

Day case laparoscopic cholecystectomy in a centre with more than 10 years experience in ambulatory surgery: indications, complications, length of stay, and readmissions

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Abstract

Aim: To review the results of outpatient laparoscopic cholecystectomy (LC) in a centre with more than 10 years experience of ambulatory surgery.

Methods: Data collected consecutively for one year for all cholecystectomy patients. Patient demography, indications for LC, per- and postoperative complications, grade of surgeon, length of stay and readmission data for patients undergoing LC as an outpatient day case or as an admission.

Results: 201 outpatients vs 117 inpatients in 1 year. 81.6% of outpatients was discharged within the first few hours after surgery. Complicated gallstone disease was associated with higher complication and conversion rates. Re-admission rate was a lower in the outpatient-group (4.0% vs. 6.8%). The complication rate was similar with both experienced and more junior surgeons.

Conclusion: Outpatient day case LC can be performed safely with low complication and conversion rates and by less experienced surgeons under adequate supervision. Approximately 80% of patients can be discharge within a few hours of surgery.

Keywords: Laparoscopic cholecystectomy; Ambulatory surgery; Per- and postoperative complications, Re-admission rate.

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Introduction

Laparoscopic cholecystectomy (LC) was introduced in 1991, and is now considered the treatment of choice for benign gall bladder disease. More than 7000 LCs are carried out annually in Denmark, with most cases performed as day-case procedures. Day-case LC was introduced at the Department of Surgery, Glostrup University Hospital, Copenhagen, Denmark in 1999. Different therapeutic and technical initiatives have been trialled locally to improve outcome and convalescence and shorten length of stay (LOS) [22]. It is unknown, however, if these initiatives have changed the outcomes, i.e. LOS, complications and readmissions.

We reviewed our experience of ambulatory LC over the last 10 years. Patient demography, indications for LC, incidence of per- and postoperative complications, length of stay (LOS), and readmissions for patients undergoing outpatient LC were assessed and compared with patients who had undergone inpatient surgery. Moreover, we examined whether the indications for surgery affected complication rates or LOS.

Patients and methods

Study population

Hospital records at Glostrup University Hospital were reviewed for the surgical procedure code JKA21 (laparoscopic cholecystectomy) and JKA20 (open cholecystectomy) performed over a one year period from May 15th. 2007 to May 14th. 2008. Medical records were retrieved and scrutinized by two authors (CØT and CR). The following data were recorded: sex, age, indication for LC,

surgeon details, per- and postoperative complications, LOS, and re-admissions. In all patients the intended treatment was laparoscopic cholecystectomy.

Indication for cholecystectomy

Patients were divided into four groups according to the clinical indications for cholecystectomy.

Group 1: Uncomplicated gallstone diseases: biliary colic with no history of cholecystitis, gallstone pancreatitis or common bile duct (CBD) stones.

Group 2: Gallstone pancreatitis or CBD stones: previous or present gallstone pancreatitis or CBD stones.

Group 3: Cholecystitis: acute cholecystitis or planned LC because of previous incidence of cholecystitis.

Group 4: Other indications: benign gallbladder polyps, previous gallstone ileus, bowel obstruction from gallstones, emergency laparotomy, ERCP complications and causes unknown.

Length of stay (LoS)

LoS was calculated from the day of surgery until the day of discharge. Patients, who were discharged on the day of surgery, were regarded as having been admitted for 0 days. In case of readmission, LoS was calculated as the number of days admitted for the primary procedure plus the number of days of the readmission.

Readmission

Readmission within 30 days of surgery and the LoS of the readmission was recorded.

Complications of cholecystectomy

a) Perioperative complications

Complications recorded preoperatively were:

- Conversion to the open procedure
- Bile duct lesions: defined as accidental injury to the common bile duct, cystic duct or common hepatic duct which required suturing, biliary stenting or reconstructive surgery.
- Bleeding: if estimated blood loss exceeded 500 ml, blood transfusion were given pre- or postoperatively, or re-operation for bleeding was necessary
- Bowel lesions were defined as transmural or serosal lesions of the small or large bowel.

b) Postoperative complications

Complications recorded postoperatively were:

- bile leak confirmed by ERCP or MRCP.
- intra Abdominal abscess proven by ultrasound or CT.
- wound complications defined as haematoma or infection requiring antimicrobial treatment or surgical drainage.
- pulmonary complications were defined as X-ray or CT proven pneumonia, pleural effusion, or pulmonary embolism.
- Other complications.

Location of Surgery

Patients for day case surgery were admitted to the Department of Outpatient Surgery (DKA) and those for overnight stay were admitted to the inpatient surgical ward (COP).

DKA opened on weekdays and closed daily at 4.30 p.m. [6]. Patients scheduled for outpatient LC received their operations between 08.00 a.m. and 01.00 p.m. At 3.00 p.m. all patients were examined by the surgeon and discharged, if possible. Patients not ready for discharge were re-examined at 04.30 p.m. and either discharged or admitted to the surgical ward as unplanned overnight admissions.

Patients scheduled for LC at COP consisted of two different groups:

- 1) patients suffering from gall stone disease requiring surgery within a few days (acute cholecystitis, mild gallstone pancreatitis, or accumulated gall stone symptoms)
- 2) patients where difficult surgery could be foreseen, patients with severe co-morbidity, patients living alone, or patients who did not speak Danish.

Grade of surgeon

The grade of the operating surgeon in charge was considered a proxy for surgical experience and recorded as resident, senior registrar or senior consultant.

Method of LC

The French LC method was employed where the surgeon stood between the patient's legs. A 12 mm trocar was placed just above the umbilicus. Three 5 mm trocars were positioned in the right lower quadrant, below the xiphoid, and in the upper left quadrant, respectively. Intra Abdominal Pressure was set at 12 mm Hg, and a 5 mm, 30° camera was used. Gentamicin 160 mg was administered intravenously during surgery. The cystic artery and duct were ligated with titanium-clips or Liga-Sure®. The gall bladder was removed via an Endobag through the umbilical wound. Closure of the umbilical wound was performed with Vicryl 2-0 resorbable sutures in the fascia. The skin was closed with nylon 3-0.

Statistical methods

The data was analysed using the programme SPSS® version 10.0. Sex specific mean (variance) and median values (interquartile range) for age and LoS were calculated and categorized according to surgery site (COP; DKA) and indication for surgery (groups 1-4). Mean and median values were compared with the Student-t test, the Kruskal Wallis and Mann-Whitney U tests.

Proportion (%) of per- and postoperative complications by sex, site of surgery, and indication for surgery was calculated and compared using the χ^2 test. Ninety five percent confidence intervals (CI) for proportions were extracted from the binomial distribution. Level of significance was set at 5%.

Results

Demography

Between May 15th. 2007 and May 14th. 2008, 318 cholecystectomies were performed (Table 1). The majority of cases (n=201) were performed on a day-case basis, while 117 LCs required overnight admission. Mean and median ages were 48.6 and 47.0 years respectively. The median ages for males and females were similar (51.0 and 47.5 years) Patients operated at COP were older than patients operated at DKA (median 52 yrs. vs. median 45 yrs., Kruskal Wallis test $p = 0,046$). More women than men had surgery (male:female ratio 1:2,2).

Indication for LC

More than half (54.1%) of the LCs were performed for uncomplicated gallstone disease. Of these, 138 of the 172 patients (80.2 %) were day cases (Table 1). Acute cholecystitis accounted for 28 % of the LCs and was the most frequent cause of LC at COP. Of 89 patients who had surgery for cholecystitis, 35 (39, 3%) underwent acute LC. The remaining 54 patients were scheduled for LC after 3 months. Most of these (n=40) were treated as day-case patients at DKA.

Complicated gall stone disease (cholecystitis, CBD stones, and gall stone pancreatitis) was more frequent in males than in females. In patients presenting with gallstone pancreatitis or CBD stones (Group 2), 15.3 % were male and only 9.5% were female and in those presenting with cholecystitis (Group 3) 38.8 % were male and 23.2% female.

Complications

A total of 35 (11%) patients had complications. As some patients had more than one complication, the cumulated number of perioperative and postoperative complications was 43 (13.5 %).

a) Perioperative complications

Eight patients (2.5 %) had a perioperative complication (Table 2), four (2.0 %) in the day surgery (DKA) cohort and four (3.4%) who had overnight admission in COP. Perioperative complications were more common in patients with cholecystitis (6.7% vs. 0.9 %, $\chi^2 = 12.82$, d.f.=3, $p = 0.005$). One true bile duct lesion involving the CBD and right hepatic duct was seen. The patient was subsequently transferred to a specialist centre for hepato-biliary surgery. Two patients suffered duct damage at the junction of the cystic duct and common bile duct and were managed locally.

b) Postoperative complications

There were 35 postoperative complications in 27 patients (8.5%). Nine patients had more than one complication. Postoperative complications were equally distributed between men and women (7.1% vs. 9.1%, χ^2 test, d.f.=1, $p = 0.6$). The incidence of postoperative complications was significantly higher in the

Table 1 Indication for LC in 318 Danish adults at Glostrup University Hospital, May 15th 2007 until May 14th 2008.

Cause of Surgery	COP	DKA	Total	Male:female ratio
Group 1: Uncomplicated gallstone diseases n=172 (54.1%)	34 (29.1%)	138 (68.7%)	172	1:3.4 (39/133)
Group 2: Gallstone pancreatitis or CBD stones* n=36 (11.3%)	25 (21.4%)	11 (5.5%)	36	1:1.4 (15/21)
Group 3: Cholecystitis (acute or elective) n=89 (28%)	49 (41.9%)	49 (41.9%)	89	1:1.3 (38/51)
Group 4: Other indications** n=21 (6.6%)	9 (7.7%)	12 (6.0%)	12 (6.0%)	1:2.5 (6/15)
Total	117 (36.8%)	201 (63.2%)	318 (100%)	1:2.2 (98/220)

*gallstone pancreatitis (n=15), CBD stones (n=20), gallstone pancreatitis and CBD stones (n=1). **former gallstone ileus (n=1), gall bladder polyps (n=9), emergency laparotomy (n=2), ERCP complication (n=1), unknown cause (n=8).

Table 2a and 2b Per- and postoperative complications in 318 adult Danes who underwent out-patient LC (DKA, 2a) or LC under admission (COP, 2b). n (%) [95 % confidence interval] *.**Table 2a:** DKA Per- and postoperative complications.

Peroperative	Group 1: Uncomplicated gallstone diseases n = 138	Group 2: Gallstone pancreatitis or common bile duct (CBD) stones n = 11	Group 3: Cholecystitis (elective) n = 40	Group 4 Other indications n = 12	Total N = 201
Bile duct lesion	-	-	1 (2.5%)	-	1 (0.5%)
Bleeding	-	-	1 (2.5%)	-	1 (0.5%)
Bowel lesion	-	-	2 (5.0%)	-	2 (1.0%)
Postoperative	-	-	-	-	
Intra-abdominal abscess	1 (0.7%)	-	-	-	1 (0.5%)
Bile Leakage	2 (1.4%)	-	1 (2.5%)	-	3 (1.5%)
Wound complication (hematoma/abscess)	1 (0.7%)	-	1 (2.5%)	-	3 (1.5%)
Pulmonary complications	1 (0.7%)	-	1 (2.5%)	-	2 (1.0%)
Other**	1 (0.7%)	-	-	-	1 (0.5%)
Total	6 4.3 % [2.0;9.2]	0	7 17.5 % [8.8;13.2]	1 (8.3%) [1.9;36.0]	14 (7.0%) [4.2;11.4]

admitted patients operated at COP (15.4%) compared with patients undergoing day surgery at DKA (4.5 %) ($\chi^2=11.32$, d.f.=1, $p < 0.005$). Likewise, patients with cholecystitis had more complications than other patients (13.5% vs. 6.6%, χ^2 test=5.18, d.f.=1, $p = 0.046$) as a result of increased numbers of wound infections and intra-abdominal fluid collections (Table 2).

Postoperative bile leakage were reported in 7 (2.2%) of the total of 318 patients and were treated with percutaneous drainage and CBD stenting.

One patient died from their complications (mortality = 0.3%) .

Conversion to open surgery

Seventeen of 318 (5.3%) patients undergoing LC were converted to open surgery. Conversion rates in Groups 1 to 4 were 1.7%, 5.6%, 12.4% and 4.8% respectively. Conversion occurred in 6 patients (3.0 %) undergoing day case surgery in DKA and 11 (9.4 %) in patients admitted to COP. In patients with cholecystitis, the conversion rate to the open procedure was 14.3% in patients who had acute surgery and 11.1% in patients undergoing planned surgery. Almost one fifth (18.4%) of operations for cholecystitis in men required conversion to open surgery.

Table 2a and 2b Per- and postoperative complications in 318 adult Danes who underwent out-patient LC (DKA, 2a) or LC under admission (COP, 2b). n (%) [95 % confidence interval] *.

Table 2b: COP Per- and Postoperative complications.

Peroperative	Group 1: Uncomplicated gallstone diseases n = 34	Group 2: Gallstone pancreatitis or common bile duct (CBD) stones n = 25	Group 3: Cholecystitis (elective) n = 49	Group 4 Other indications n = 9	Total N = 117
Bile duct lesion	-	2 (8.0%)	-	-	2 (1.7%)
Bleeding	-	-	1 (2.0%)	-	1 (0.9%)
Bowel lesion	-	-	1 (2.0%)	-	2 (0.9%)
Postoperative	-	-	-	-	
Intra-abdominal abscess	-	-	4 (8.2%)	-	4 (3.4%)
Bile Leakage	1 (2.9%)	1 (4.0%)	1 (2.0%)	1 (11.1%)	4 (3.4%)
Wound complication (hematoma/abscess)	1 (2.9%)	1 (4.0%)	3 (6.1%)	1 (11.1%)	6 (5.1%)
Pulmonary complications	-	1 (4.0%)	2 (4.1%)	2 (22.2%)	6 (5.1%)
Other**	-	-	-	-	1 (0.5%)
Total	2 5.9 % [1.8;19.2]	5 20.0% [8.9;39.4]	16 32.7 % [21.2;46.7]	1 (8.3%) [1.9;36.0]	14 (7.0%) [4.2;11.4]

Grade of surgeon

LCs were distributed equally between the groups of surgeons (residents 31.4%, senior registrars 34.6% and senior consultants 34.0%) with no differences noted in complication rates between groups.

Length of Stay

Median (mean) LoS was 0 (0.86) days at DKA for intended day cases and 2 (5.06) days at COP for admitted patients (Mann Whitney test $p < 0.005$, Student-t test $p < 0.05$) (Table 3). No sex difference was seen in LoS.

LoS was longer for patients with complicated gall stone disease (Kruskall Wallis test $\chi^2 = 47.74$, d.f. = 3, $p < 0.005$). Surgery at COP was associated with longer median LoS than surgery in DKA, regardless of the indication (2 days vs. 0 days LoS :Mann Whitney test, $p < 0.005$).

Thirty-seven of the 201 patients allocated to have day surgery at DKA (18.4%) could not be discharged. Surgical or anaesthesia complications and conversions accounted for 15 admittances. The remaining patients suffered from PONV, or late finishing surgery.

Readmissions

Table 3 LoS (median and mean values, days) after LC, by cause of surgery and site.

Cause of surgery	Mean (variance) Days	Median (IQ-range) Days	Mean (variance) Days	Median (IQ-range) Days
Group 1: Uncomplicated gallstone diseases	2.71 (0-19)	1.5 [1.0 ; 3.0]	0.52 (0-21)	0 [0 ; 0]
Group 2: Gallstone pancreatitis or common bile duct (CBD) stones	4.96 (0-37)	2 [1.0 ; 6.0]	0.09 (0-1)	0 [0 ; 0]
Group 3:	5.88 (1-44)	2 [1.5 ; 6.0]	2.48 (0-21)	0 [0 ; 1.75]
Cholecystitis (acute or elective)	9.78 (0-49)	5 [1.5 ; 10.5]	0 (0-0)	0 [0 ; 0]
Group 4	5.06 (0-49)	2 [1.0 ; 4.0]	0.86 (0-21)	0 [0 ; 0]
Other indications	1 (2.9%)	1 (4.0%)	1 (2.0%)	1 (11.1%)
Total	1 (2.9%)	1 (4.0%)	3 (6.1%)	1 (11.1%)

Table 4 Reasons for readmission, by operation site (n%).

Reason for readmittance	DKA (n=201)	COP (n=117)	Total (n=318)
Pains	3 (1.4%)	1 (0.8%)	4 (1.2%)
Bile Leakage	1 (0.5%)	-	1 (0.3%)
Intra abdominal abscess	-	4 (3.4%)	4 (1.2%)
Wound infection/hematoma	3 (1.4%)	1 (0.8%)	4 (1.2%)
Common bile duct stone	1 (0.5%)	-	1 (0.3%)
Malaise	-	2 (1.7%)	2 (0.6%)
Total	8 (4.0 %)	8 (6.8 %)	16 (5.0%)

Sixteen (5%) patients were readmitted (Table 4) but the readmission was unrelated to location of surgery ($\chi^2 = 1.264$, d.f.=1, $p = 0.29$) or the indication for surgery ($\chi^2 = 2.37$, d.f.=3, $p = 0.49$).

Discussion

In 1999, LC was implemented as a standard outpatient procedure at Glostrup Hospital. Since then, the number of operations performed has increased steadily, and the setup, logistics and procedures have undergone continuous refinement. We previously reported in 2001 our results for day case LC performed in DKA [6] where the day case rate was 77% with a readmission rate of 5%. This present study confirms that 2/3 of patients with gall stone disease could be handled safely on a day-case basis in our hospital with more than 80 % of patients scheduled for day-case LC discharged as planned, and again only 5% of patients requiring readmission. However our frequency of post-operative complications in 2001 was only 1.5% compared to 5 % in DKA patients in this study [6]. This increase may be explained by a more liberal access to out-patient surgery for patients in ASA III, the inclusion of patients with a previous episode of cholecystitis, and differences in the calculation and recording of post-operative complications. More women than men underwent LC, but complicated gall stone disease was more common in men. The overall complication rate was 13.5% with an incidence of bile duct lesions of 0.9 %. Most postoperative complications were due to infections, and were primarily seen after cholecystitis. Conversion to open surgery occurred in 5.3 %, most commonly in men and in patients with cholecystitis. The longest LoS was seen after complicated gall stone disease.

Over the past decade we have seen a steady increase in the number of LCs performed in our centre and our pathway and operative techniques have evolved to maximize our day case numbers.

Minimizing the surgical and anaesthetic stress response may reduce postoperative pain and PONV (post-operative nausea and vomiting). NSAIDs, acetaminophen, and local skin analgesia are part of the standard procedure in most centres [22]. Preoperative steroid and anti-emetics are widely used and appear to reduce PONV, but a recent Cochrane Review was inconclusive [23]. Preoperative beta blockage reduces the use of opioids and painkillers, but further studies are needed [24]. Gabapentin and intraperitoneal local analgesia do not seem to have any pronounced effect. Providing local anaesthesia is applied to the surgical wounds, the preparation itself does not influence outcome [21,22,25,26]. Development of smaller cameras and instruments has led to the use of smaller and fewer trocars. More recently the SILS-technique has shown promising results. Propofol has now replaced older drugs, and laryngeal-mask rather than endotracheal intubation is commonly used for day cases in most centres today.

High age, high ASA score, complicated gall stone disease, previous abdominal surgery, drainage, conversion, PONV and high BMI increase LoS after LC [3,7,10,12,14]. High age is not a contra-indication for day case outpatient LC does not contra indicate outpatient LC but may be associated with co morbidities, which may necessitate hospitalization [2,3,4,5].

In this study, LC on COP compared to DKA was associated with longer LoS irrespective of indication for surgery. While this may be explained by differences in co- morbidity and age, a lack of a dedicated ambulatory pathway with inadequate preoperative information and obsolete ward routines may also have extended LoS at our COP inpatient facility.

We found a shorter LoS than previously reported in Denmark [1,3] and a two to six times longer LoS after complicated gall stone disease in accordance with previous reports [7,8]. This difference could be due to more postoperative morbidity and higher rates of conversion [9,10,11].

The finding that 18.4 % of DKA patients could not be discharged has previously been reported [5, 6]. The reasons for this include conversion to the open procedure but in successful LCs the main cause of admission was PONV. It is possible that extending opening hours in DKA may also result in fewer patients being admitted.

Patients with mild gall stone pancreatitis had LC at COP within the first week of the symptoms. Patients with severe gall stone pancreatitis and patients who had ERCP were scheduled for LC in DKA 3 months after the initial attack. The present data suggest that LC can be done in such cases without prolonging LOS, but with a slightly increased risk of complications.

The cumulated number of complications was 13.5%, which is higher than previously reported [2,5,13]. One severe and two minor bile duct injuries (0,9% [0,0;2,0]) were recorded. This is not significantly different from the rate reported in the National Danish Cholecystectomy Database (DGD) (0.6 % in 2006 0.5% in 2008) [1], or in international reports (0.3-1.6%) [1,7,18,19]. Seven cases of bile leakage emerged in the postoperative period and were usually caused by cystic duct leakage. Method of ligation (Ligasure vs. clips) did not seem to affect the rate of leakage [30].

The use of abdominal drains for bleeding, bile spillage or contamination, was not considered a complication. Drains prolong LoS and increase the risk of pain and infection [14,15]. No scientific evidence supports the use of drains unless a bile leak is suspected. In this study only 5 of 30 drains inserted were for that reason.

No sex difference was seen in complications rates. Other studies have, however shown more complications in males [2,3,9,20] and after complicated gallstone disease [2,7,8,9,10,11].

Less experienced surgeons did not appear to have more complications than more experienced operators. A possible explanation may relate to an experienced surgeon being summoned for help by the junior in difficult cases with the experienced surgeon then being registered as the operating surgeon.

Conversion to open surgery was performed in 5.3% (national rate 8%, international rate 1.5% -10%) with higher rates in cholecystitis (8-32%) [1,9,10,11,12,27,28,29]. In this study conversion rates in cholecystitis patients were slightly lower in scheduled LC than in acute LC. Moreover, almost 1/5 of men with cholecystitis underwent open cholecystectomy. Other studies have shown that conversion rates are not increased if surgery is postponed until acute cholecystitis has ceased [11,13]. Timing of LC in these cases is difficult and future studies should assess whether earlier or later surgery may lower conversion rates.

Patients suspected of CBD stones all had a preoperative ERCP/MRCP or per-operative cholangiography. The low number of readmission due to CBD stones (n=1) implies that this preoperative work up is sufficient in most gall stone patients.

In conclusion, the outcome of LC in this department seems to match the results of both national and international centres. LC can be performed safely by younger surgeons under adequate supervision and as an out-patient day case procedure with low complication and conversion rates. Surgery for complicated gall stone disease should warrant extreme caution due to a higher risk of complications.

Improved patient information, focused treatment of the side effects of anaesthesia and surgery may contribute to lower LoS and Fast-Track regimens for patients undergoing LC under admission may contribute to lower LoS and the rate of readmissions. Randomized studies should focus on the impact of the timing of surgery in complicated gall stone disease.

Conflicts of interest: None

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