

Risk factors for trocar site hernia following laparoscopic cholecystectomy

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ABSTRACT

Introduction: Laparoscopic cholecystectomy (LC) remains the gold standard surgical method for cholelithiasis. The objective of this study was to evaluate risk factors for the development of a trocar site hernia following an LC.

Materials and Methods: All of the patients who underwent an LC between 2014 and 2017 at the Kartal Research and Education Hospital were included in the study. Clinical data were collected retrospectively and possible causes of a trocar site hernia were analyzed. Age, gender, the method of suturing trocar sites, open or closed trocar insertion technique, body mass index (BMI), surgical site infection occurrence, associated diseases, and follow-up times were recorded.

Results: A total of 340 patients were included in this study. In the group, 254 were female (74%). The mean age was 48.4±14 years (range: 19-90 years). The mean follow-up time was 31.9±12.7 days. A trocar site hernia developed in 20 (5.9%) patients, and the mean age was 62.5±12.8 years ($p=0.0001$). Six (35.2%) of 17 patients with a postoperative surgical site infection developed a hernia ($p=0.0001$). In all, 35 patients had diabetes and 6 diabetic patients (17.1%) developed a hernia ($p=0.003$). The mean BMI was 31.2±6.1 kg/m² in the presence of a hernia and 27.9±4 kg/m² in the absence of a hernia ($p=0.001$).

Conclusion: This study examined age, BMI, diabetes, surgical site infection, trocar insertion method, and the technique used for the closure of fascia as possible risk factors in the development of trocar site hernia. Multivariate analysis revealed that only age, diabetes, BMI, and wound site infection were significant.

Keywords: Hernia; laparoscopy; trocar.

Introduction

Laparoscopic cholecystectomy (LC) remains gold standard surgical method for cholelithiasis.^[1] First laparoscopic cholecystectomy was performed in 1985 by Mühe. Frequency of application has increased through recent decades without any limitation.^[2] Despite minimal inva-

sive performance, some complications were attributed to trocar placement, one example is trocar site hernias (TSH).^[3] TSH are rare, but carry the risk of strangulation due to intestinal protrusion and may cause mortality and morbidity.^[1-3] Prevalance of TSH after LC remains as 0.14%–22%.^[3-8] Lack of long time follow-ups and due to absence of patients symptoms, real incidence could be



Received: 26.08.2019 Accepted: 23.09.2019

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more than these numbers.^[6] Usually these type hernias occur in 10 mm ports, whereas rare appearances could be seen in 5 mm ports.^[9]

In this present study we aimed to evaluate risk factors for developing trocar site hernias following laparoscopic cholecystectomy.

Materials and Methods

All patients received LC between 2014 and 2017 in Kartal Research and Education Hospital were included in our study. Clinical data were collected retrospectively via chart review. Patients with ASA IV status, conversion to open surgery and those without contact were excluded from the study.

We performed physical examinations and ultrasound evaluations. Possible causes, which could be effective in trocar site hernias were analyzed. Age, gender, surgical site infection (SSI), suturation of trocar sites, open or close entrance of trocars, BMI, associated diseases and follow-up times were recorded.

In our practice, we insuffulate abdomen via CO₂ through help of Veres needle. Initial 10 mm subumbilical trocar was introduced for scope. Additionally, one 10 mm trocar through epigastric space and two 5 mm trocars through right upper quadrant are introduced. Antibiotic prophylaxis are applied routinely.

Statistical Analysis

Continuous variables are expressed in mean and standard deviation and median and range according to distribution. Continuous normally distributed variables

were compared by Student's t-test. Mann-Whitney U test were used compare means of variables which were not normally distributed. The frequencies of categorical variables were compared using Pearson χ^2 or Fisher's exact test, when appropriate. Multiple ANOVA (MANOVA) were conducted for multivariate analyses. A value of $p < 0.05$ was considered significant.

Ethics Committee

This study was approved by the Dr Lütfi Kırdar Kartal Training and Research Hospital Ethics Committee (Number:89513307/1009/220).

Results

A total of 340 patients were included in this study. Two hundred fifty four of them were female (74%). Mean age was 48.4±14 years. Mean follow-up time was 31.9±12.7. Trochar site hernia was developed in 20 (5.9%) patients with mean age of 62.5±12.8. Remaining 320 patients had mean age of 47.7±14.2 ($p < 0.0001$). 6 cases (35.2%) out of 17 patients with postoperative SSI are presented with hernia ($p < 0.0001$). 14 cases out of 211 (6.6%) with closed insertion had hernias ($p < 0.451$). 14 cases out of 209 (6.6%) in absence of fascial closure had hernias ($p = 0.419$). 35 cases had diabetes. 6 diabetic patients had (17.1%) hernias ($p < 0.003$). Mean BMI was 31.2±6.1 in presence of hernia, whereas it was 27.9±4 in absence of hernia ($p < 0.001$). According to univariate analysis in our study; age, diabetes, SSI, open or closed entrance of trocars and closure of fascial space were effective factors in TSH after LC. In multivariate analysis studies; only age, diabetes, BMI and SSI were effective (Table 1).

Table 1. Parameters

Parameters	Hernia (+) n=20	Hernia (-) n=320	p
Age, mean±SD	62.5±12.8	47.7±14.2	0.0001
Gender, n (%) / (K, n=253), (E, n=87)	13 (5.1)	7 (8)	0.32
Diabetes mellitus, n (%) / (+, n=35), (-, n=305)	6 (17.1)	14 (4.6)	0.003
COPD, n (%) / (+, n=61), (-, n=279)	6 (9.8)	14 (5)	0.147
Cigarette, n (%) / (+, n=164), (-, n=176)	7 (4.2)	13 (7.3)	0.222
Surgical site infection, n (%) / (+, n=17), (-, n=323)	6 (35.2)	14 (4.3)	0.0001
Entrance, n (%) / (Open, n=129), (Close, n=211)	6 (4.6)	14 (6.6)	0.451
Fascia closure, n (%) / (+, n=131), (-, n=209)	6 (4.5)	14 (6.6)	0.419
Chronic constipation, n (%) / (+, n=36), (-, n=304)	4 (11.1)	16 (5.2)	0.159
Body mass index (kg/m ²), mean±SD	31.2±6.1	27.9±4.1	0.001

COPD: Chronic obstructive pulmonary disease; SD: Standard deviation.

Discussion

Increased use of laparoscopy is associated with additional complications which are specific to laparoscopy, such as trocar site hernias (TSH). Although incidence of TSH is relatively low, it can lead to serious complications such as strangulation requiring urgent surgery. According to the literature, the incidence of TSH is reported as 1%.^[10,11] The number of studies investigating TSH is quite low.^[12] In our study, only patients who underwent cholecystectomy were considered.

Some risk factors for the development of TSH have been demonstrated. These include advanced age, DM, increased BMI, smoking, wound infection, trocar size and localization.^[2,9,13,14] These predisposing factors can be examined in two main groups as patient-related and technique-related factors. In our study, considering the literature, our patients were evaluated in terms of age, gender, wound infection, open and closed entry, closure of trocar site, BMI, additional diseases and follow-up period.

Many studies have shown that obesity is one of the most important patient-related risk factors in the development of TSH.^[8] In accordance with the literature, TSH was significantly higher in obese patients in our study. While the BMI of our patients who developed TSH was approximately 31 kg/m², the BMI was 28 kg/m² in the patients who did not develop TSH. In a review of 1156 cases, it was shown that advanced age was another important patient-related risk factor for the development of TSH.^[15] As a hypothesis, decreasing volume of fascias and muscles in elderly patients was reported to be a potential risk factor for TSH.^[16] In parallel to the literature, TSH developed significantly more frequently in elderly patients in our study. Also, in our study, diabetes melitus was confirmed to be an significant risk factor in the development of TSH.

While Tonouchi et al.^[9] recommended the closure of the fascial defects of 10 mm and wider, they stated that the closure of 5 mm defects was optional. Although some surgeons close all trocar site fascial defects,^[17] many surgeons do not routinely close them.^[9] In a 1172 case, Chatzimavroudis et al.,^[18] despite routine closure of fascia, found TSH ratios as 0.6% and 0.94% in the first and second years, respectively. Nassar et al.^[19] reported the incidence of TSH was 1.8% in patients with preoperative umbilical hernia even if the defect was closed primary. In our series, no significant difference was found between patients whose fascia was closed and not closed. Postop-

erative wound infection was also shown to be one of the factors contributing to the development of TSH.^[7,17] In our series, the incidence of TSH was significantly higher in patients with postoperative wound infection.

There are some limitations that need to be emphasized in our study. First of all, our study is a retrospective analysis and the sample size is relatively low.

Conclusion

On our study, advanced age, diabetes, obesity and SSI were found to be independent risk factors for the development of TSH after laparoscopic cholecystectomy. In patients with these criteria, more attention should be paid to prevent the development of TSH.

Disclosures

Ethics Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

References

- Teixeira F, Jin HY, Rodrigues Júnior AJ. Incisional hernia at the insertion site of the laparoscopic trocar: Case report and the review of the literature. *Rev Hosp Clin Fac Med Sao Paulo* 2003;58:219–22. [\[CrossRef\]](#)
- Mühe E. Laparoskopische cholecystektomie. *Endoskopie Heute* 1990;4:262–6.
- Rao P, Ghosh K, Sudhan D. Port site hernia: A rare complication of laparoscopy. *Med J Armed Forces India* 2008;64:187–8. [\[CrossRef\]](#)
- Cadeddu MO, Schlachta CM, Mamazza J, Seshadri PA, Poulin EC. Soft-tissue images. Trocar-site hernia after laparoscopic procedures. *Can J Surg* 2002;45:9–10.
- Thapar A, Kianifard B, Pyper R, Woods W. 5 mm port site hernia causing small bowel obstruction. *Gynecological Surgery* 2008;7:71–3. [\[CrossRef\]](#)
- Reardon PR, Preciado A, Scarborough T, Matthews B, Marti JL. Hernia at 5-mm laparoscopic port site presenting as early postoperative small bowel obstruction. *J Laparoendosc Adv Surg Tech A* 1999;9:523–5. [\[CrossRef\]](#)
- Bergemann JL, Hibbert ML, Harkins G, Narvaez J, Asato A. Omental herniation through a 3-mm umbilical trocar site: Unmasking a hidden umbilical hernia. *J Laparoendosc Adv Surg Tech A* 2001;11:171–3. [\[CrossRef\]](#)
- Hussain A, Mahmood H, Singhal T, Balakrishnan S, Nicholls J, El-Hasani S. Long-term study of port-site incisional hernia after laparoscopic procedures. *JLS* 2009;13:346–9.
- Tonouchi H, Ohmori Y, Kobayashi M, Kusunoki M. Trocar site

- hernia. *Arch Surg* 2004;139:1248–56. [\[CrossRef\]](#)
10. Montz FJ, Holschneider CH, Munro MG. Incisional hernia following laparoscopy: a survey of the American Association of Gynecologic Laparoscopists. *Obstet Gynecol* 1994;84:881–4. [\[CrossRef\]](#)
 11. Lajer H, Widecrantz S, Heisterberg L. Hernias in trocar ports following abdominal laparoscopy. A review. *Acta Obstet Gynecol Scand* 1997;76:389–93. [\[CrossRef\]](#)
 12. Bhojru S, Payne J, Steffes B, Swanstrom L, Way LW. A randomized prospective study of radially expanding trocars in laparoscopic surgery. *J Gastrointest Surg* 2000;4:392–7.
 13. Azurin DJ, Go LS, Arroyo LR, Kirkland ML. Trocar site herniation following laparoscopic cholecystectomy and the significance of an incidental preexisting umbilical hernia. *Am Surg* 1995;61:718–20.
 14. Ahmad SA, Schuricht AL, Azurin DJ, Arroyo LR, Paskin DL, Bar AH, et al. Complications of laparoscopic cholecystectomy: the experience of a university-affiliated teaching hospital. *J Laparoendosc Adv Surg Tech A* 1997;7:29–35. [\[CrossRef\]](#)
 15. Antoniou SA, Pointner R, Granderath FA. Single-incision laparoscopic cholecystectomy: a systematic review. *Surg Endosc* 2011;25:367–77. [\[CrossRef\]](#)
 16. Mayol J, Garcia-Aguilar J, Ortiz-Oshiro E, De-Diego Carmo JA, Fernandez-Represa JA. Risks of the minimal access approach for laparoscopic surgery: multivariate analysis of morbidity related to umbilical trocar insertion. *World J Surg* 1997;21:529–33. [\[CrossRef\]](#)
 17. Moreaux G, Estrade-Huchon S, Bader G, Guyot B, Heitz D, Fauconnier A, et al. Five millimeter trocar site small bowel eviscerations after gynecologic laparoscopic surgery. *J Minim Invasive Gynecol* 2009;16:643–5. [\[CrossRef\]](#)
 18. Chatzimavroudis G, Papaziogas B, Galanis I, Koutelidakis I, Atmatzidis S, Evangelatos P, et al. Trocar site hernia following laparoscopic cholecystectomy: a 10-year single center experience. *Hernia* 2017;21:925–32. [\[CrossRef\]](#)
 19. Nassar AH, Ashkar KA, Rashed AA, Abdulmoneum MG. Laparoscopic cholecystectomy and the umbilicus. *Br J Surg* 1997;84:630–3. [\[CrossRef\]](#)