OPEN ACCESS

ISSN:2676-7473

RBMS.2025;30(1):e10

ORIGINAL RESEARCH

Port related complications in laparoscopic surgeries: An observational study

Hojatolah Khoshnoudi[1], Tahmaseb Jouzdani[1], Hamed Tahmasbi[1], Majid Samsami[1], Alireza Haghbin Toutounchi[1], Seyed Pedram Kouchak Hosseini[1], Parnasadat Hosseini Migoni[2], Fatemeh Parsaeian[1], Mohammad Aghaei[1], Behzad Nematihonar[1*]

1. *Department of General Surgery, Imam Hossein medical and educational center, Shahid Beheshti University of medical sciences, Tehran, Iran*
2. *Department of Internal Medicine, Taleghani medical and educational center, Shahid Beheshti University of medical sciences, Tehran, Iran*

*Corresponding Author:
Address: Imam Hossein medical and educational Center, Tehran, Iran
Email: behzadnematihonar@yahoo.com
ORCID: 0000-0001-9247-7268

Date Received: May 2024 *Date Accepted: June 2024* *Online Publication: July 15, 2025*

Abstract

Objective: While laparoscopic abdominal surgery has many benefits, the results of past studies regarding the rate of complications after surgery using different laparoscopic approaches are contradictory. According to the different results of previous studies, we have prospectively investigated pot-related complications in laparoscopic abdominal surgeries in the Iranian population.

Materials and Methods: This study was conducted as a prospective cohort. Number of 346 patients' candidates for abdominal surgery using the laparoscopy technique referred to Imam Hossein Hospital in Tehran, Iran, in 2021-2023 were included in the study based on the inclusion and exclusion criteria. Demographic information about the patients (age, gender, and underlying disease) and information related to surgery and complications related to the port were examined and recorded by the surgeons for six months after surgery.

Results: In this study, 346 patients were examined. The mean age of patients was 44.34 ± 11.80 years, ranging from 16 to 77 years. 206 (59.5%) were women, and 140 (40.5%) were men. Out of 346 operated patients, 129 patients (37.3%) had cholecystectomy, 117 patients (33.8%) had bariatric surgery, and 71 patients (20.5%) had herniorrhaphy. Port-related complications were seen in 11 patients (3.2%). Port site infection was diagnosed in 10 patients (2.9%). An incisional hernia was diagnosed in one patient (0.3%). There was no port site bleeding, omentum injury, or other possible port-related complications.

Conclusion: Although laparoscopic surgery is safe, requires sufficient expertise, training, and appropriate equipment. In this study Port-related complications of Iranian population have been reported to compare with others.

Keywords: Laparoscopy, Port-related complication, Abdominal surgery, Trocar

Introduction

Efforts to minimize the trauma caused by surgery and facilitate and reduce the recovery period during the past decades have led to the introduction of minimally invasive surgeries (1). The laparoscopic surgery approach is one of the standards less invasive surgical methods, which has been increasingly used in cholecystectomy, appendectomy, colorectal, and gynecological surgeries in the past years, and today it has been converted to the gold standard in many abdominal surgeries (2). Compared to other surgical methods, less inflammatory response, less pain, and satisfactory cosmetic results are the advantages of laparoscopic procedures (3). Efforts to further reduce the trauma caused by surgery led to the introduction of more advanced laparoscopic techniques, such as mini-laparoscopic surgery, natural orifice transluminal endoscopic surgery (NOTES) and Single-incision laparoscopic surgery (SILS) has been performed (4, 5). Initial evaluations showed these methods' safety, better surgical results, and aesthetic benefits. However, surgeons have concerns regarding the side effects of these methods, such as incisional hernia (6). In general, severe complications during or after laparoscopic surgery are reported to be less than 1%, and the mortality rate is estimated between 4 and 8 cases per 100,000 cases (7). More than 50% of the side effects of laparoscopic surgery are related to the trocar insertion site (8, 9). There still needs to be an optimal approach to determine the trocar insertion site and the number of trocars for performing laparoscopic surgeries. The results of past studies regarding the rate of complications after surgery using different laparoscopic approaches are contradictory. For example, although the SLIS method seems to have more aesthetic benefits, the need for a larger incision in abdominal wall may be associated with a higher incidence of incisional hernia. Previous studies have reported the incidence of incisional hernia in those method between 1.5 and 33%. Some studies have related the incidence of this complication with factors such as age, gender, BMI, trocar insertion site, and previous history of hernia (1-4). According to the different results of previous studies, we have investigated port-related complications in laparoscopic abdominal surgeries in the Iranian population.

Materials and Methods

This is a prospective cohort study surveying possible port-related complications in the patients underwent abdominal surgery using the laparoscopy technique referred to Imam Hossein Hospital, Tehran, Iran during 2021-2023. Ethical approval was obtained from the Ethics Committee of Shahid Beheshti University of Medical Sciences. Written informed consent was obtained from all patients participated in the study. The patients with history of any abdominal surgery were not included. Hand assisted surgeries and using wound retractor were not included. In all trocar greater than 5mm insertion site, facia repaired by vicryl suture. All the resected specimens such as gallbladder were removed trough the abdominal wall by EndoBag. Demographic information, the urgency of surgery, type of surgery, and number of trocars were recorded. After surgery, all patients were clinically examined for complications related to the port during admission and after discharge for 6 months. All possible complications related to the port, including port site infection, port site bleeding, incisional hernia, and metastasis of the port site, were investigated in the patients. The data were statistically analyzed by SPSS version 27. The study is reported in line with STROBE guideline (25).

Results

In this study, 346 patients were examined. The mean age of patients was 44.34 ± 11.80 years, ranging from 16 to 77 years. Two hundred-six patients (59.5%) were women, and 140 (40.5%) were men. 77 patients (22.3%) had an underlying disease in addition to requiring surgical intervention, the most underlying diseases being diabetes (n=39, 11.3%), hypertension (n=32, 9.2%), and heart disease (n=21, 6.1%). 334 patients (96.5%) underwent elective surgery. Out of 346 operated patients, 129 patients (37.3%) had cholecystectomy, 117 patients (33.8%) had bariatric surgery, and 71 patients (20.5%) had herniorrhaphy (Table 1). A mean of 3.80 ± 0.93 trocar numbers was used for patients ranging from 2 to 5. For most of the patients (151 patients, 43.6%), 3 trocars, 109 patients (31.5%), 5 trocars, 73 patients (21.1%), 4 trocars, and only in 13 patients (3.8%), 2 trocars were used.

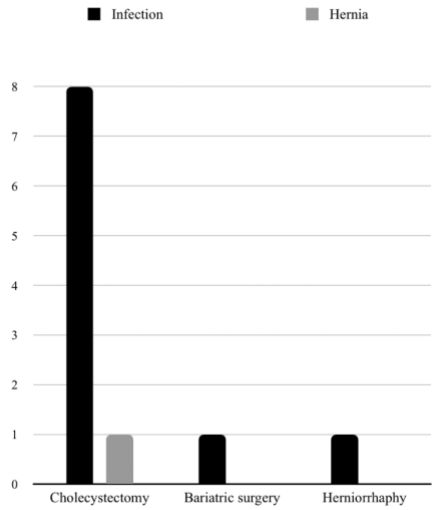
Out of 346 examined patients, port-related complications were seen in 11 patients (3.2%).

Port site infection was diagnosed in 10 patients (2.9%). Out of 10 patients with port site infection, eight patients (80.0%) underwent cholecystectomy, one patient (10.0%) underwent bariatric surgery, and one patient (10.0%) underwent herniorrhaphy. The port site infection was superficial in 9 patients and ultimately recovered without oral antibiotics. An incisional hernia was diagnosed in one patient (0.3%) following cholecystectomy (Table 1) (Figure 1). There was no port site bleeding, omentum injury, or other possible port-related complications. The number of trocars used in terms of complications related to the port was compared with each other, and there were no significant differences (3.79 ± 0.93 vs. 4.09 ± 0.83 for without and with complications, respectively, P=0.279 in Mann-Whitney U test).

Table 1: Type of surgery and complications.

Surgery types	n (%)	Compilation n (%)
Cholecystectomy	129 (37.3%)	9 (7%)
Bariatric surgery	117 (33.8%)	1 (0.9%)
Herniorrhaphy	71 (20.5%)	1 (1.4%)
Diagnostic	18 (5.2%)	0 (0%)
Appendectomy	11 (3.2%)	0 (0%)
Total	346 (100%)	11 (3.2%)

Figure 1: Distribution of complications (n=11).



Discussion

This prospective study investigated the frequency and types of port-related complications in laparoscopic surgeries. Previous findings have shown that laparoscopic surgery has many advantages over the open surgery (10, 11, 12). However, Various complications may occur related to laparoscopic ports. The incidence of these complications may depend on port size, type of surgery, and surgeon's expertise. Although complications are not common, the port-related ones are more frequent than other complications. On the other hand, Complications during surgery, such as large vessels injury and intestinal perforation, if they occur, usually lead to open surgery and can be life-threatening (13).

Complications after surgery, are usually more common than complications during surgery such as hernia, infection, metastasis of the port entry area, and tuberculosis of the port site are (14, 15). The present study showed port-related complications in 11 patients (3.2%). Port site infection was diagnosed in 10 patients (2.9%). Out of 10 patients with port site infection, eight underwent cholecystectomy, one underwent bariatric surgery, and one underwent herniorrhaphy. Incidence of port-related complications following laparoscopy has been reported from 2.5 to 10% in different studies (16-20). The most common complication related to the port was port site infection (18-20), which is in line with results of the present study. On the other hand, in the present study, the port site infection was superficial in 9 patients (90%) and ultimately recovered without oral antibiotics. In the study of Yadav et al. on 656 patients with abdominal surgery for various reasons, 21 patients (3.2%) had port site infection. However, out of 21 reported infections in this study, 16 were superficial (18). In the study of Colizza et al. less than 2% of patients had a port infection, all of which were superficial and involved the skin and subcutaneous tissue (21). Therefore, skin preparation seems to be very important in patients. The other complication is herniation at the port entry site. In the study of Dugg et al. there was no hernia in the port entry area in these patients after surgery (22). But in studies by Kabir et al. and Panigrahi et al. the incidence of hernia was 2.8% and 3.8%, respectively (23, 24). Our study diagnosed an incisional hernia in one patient (0.3%) following cholecystectomy. Having just one incisional hernia in our patients after surgery versus above mentioned studies may be due to differences in trocar insertion technique, fascia suture, and type of suture in these patients. In all cases we use bevel tip trocars, all trocar defects greater than 5mm are

repaired by a simple vicryl suture using facia closure.

Laparoscopic surgery undoubtedly is a better choice comparing with open surgery for many reasons such as fewer complications. However, this method requires sufficient expertise, training, and appropriate equipment, and it is faced with difficulties. The present study shows that laparoscopic surgery is safe with minor complications and overviews related complications in Iran.

Conflict of interest

All authors declare that they have no conflicts of interest.

Ethical approval

Ethics approval was obtained from the ethics committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Funding

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable requests.

References:

1. Girlich D, Bonnin RA, Dortet L, Naas T. Lirici MM, Califano AD, Angelini P, Corcione F. Laparo-endoscopic single site cholecystectomy versus standard laparoscopic cholecystectomy: results of a pilot randomized trial. The American Journal of Surgery. 2011;202(1):45-52.
2. Basunbul LI, Alhazmi LSS, Almughamisi SA, Aljuaid NM, Rizk H, Moshref R. Recent Technical Developments in the Field of Laparoscopic Surgery: A Literature Review. Cureus. 2022;14(2):e22246.
3. Buia A, Stockhausen F, Hanisch E. Laparoscopic surgery: A qualified systematic review. World J Methodol. 2015;5(4):238-54.
4. Hoyuela C, Juvany M, Carvajal F. Single-incision laparoscopy versus standard laparoscopy for colorectal surgery: a systematic review and meta-analysis. The American Journal of Surgery. 2017;214(1):127-40.
5. Fung AK-Y, Aly EH. Robotic colonic surgery: is it advisable to commence a new learning curve? Diseases of the colon & rectum. 2013;56(6):786-96.
6. Maerz DA, Beck LN, Sim AJ, Gainsburg DM. Complications of robotic-assisted laparoscopic surgery distant from the surgical site. Br J Anaesth. 2017;118(4):492-503.
7. Bongard F, Dubecz S, Klein S. Complications of therapeutic laparoscopy. Current problems in surgery. 1994;31(11):868-924.
8. Vilos GA. Laparoscopic bowel injuries: forty litigated gynaecological cases in Canada. Journal of Obstetrics and Gynaecology Canada. 2002;24(3):224-30.
9. Vilos GA. Litigation of laparoscopic major vessel injuries in Canada. The Journal of the American Association of Gynecologic Laparoscopists. 2000;7(4):503-9.
10. Noh JJ, Kim T-H, Kim C-J, Kim T-J. Incisional hernia after 2498 single-port access (SPA) gynecologic surgery over a 10-year period. Scientific reports. 2020;10(1):1-8.
11. Barutcu AG, Klein D, Kilian M, Biebl M, Raakow R, Pratschke J, et al. Long-term follow-up after single-incision laparoscopic surgery. Surgical endoscopy. 2020;34(1):126-32.
12. Hoyuela C, Juvany M, Guillaumes S, Ardid J, Trias M, Bachero I, et al. Long-term incisional hernia rate after single-incision laparoscopic cholecystectomy is significantly higher than that after standard three-port laparoscopy: a cohort study. Hernia. 2019;23(6):1205-13.
13. Moazzez A, Mason RJ, Katkhouda N. Thirty-day outcomes of laparoscopic versus open appendectomy in elderly using ACS/NSQIP database. Surgical endoscopy. 2013;27:1061-71.
14. Mishra A, Keeler B, Maxwell-Armstrong C, Simpson J, Acheson A. The influence of laparoscopy on incisional hernia rates: a retrospective analysis of 1057 colorectal cancer resections. Colorectal Disease. 2014;16(10):815-21.

15. Watanabe J, Ishibe A, Suwa Y, Suwa H, Ota M, Kubota K, et al. Hernia incidence following a randomized clinical trial of single-incision versus multi-port laparoscopic colectomy. Surgical Endoscopy. 2021;35(6):2465-72.
16. Mudgal MM, Kothiya PK, Kushwah N, Singh R. Port site complications following laparoscopic surgeries: a prospective study. International Surgery Journal. 2018;5(2):598-601.
17. Singh AA, Kumar P, Mahendru V, Ali M, Rai S, Afroz A, et al. A STUDY OF POST LAPAROSCOPIC PORT RELATED COMPLICATIONS. JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS. 2018;7(8):978-83.
18. Verma S, kesh Yadav H, Goel VK, Kala S. Laparoscopic port site complications: a multicentre prospective descriptive study from North India. World journal of Minimal Access Surgery. 2018;6(1).
19. Gad KH, Elhefny AMM, Gerges WB, Sebaie MSA. Assessment of Port Site Complication in Laparoscopic Abdominal Surgery. QJM: An International Journal of Medicine. 2020;113(Supplement_1):hcaa050.19.
20. Karthik S, Augustine AJ, Shibumon MM, Pai MV. Analysis of laparoscopic port site complications: A descriptive study. Journal of minimal access surgery. 2013;9(2):59.
21. Colizza S, Rossi S, Picardi B, Carnuccio P, Pollicita S, Rodio F, et al. Surgical infections after laparoscopic cholecystectomy: ceftriaxone vs ceftazidime antibiotic prophylaxis. A prospective study. Chirurgia italiana. 2004;56(3):397-402.
22. Dugg P, Shivhare P, Singh H, Mittal S, Kumar A, Munghate A. A prospective analysis of port site complications in laparoscopic cholecystectomy. Annals of Bariatric Surgery. 2014;3(2):100-10.
23. Kabir SF, Haque MA. Incidence of trocar (port) site hernias after laparoscopic cholecystectomy-study of 100 cases. Bangladesh Journal of Anatomy. 2011;9(2):110-2.
24. Panigrahi S, Behera C, Pujari P, Mishra A, Kanungo A. Analysis of port site complications in laparoscopic surgeries in a tertiary care centre. International Journal of Scientific Research. 2018;7(1):241-43.
25. von Elm, Erik et al. "The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies." Lancet (London, England) vol. 370,9596 (2007): 1453-7.

STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	3
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3
Bias	9	Describe any efforts to address potential sources of bias	3
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	3
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, explain how loss to follow-up was addressed	
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4
		(b) Give reasons for non-participation at each stage	4
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	4
		(c) Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	Report numbers of outcome events or summary measures over time	4
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	4
		(*b*) Report category boundaries when continuous variables were categorized	4
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	5
Discussion			
Key results	18	Summarise key results with reference to study objectives	5
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	5
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	5-6
Generalisability	21	Discuss the generalisability (external validity) of the study results	6
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	7

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.