



Assessing Effect of Fascial Non-Closure in 10 mm Trocar Sites on Incidence of Incisional Hernia

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ABSTRACT

Background: Trocar site, incisional hernia is one of the serious complications of laparoscopic surgery. As a result, many surgeons prefer to close the fascia, especially in those sites where a trocar of 10 mm in size or larger has been inserted. On the other hand, suturing the fascia may lead to damage of other tissues, such as the intestines; hence, some surgeons prefer not to close the fascia.

Objectives: This study was performed to evaluate the outcome of using fascial non-closure in sites of 10 mm ports and the incidence of subsequent incisional hernia in patients undergoing laparoscopic cholecystectomy.

Patients and Methods: The current study was a cohort scheduled for surgery in the General Surgery Ward at the Shariati Hospital of the Tehran University of Medical Sciences. Two hundred and twenty patients were selected in a convenient manner for a cholecystectomy. A 10 mm trocar was inserted in the umbilicus and the other ports were 5 mm. None of the trocar sites was closed. All of the patients were followed up to one year after the operation.

Results: The mean age was 43.41 years and 91 patients (41.4%) were male. Five patients (2.3%) developed incisional hernia. The occurrence of hernia was not associated with; age, sex, BMI > 25, smoking or diabetes ($P > 0.05$).

Conclusions: According to the results obtained in this study, it seems that in cases without closure of the fascia site of 10 mm trocars, the incidence of incisional hernia is considerable. Furthermore; age, gender, weight, smoking or diabetes, did not have any relationship with the occurrence of incisional hernia. More comparative studies are required to confirm these results.

► Implication for health policy/practice/research/medical education:

Trocar site incisional hernia is one of the serious complications of laparoscopic surgery. As a result, many surgeons prefer to close the fascia. On the other hand, suturing the fascia may lead to damage of other tissues, such as the intestines; hence, some surgeons prefer not to close the fascia. This study implies that in cases without closure of the fascia site of 10 mm trocars, the incidence of incisional hernia is considerable. We present this study to educate the surgeons about the closure of 10 mm trocar sites during minimally invasive surgery.

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1. Background

The advantages of minimally invasive surgery have made laparoscopic cholecystectomy the gold standard of cholecystectomy (1). Therefore, efforts are needed to identify and reduce possible side effects. One of these issues is that trocar site incisional hernia occurs with a prevalence rate of 0 to 5.2% in laparoscopic operations (2). Several studies have been conducted to identify factors that lead to incisional hernia. In this context, older patients, and the size and type of trocar port are some of the factors known to cause this problem (3-6). For example, if the size of the port is larger than 10 mm or the trocar is non-blade, the risk will be greater. Therefore, in such cases, suturing of the fascia is recommended (7-10). On the other hand, suturing may be associated with damage to other organs such as the intestines (5). Therefore, there is some preference to avoid suturing the port site. In addition, this approach leads to reduced operation and anesthesia times. If the incidence of hernia followed by this method is similar to the former one (fascial closure), this method would be preferred due to its benefits.

2. Objectives

The current study was performed to evaluate the outcome of not suturing ports entry and subsequently the incidence of incisional hernia in patients undergoing a laparoscopic cholecystectomy.

3. Patients and Methods

This study was a prospective study performed in the General Surgery Ward at the Shariati Hospital of the Tehran University of Medical Sciences. The study followed the ethical guidelines of the 1989 declaration of Helsinki and the protocol was approved by the University Ethics Committee and Institutional Review Board. All candidates provided their written informed consent prior to participation in the study. Two hundred and twenty patients scheduled to undergo laparoscopic cholecystec-

tomy between September 2010 and February 2011, were eligible to be enrolled in this study. The inclusion criteria were; all patients of at least 18-years of age, undergoing an elective or emergency laparoscopic cholecystectomy. The exclusion criteria were as follows; 1) need to dilate opening in the fascia in order to extract gallbladder containing extra-large stone(s), and 2) previous surgery around the umbilicus with a probability of intestinal adhesions to the abdominal wall, in such cases, we inserted a first port using the 'open technique'.

In this present study we inserted a trocar with the umbilical port being 10 mm, while the other ports were 5 mm. We inserted a 10 mm trocar (Yellow Port, Surgical Innovation Ltd, USA) in a closed way through a 15 mm incision made in the inferior part of the umbilicus, while pulling the abdominal wall upwards. In order to assess the incidence of incisional hernia, all of the patients were followed up to one year after their operation at; one, three, six and twelve month intervals. We assessed the umbilical hernia by a physical examination performed by the attending surgeons. In cases of bulging, local pain and/or tenderness and any equivocal finding, the patients underwent an ultrasonography using a 7.5 MHz probe to confirm or rule out the existence of a hernia. Statistical analyses were performed using SPSS version 17. We tested the normality of the quantitative data distributions using Kolmogorov-Smirnov tests. Data were reported as means \pm SD. Data with a normal distribution was analyzed using independent t-tests. Qualitative data were analyzed using a Fisher's exact test. $P < 0.05$ was considered statistically significant.

4. Results

Out of the 220 patients enrolled in this study, 91 (41.4%) and 129 (58.6%) patients were male and female, respectively. The mean age was 43.4 ± 13.7 years. A total of 117 (53.2%) patients had a BMI > 25 and 103 (46.8%) cases were of normal weight. Five patients (2.3%) were diagnosed with an incisional hernia after their laparoscopic surgery.

Table 1. Rate of Possible Risk Factors in Each Group

	Patients With Incisional Hernia	Patients Without Incisional Hernia	P value
Age, y, mean \pm SD	56.50 \pm 6.56	43.15 \pm 13.68	> 0.05
Gender, No. (%)			> 0.05
Male	2 (40)	89 (41.4)	
Female	3 (60)	126 (58.6)	
Cause of surgery, No. (%)			> 0.05
Cholecystitis	1 (20)	15 (7)	
Cholelithiasis	4 (80)	200 (93)	
Surgery duration, mean \pm SD	59 \pm 10.25	48.22 \pm 12.60	> 0.05
Diabetes, No. (%)	2 (40)	63 (29.3)	> 0.05
BMI > 25, No. (%)	3 (60)	114 (53)	> 0.05
Smoking, No. (%)	1 (20)	51 (23.7)	> 0.05

Table 2. Summary of Previous Studies

	Cases, No.	Suturing Fascia Status	Trocar Size	Hernia Rate, %
Liu <i>et al.</i> (2000) (15)	110	Non-closure	10-12	0
Sequeira <i>et al.</i> (2004) (8)	70	Non-closure	12	0
Shalhav <i>et al.</i> (2002) (16)	90	Non-closure vs. closure	12	0 vs. 0
Hussain <i>et al.</i> (2009) (5)	5 541	Closure	5-10-12	0.1
Nezhat <i>et al.</i> (1997) (11)	5 300	Closure	≥ 5	0.2
Coda <i>et al.</i> (2000) (14)	1 287	Closure	11-12	1
Azurin <i>et al.</i> (1995) (13)	1 300	Closure	≥ 10	0.8

Mean age in the patients with and without incisional hernia was 56.5 ± 6.6 and 43.2 ± 13.7 , respectively ($P > 0.05$). In the incisional hernia group, two (40%) patients were male and three (60%) patients were female. In the second group, the rates of male and female were 89 (41.4%) and 126 (58.6%), respectively. The incidence of diabetes in the patients with incisional hernia was 40% (two patients), whereas it was 29.3% (63 patients) in the latter group. Three (60%) patients who developed a hernia had a BMI > 25 , while in the other group it was 53% (114 patients). The number of smokers in the patients with and without hernia, were one (20%) and 51 (23.7%), respectively. Factors such as diabetes, BMI > 25 , smoking, surgery duration, gender and cause of surgery, were not significantly different between the two groups (Table 1).

5. Discussion

This study identified a 2.3% prevalence of trocar site herniation following laparoscopic cholecystectomy, without fascial closure. This finding is in close agreement with previous studies, which illustrate that the frequency of incisional herniation after laparoscopic abdominal surgeries is approximately 0–5.2% (2). In a study by Hussain *et al.*, they showed that during the 43 months after laparoscopic surgery with fascial closure, the rate of incisional hernia was 0.14% (5). Nezhat *et al.* and Voiculescu *et al.* also illustrated that the incidence of incisional hernia in laparoscopic surgeries with closure is 0.2% and 0.08%, respectively, which is lower than the results of the current study performed without closure. Based on their results, Nezhat concluded that suturing the fascia in 10 mm trocars or larger and also in 5 mm trocars, which are associated with extensive manipulations, is mandatory (11, 12). Likewise, Azurin *et al.* has shown that out of 1 300 laparoscopic cholecystectomies, 0.8% developed incisional hernia. Interestingly, all of the trocar site hernias occurred through large (≥ 10 mm) defects, consequently, they recommended that large fascial defects should be closed (13). In another study with 1 287 cases, Coda *et al.* has shown that the incidence of herniation after a laparoscopic cholecystectomy when the fascia is sutured, is 1% (14). Based on a systematic review done in 2010, the larger the trocar (≥ 10 mm) especially when located in

the umbilicus site (where most large trocars are placed), the higher the incidence of incisional hernia. Despite the fact, that the authors mentioned that there is inadequate evidence around this subject, the review suggested the use of small entry ports, and also recommended the suturing of all defects larger than 10 mm (2). On the other hand, a study undertaken by Liu *et al.* has shown that no incisional hernia occurred within 11 months of follow-up, following the insertion of non-bladed 10-12 mm ports, in 110 different sites (15). In addition, Siqueira *et al.* assessed the safety of non-closed fascia after 12 mm blunt-tipped port insertion in 70 trans-peritoneal, laparoscopic live donor nephrectomies and found that no patient had detectable trocar-site hernia and described this method as safe (8). Likewise, Shalhav *et al.* in a retrospective study on 90 trans-peritoneal laparoscopic renal procedures compared postoperative complications between two groups (one group with fascial closure and the latter with fascial non-closure), after using trans-peritoneal 12 mm blunt trocars. Following 4.5 months follow-up, no incisional hernia developed in either of the two groups. As a result, they concluded that the fascial non-closure method is as safe as the fascial closure one (16).

In contrast, to the studies supporting non-closure fascia in large sizes of trocar, there are some articles with the opposite results. Helgstrands *et al.* has shown that the rate of herniation in the non-closure fascia method is higher than fascial repair (0.6% vs. 1.5%) (2). In addition, Kadar *et al.* reported that the incidence of incisional hernia is significantly higher in laparoscopic surgeries when inserting 12 mm trocar, rather than 10 mm trocar (3.1% vs. 0.23%). He has also found that this problem is much more prevalent if the fascia was left open ($P = 0.021$) (17).

A summary of these studies is shown in Table 2. Accordingly, as there are a number of these various controversies, more studies are required. In addition, by the preparation of a systematic review and precise assessment concerning the reasons for this diffuse spectrum of results, it is possible to reach a definitive approach. Some investigations have shown that it is possible to reduce the occurrence of incisional hernia by applying new techniques in surgery. In a study by Lorenzo *et al.* in Italy, which was published in 2002, it was declared that the rate of incisional hernia after using Deschamps needles with

closure, was zero in 1400 patients (18). In terms of the risk factors related to developing an incisional hernia, unlike the former studies (2-6), in the current study, there was no significant relationship between; age, gender, diabetes, smoking, and the incidence of incisional hernia. Moreover, similar to the results from a systematic review, there was no significant relationship between obesity and incisional hernia (2). There were also no significant differences found in the rates of risk factors between the two groups, in this study. The incidence of some factors, however, was clearly higher in patients who experienced incisional hernia. For example, 20% of patients with incisional hernia had cholecystitis, whereas only 7% patients in the other group had this complaint. Also in the group with a hernia, the patients' mean age was higher than in the other group. It is possible that the lack of a sufficient sample has led to the lack of significance in such risk factors. As a result, investigations with more patients are recommended in the future.

In conclusion, in the current study, the prevalence of incisional hernia in sites using 10 mm trocars with the fascial non-closure method was greater than the incidence in cases with fascial closure, found in other studies. Consequently, suturing the fascia is recommended until further studies can be carried out.

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Authors' Contribution

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