

ORIGINAL ARTICLE

Reasons for laparoscopic cholecystectomy conversion in a small general hospital

Bakir Helić¹, Larisa Helić², Hajrudin Osmić¹

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ABSTRACT

Background: Laparoscopic cholecystectomy is one of the most common procedures in abdominal surgery. This procedure is the gold standard for the treatment of symptomatic cholelithiasis and acute cholecystitis. However, the difficulty and possibility of safely performing laparoscopic cholecystectomy vary considerably due to the variety of local findings and the course of the procedure. If it is not possible to complete the procedure safely by laparoscopy, due to intraoperative complications or to avoid the occurrence of complications, it is necessary to convert laparoscopic cholecystectomy to open cholecystectomy.

Methods: We performed retrospective research on cases of cholecystectomy performed on all patients at the Dr. Mustafa Beganović General Hospital in Gračanica from 2014 to 2020, which were started by laparoscopy and finished using laparoscopy or converted to open cholecystectomy.

Results: There were 888 cases that started as laparoscopic cholecystectomy. In 43, or 5.39% of cases laparoscopic cholecystectomy was converted to open cholecystectomy. The most common reasons for conversion from LC to OC were adhesions, the inability to identify anatomical structures, and inflammation.

Conclusion: The number of conversions in our sample is in accordance with the data from the relevant research and at the same time the incidence of bile duct injuries is very low.

Keywords: laparoscopic cholecystectomy, conversion, risk factors, cholecystitis, cholelithiasis

¹ Department of Surgery, Gračanica General Hospital, Gračanica, Bosnia and Herzegovina

² Department of Internal Medicine, Gračanica General Hospital, Gračanica, Bosnia and Herzegovina

Bakir Helić

email: bakirh@gmail.com

ORCID: 0000-0002-5891-6164,

Introduction

Despite the skepticism of contemporaries towards the authors and procedures, that is, Langenbuch, who performed the first cholecystectomy in 1882, and Mühe, who performed the first laparoscopic cholecystectomy in 1985¹ this procedure has today become one of the most common operations in abdominal surgery². The most common indication for cholecystectomy is symptomatic cholelithiasis. Other indications include: biliary dyskinesia, acalculous cholecystitis, polyps in the gallbladder, and suspected malignant or premalignant conditions of the gallbladder^{3,4}.

Due to the numerous benefits for the patient, laparoscopic cholecystectomy (LC) has long been the gold standard for the treatment of symptomatic cholelithiasis. However, the number of bile duct injuries, as the most significant complication of cholecystectomy, increased after the introduction of LC⁵. Although earlier research indicated that the surgeon's experience, i.e. the learning curve, is one of the factors for bile duct injury, recent data show that the initial decrease in the number of injuries has not continued, that is, that the number of these injuries has not decreased with time^{6,7}.

Although it is very common, in 16% of cases LC is a difficult procedure, usually due to severe inflammation⁸. Difficult cholecystectomy, in some cases, is a life-threatening procedure for the patient, and pushes surgeons to the limits of their technical capabilities. In these cases, in order to avoid complications, the most common exit strategy is the conversion of laparoscopic to open cholecystectomy or subtotal cholecystectomy if it can be performed by laparoscopy⁹. Recent data suggest that conversion from laparoscopic to open cholecystectomy (OC) occurs in 2 to 15% of cases¹⁰.

Therefore, we conducted a study to determine the reasons for conversion in a small general hospital, without the diagnostic resources present in university hospitals, and to determine the possible differences.

Patients and methods

For the research, data on cholecystectomies were collected from the public hospital, Gračanica General Hospital, Bosnia and Herzegovina. Procedures that were started using laparoscopy and completed by laparoscopy or converted to open cholecystectomy were considered. In the period from 2014 to 2020, 888 operations were found that correspond to these criteria. The patients were male and female, aged from 15 to 85 years. The reasons for conversion from laparoscopic to open cholecystectomy were taken from the operative findings of each case and, on the basis of the reason for conversion, the subjects were divided into the following groups: adhesions, inability to show anatomical structures, inflammation, technical reasons, bile duct lesion, bleeding, the patient's poor condition, and other reasons. The research was approved by the Ethics Committee of Gračanica General Hospital, number 01-775-4/19, dated July 5, 2019. The research was conducted in compliance with the general and ethical principles of Gračanica General Hospital.

Results

The sample included patients aged from 15 to 85 years. The youngest female patient was 15 years old at the time of surgery, and the oldest surgical patient was 82 years old. Male patients ranged in age from 16 to 85 years at the time of surgery, as shown in Table 1.

Table 1. The ages of the patients at the time of surgery

Sex	N	Min	Max	Xsr	SD
Female	687	15	82	46.05	14.55
Male	201	16	85	48.78	15.01
Total	888	15	85	46.66	14.69

Table 2. Number of conversions, total and by gender

	Female			Male					
	Exposed	No. in sample	%	Exposed	No. in sample	%	Exposed	Total	%
Conversion	25	687	3.64	22	201	10.95	47	888	5.29

Table 3. Reasons for conversion

Reason for conversion	No of cases	Percent	
		From total	From conversions
Adhesions	18	2.027	38.297
Inability to identify anatomical structures	14	1.576	29.787
Inflammation	7	0.788	14.893
Technical reasons	2	0.225	4.255
Lesion of bile ducts	2	0.225	4.255
Bleeding	1	0.112	2.127
Critical status of the patient	1	0.112	2.127
Other	2	0.225	4.225
Total	47	5.29%	100%

Conversion was performed in 47 cases out of 888 operations that were started using laparoscopy, i.e. in 5.29% of cases. In women, conversion was done in 25 out of 687 cases, and in men in 22 out of 201 cases, as can be seen in Table 2.

The Chi2 test determined that the frequency of conversion depended on the gender of the subject ($\chi^2=14.36$, $P<0.001$). The chance of conversion is 3.01 times higher in men (95%CI: 1.66,5.45). The reasons for conversion were divided into eight groups, according to the operating sheet for a particular case and they are presented in Table 3.

The largest number of conversions were due to adhesions, then the impossibility of displaying anatomical structures, and inflammation. Technical reasons

for conversion occurred in two cases, due to a malfunction of the instruments and the impossibility of establishing pneumoperitoneum due to the thickness of the patient's anterior abdominal wall, i.e. due to the lack of adequate instruments.

In one case, a lesion of the cystic duct occurred, and in one case, the existence of a biliary fistula was suspected, so we included these cases in the group of lesions of the bile ducts. Bleeding that could not be controlled and the poor condition of the patient, i.e. a heart rhythm disorder, were the reasons for one conversion. There were two patients in the remaining group, and the conversions in these cases were due to cystic duct calculus and a suspected common bile duct tumor.

Discussion

Every surgical procedure carries with it the possibility of complications, and that is also the case for laparoscopic cholecystectomy. Although this procedure is the gold standard and one of the most common procedures in abdominal surgery, complications still occur relatively often, from surgical wound infections to the most serious complication of bile duct injury.

Injuries to the bile ducts are mainly caused by inadequate visualization of the anatomical structures in the operative area, which is why the wrong structure is mistakenly injured or cut. Inadequate visualization may occur due to severe inflammation, procedural sequelae, or bleeding. An additional reason for a possible error during cholecystectomy that can cause iatrogenic injury to the bile ducts is anatomical variations, which are common in the biliary tree¹¹. To perform LC safely, it is common practice to achieve Critical View of Safety (CVS).

In addition to the complications that affect patients with bile duct injuries, and 40% of such patients have long-term biliary complications, it is important to mention the burden on the health institutions that have to treat these injuries, the high cost of treatment, and compensation costs in case of lawsuits^{12,13}.

In our research, we included 888 patients, of whom 77.36% were women, 22.64% were men. 97.51% of the patients had gallstones, so there was an identical ratio in relation to the presence of gallstones and gender. Approximately the same ratio of surgical patients in terms of gender can be found in other studies, such as Warchałowski et al. (75.8%:24.2%), while other studies indicate a lower ratio of operated women compared to men (70%:30 %)^{10,14}.

The average age of the patients in our sample at the time of surgery was 46.66 years, and it is approximately the same for women (46.06) and men (48.78). The age of 40 is cited in the literature as a risk factor for cholelithiasis, which explains the largest number of patients who underwent surgery in that age group, both in our sample and in other studies^{2,15}. The youngest patient was 15 years old at the time of the operation.

Although cholelithiasis also occurs in younger patients, younger patients could not be included in the research because the department where the research was conducted does not treat the pediatric population. The oldest patient was 85 years old. Although the incidence of cholelithiasis increases with age, the number of operated persons over the age of 90 is relatively small. Thus, the number of cholecystectomies in persons over 90 in the USA is about 125 per year. At the same time, the average age of those who died in Bosnia and Herzegovina was 77.2 years for women and 71.9 for men, which is why we can justify the fact that we did not have any patients older than 85 years^{16,17}. From this, it can be concluded that the demographic range of the operated patients, in terms of age and gender distribution, corresponds to data from the literature and the population treated in the institution where the research was conducted.

Conversion of LC to OC was performed in 47 out of 888 cases, i.e. 5.29%. This indicates a relatively low conversion rate of LC to OC, if we know that the conversion rate in some research is up to 15%. The rate of conversion corresponds to the results of the meta-analysis by Pucher et al., who included in their research over 500,000 cases and found that conversion occurs in a percentage between 4.2 and 6.2%⁵.

The most common reason for LC conversion to OC in our study was adhesions. This was followed by the inability to identify anatomical structures, inflammation, and other less common reasons. In the operational findings, there were no standardized reasons for conversion and the same are relatively subjective descriptions that depend on the surgeon. We divided them into eight groups. The impossibility of showing anatomical structures may be associated with inflammation, fibrosis, and adhesions. If we look at these reasons as one group, which can basically be reduced to the impossibility of safely performing the procedure due to the lack of safe display and identification of anatomical structures, these reasons are the cause of 82.97% of conversions. It is important to mention that conversions happened for technical reasons as well, which should not happen, that is, it is necessary to

have spare and adequate instruments. Unfortunately, in Bosnia and Herzegovina, surgeons are still forced to improvise, and are faced with a lack of instruments and surgical consumables.

Two conversions were performed due to injury or suspected injury of the bile duct. In one case, conversion was undertaken because of the suspicion of bile duct injury, but after conversion and detailed exploration, no biliary fistula was verified, postoperatively there was no bile secretion in the drain, and the patient recovered fully without further interventions. From the course of treatment, it was concluded that there had probably been an injury to Luschka's duct. In the second case, it was a lesion of the cystic duct below the site where it was clipped. The problem was solved by manual ligation of the cystic duct below the site of the lesion after conversion. It is important to emphasize that there

were no injuries to the large bile ducts in our sample that would have serious health consequences and be the cause of further treatment, but we can state that injuries to the bile ducts were the cause of conversion in 2 out of 47 cases, i.e. 4.25%. The percentage of bile duct injuries in our sample was two out of 888 procedures, or 0.00225%, and 0% large bile duct injuries. In the study by Genc et al., the percentage of conversions due to bile duct injury was reported as 4.9% of cases (7 out of 163 conversions). Genc mentions the injury of large bile ducts in 0.135% of the total number of patients operated, which is a very low rate of bile duct injury compared to that described in the literature, and corresponds to the rate of bile duct injury in open cholecystectomy^{5,18,19}. Table 4 shows the most common reasons for conversion of LC to OC in the literature and in our sample:

Table 3. Reasons for conversion

Author	Most common reasons for conversion	Number of cases	Conversion rate
Ozdemir ²⁰	Adhesion due to inflammation (53.6%)	898	3.04%
	Inability to see the hilum (21.4%)		
	Adhesions due to previous operations (14.3%)		
Genc ¹⁸	Adhesions caused by severe tissue inflammation (59.5%)	5164	3.16%
	Fibrosis of Calot's triangle (7.36%)		
	Intraoperative hemorrhage from gallbladder bed (6.74%)		
Pavlidis ²¹	Empyema/severe inflammation (20.4%)	1263	7.75%
	Calot's triangle fibrosis (19.38%)		
	Adhesions (18.36%)		
Licciardello ²²	Acute inflammatory changes (36.3%)	414	7.9%
	Intra-abdominal adhesions (24.2%)		
	Fibrosis of Calot's triangle (18.2%)		
Helić*	Adhesions (38.29%)	888	5.29%
	Inability to identify anatomical structures (29.78%)		
	Inflammation (14.89%)		

Conclusion

If we consider that conversion of LC to OC is performed to prevent bile duct injury, it is obvious that conversions were not undertaken unnecessarily as the number of conversions in our sample is in accordance with the data from relevant research, and at the same time the number of bile duct injuries was very low. It is obvious that the reporting of reasons for conversion of LC to OC is not standardized, and for easier reporting and relevant comparison of results it would be good to agree on common terms and reasons for conversion in standardized groups.

Conflict of interests

The authors have no relevant financial or non-financial interests to disclose.

Patient Consent Form: All participants were informed about subject of the study.

Author's Contribution:

Bakir Helic: Data curation, Visualization, Investigation, Methodology, Writing-Reviewing. Larisa Helic: Software, Validation. Hajrudin Osmic: Investigation.

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