offers realistic benefits over conventional surgery [1]. On the other hand, the increased use of laparoscopy has resulted in added complications specific to the laparoscopic approach, such as port-site incisional hernia (PIH).

Although its incidence is variable, it is potentially dangerous and can lead to considerable morbidity requiring surgical intervention [2,3]. Several studies show an incidence of port-site hernia ranging from 1% to 22% [1,4,5] but the real incidence may be higher, as some patients remain asymptomatic or do not return to the primary

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surgeon [2].

Since various factors have been implicated for the development of port-site hernia [6], various methods are also suggested for its prevention [7–9]. But until today, it is not finally clarified how to close laparoscopic port-sites defects [10,11]. Whereas the classical method of port-site closure by suture is widely used because of its simplicity and cost effectiveness, in some cases, this closure can be difficult and is associated with the predictable fear of injuring or including the underlying bowel loops, omentum, or other abdominal organs by the needle [12,13]. This may result in less optimal closure and subsequent complications, including port-site incisional hernia. In these cases of PIH, the optimal treatment strategy (suture vs. mesh) is yet not clarified.

Thus, the aim of this study was to describe our experience with port-site hernias presenting a series of 54 patients with PIH operated in two surgical centres during ten years and investigated their preoperative status, their operative details and their post-operative course.

2. Materials and methods

Data was drawn from a two-centre retrospective cohort study. All patients receiving port-site hernia repair between 2003 and 2013 were retrospectively analyzed. One centre is the local university hospital, the other one is an independent hospital close to the university. There was no ethical approval needed for the study. The work has been reported in line with the PROCESS criteria [14].

Demographic details were registered as well as clinical details and complication rates (Tables 1 and 2). In evaluation of pre-existing co-morbidities, cardiac diseases included the presence of coronary heart disease, history of cardiac infarction and cardiac insufficiency. Renal insufficiency was determined by a raise in creatinine beyond 1.2 mg/dl or blood urea nitrogen beyond 50 mg/dl. Pulmonary diseases included the presence of chronic obstructive pulmonary disease, bronchial asthma with need for medical treatment and any other pulmonary dysfunction (Table 1).

Investigating the operative details, fascial defect size, the previous port-site size and operation time was documented. Post-operatively, length of in-hospital stay and hernia recurrence rates were included (Table 2).

In both study centres, port-sites of 10 mm size and larger were standardized sutured. Table 3 shows the suture materials used. 5 mm port-sites were left without any suture.

Port-site incisional hernia with fascial defects larger than 2–3 cm were standardized treated by mesh repair in sublay position (Ultrapro®, FA Ethicon Inc., Somerville, N.J., USA), whereas smaller fascial defects were continuously sutured (Prolene®, USP-Size 0, FA Ethicon Inc., Somerville, N.J., USA). Skin was closed continuously with Monocryl® of USP-Size 4-0 (FA Ethicon Inc.,

Somerville, N.J., USA).

2.1. Statistical analysis

Statistical analysis was carried out using the Statistical Package for Social Sciences software (SPSS®, Vers.17.0, Chicago, IL, USA). Differences between study groups were analyzed by Kruskal-Wallis test for non-parametric data and in case of significant differences confirmed by Mann-Whitney test. For numeric data differences were analyzed by ANOVA and in case of significance confirmed by T-Test. P-values < 0.05 were considered to be significant. All data are represented as mean ± standard deviation.

3. Results

Between 2003 and 2013, 54 patients were operated due to port-site incisional hernia in two surgical centres. No patients were excluded from the study. They were divided into two groups depending on the technique of port-site hernia repair. In 41 patients, fascial defect was sutured (*Suture only group*), whereas in 13 patients a sublay mesh repair was performed (*Mesh repair group*).

35% of the patients were male (n = 19) and 65% of the patients were female (n = 35). They were distributed equally between the study groups (p = 0.488). Mean age at time of operation was 59 ± 17 years without any significant differences between the study groups (p = 0.564). Pre-existing comorbidities were distributed equally between both groups, except for cardiac diseases which occurred significantly more often in the *Mesh repair group* than in the *Suture only group* (77% vs. 39%; p = 0.026). Furthermore, *body mass index (BMI)* was significantly higher in patients treated with mesh repair (32 ± 9 vs. 27 ± 4; p = 0.023) (Table 1).

Concerning the operative details, mean fascial defect size was significantly larger in the *Mesh repair group* than in the *Suture only group* (31 ± 24 mm vs. 24 ± 32 mm; p = 0.007). Also mean time of operation was significantly longer in the *Mesh repair group* than in the *Suture only group* (83 ± 47 min vs. 40 ± 28 min; p < 0.001). Previous trocar sizes were 10 ± 0 mm in patients treated with sublay mesh and 9.8 ± 1 mm in patients treated by fascial suture (p = 0.740). The initial laparoscopic operations which were performed were cholecystectomies (21 patients), diagnostic laparoscopies (8 patients) sigmoid resections (8 patients), funduplications (7 patients), TAPP procedures (5 patients), appendectomies (4 patients) and one case of gastric resection.

Postoperatively, mean hospital stay was 3 ± 4 days without any differences between study groups (p = 0.057). There were no cases of wound infections or surgical complications during in-hospital stay. Hernia recurrence occurred in 9% of the patients without any differences between study groups (7% vs. 10%; p = 0.653). Mean time of follow up was 32 ± 35 months in 21 patients (39%). All

Table 1
Demographic data.

	Mesh repair (n = 13)	Suture only (n = 41)	p-value	Total (n = 54)
Age in years	64 ± 11	58 ± 19	0.564	59 ± 17
Gender				
- Male	4 (31%)	15 (37%)	0.488	19 (35%)
- Female	9 (69%)	26 (63%)		35 (65%)
BMI in kg/m ²	32 ± 9	27 ± 4	0.023	28 ± 6
ASA classification				
- 1 and 2	8 (62%)	30 (73%)	0.143	38 (70%)
- 3	5 (38%)	11 (27%)		16 (30%)
Diabetes	3 (23%)	3 (7%)	0.143	6 (11%)
Cardiac disease	10 (77%)	16 (39%)	0.026	26 (48%)
Pulmonal disease	0 (0%)	2 (5%)	0.573	2 (4%)
History of malignancy	0 (0%)	2 (5%)	0.573	2 (4%)

P-values < 0.05 are considered to be significant. These values are in bold.

Table 2
Clinical details.

	Mesh repair (n = 13)	Suture only (n = 41)	p- value	Total (n = 54)
Defect size in mm	31 ± 24	24 ± 32	0.007	25 ± 30
Operation time in min	83 ± 47	40 ± 28	<0.001	51 ± 38
Previous port size in mm	10 ± 0	9.8 ± 1	0.740	9.9 ± 1
Simultaneous surgery	3 (23%)	4 (10%)	0.340	7 (13%)
Ambulant surgery	0 (0%)	2 (5%)	0.573	2 (4%)
Hospital stay in days	4 ± 3	3 ± 4	0.057	3 ± 4
Hernia recurrence	1 (7%)	4 (10%)	0.653	5 (9%)

P-values < 0.05 are considered to be significant. These values are in bold.

clinical data are presented in Table 2.

4. Discussion

The increased use of laparoscopy has resulted in added complications specific to the laparoscopic approach, such as port-site incisional hernia (PIH). Although its incidence is relatively rare in comparison to conventional surgery, it might lead to severe complications like hernia incarceration requiring emergent surgical intervention.

According to the literature, the overall incidence of port-site hernia is estimated to be around 1% [15–17], whereas fascial defects occur in 3–20% after conventional surgery depending on observational periods [6]. On the other hand, there are only a few

studies with small sample sizes available on this specific topic of port-site incisional hernia [18] leading to rare information regarding to its prevention and treatment.

Due to this lack of information and due to the fact that laparoscopy will gain more and more importance in modern surgery, the aim of this study was to contribute to the unsolved problems of prevention and optimal treatment strategy of port-site incisional hernia after laparoscopy.

Several risk factors have been described for the development of PIH like the trocar diameter, the trocar design, pre-existing fascial defects as well as some operation- and patient-related factors [6,15,19,20]. For example the risk of port-site hernia is greater in obese patients due to their larger preperitoneal space and elevated intraabdominal pressure [21]. In these patients and in cases of a larger trocar diameter, it seems to be recommendable to close port-sites by suture to avoid a later hernia development. On the other hand, authors reported PIH even for 5 mm and smaller ports [22,23]. That is the reason why it is widely accepted that port-sites ≥10 mm should be closed whereas opinions vary whether a 5 mm trocar-site defect should be closed or not [7].

In our patients, port site incisional hernia occurred in 96% after the use of trocars with 10 mm and larger diameter. Thus we may conclude that the risk of hernia development after 5 mm trocar placement seems to be a rare complication and that 5 mm port-sites can be left without any suture. This presumption is supported by the fact that fascial closure can be difficult and may be associated with the risk of injuring or including underlying structures like bowel loops or omentum by the needle [12,13]. In this context it is furthermore obvious that the preferable use of the smallest trocars possible helps to reduce the risk of PIH development additionally.

Regarding the treatment strategies of port-site incisional hernia, the current literature is extremely rare. There are only few studies with small sample sizes and a number of case reports available. Regarding the current literature, the present study is one of the largest series concerning this topic.

Patients treated with mesh repair had significantly higher *body mass index (BMI)*, significantly higher rates of cardiac diseases and their fascial defect size was significantly larger compared to the patients treated with suture only. But nevertheless, there were no significant differences in mean hospital stay and hernia recurrence rates between study groups. This might support our treatment strategy to use mesh repair in cases of higher risk patients and larger fascial defects. Furthermore it can be discussed whether higher *body mass index* and higher rates of preexisting diseases might lead to larger fascial defects later on. Other authors also found these risk factors for hernia development [24,25]. This underlines the strategy to close port-sites especially in these higher risk patients initially by suture.

In summary, our data indicate that port-site incisional hernia should be treated by suture or mesh repair depending on fascial defect size and the patients' risk factors regarding preexisting diseases and *body mass index*. It is not finally clarified which fascial defect size builds the cut-off between suture and mesh repair. Our data indicate that a fascial defect size between 2 and 3 cm seems to be the turning point. Further prospective studies are needed to be able to create definitive guidelines of how to treat PIH in individual patients.

To mention some major limitations of our study, it is its retrospective design with a heterogeneous group of patients due to their different indications for laparoscopic surgery. Furthermore, there was no patient randomization between the two study groups. Prospective studies with patient randomization need to be conducted as a future project. On the other hand, we present one of the largest sample sizes concerning port-site incisional hernia in

Table 3
Surgical details.

	Mesh repair (n = 13)	Suture only (n = 41)	Total (n = 54)
Types of surgery			
• Fundoplication	0	7	7
• Cholecystectomy	8	13	21
• Sigmoid Resection	0	7	7
• Diagnostic LSK	1	7	8
• Appendectomy	0	3	3
• TAPP	2	3	5
• Ovariectomy	1	0	1
• Prostatectomy	1	0	1
• Gastric Resection	0	1	1
Types of ports			
• 5 mm	0	2	2
• 10 mm	13	38	51
• 12 mm	0	1	1
Hernia localization			
• Umbilical	7	9	16
• Supraumbilical	3	5	8
• Epigastric	3	16	19
• Right	0	5	5
• Hemiabdomen			
• Left	0	6	6
• Hemiabdomen			
Types of sutures			
• Prolene® 0	1	3	4
• Prolene® 1-0	4	23	27
• Prolene® 3-0	1	1	2
• Miralene® 0	1	0	1
• Miralene® 1-0	0	1	1
• Vicryl® 2-0	0	3	3
• Premilene® 0	1	1	2
• Polysorb® 0	2	0	2
• Polysorb® 1-0	0	1	1
• Polysorb® 2-0	0	7	7
• Maxon® 1-0	3	0	3
• PDS® 2-0	0	1	1

comparison to the present literature.

In summary, we may conclude from our data that port sites of 10 mm and larger diameter should be closed, whereas the risk of hernia development after 5 mm trocar placement seems to be a rare complication. In cases of higher risk patients and larger fascial defects, PIH repair by sublay mesh leads to similar outcomes like suture only repair in lower risk patients with smaller fascial defects.

Ethical approval

An ethical approval was not necessary for this project.

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Author contribution

A. Lambertz, B.O. Stüben, B. Bock, C.D. Klink and C.J. Krones conceived and designed the study and collected, analyzed and interpreted the data.

A. Lambertz, B.O. Stüben, C.D. Klink, R. Eickhoff, A. Kroh, U.P. Neumann and C.J. Krones wrote the manuscript and provided critical revisions that were important for the intellectual content.

All authors approved the final version of the manuscript.

Conflicts of interest

All authors declare no conflict of interest.

Guarantor

A. Lambertz is the guarantor for this study.

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