



Early results of single-incision laparoscopic cholecystectomy in comparison with the conventional: Does it have any impact on quality of life?

Hamza Cinar^{a,*}, Koray Topgul^{b,1}, Zafer Malazgirt^{c,2}, Savas Yuruker^{d,3}, Sercan Buyukakincak^{e,4}, Tugrul Kesicioglu^{f,5}, İsmail Alper Tarim^{d,3}, Zeliha Koc^{g,6}, Zeynep Saglam^{g,6}

^a Ordu University Medical Faculty, Department of General Surgery, Ordu, Turkey

^b Anadolu Medical Center, General Surgery Department, Kocaeli, Turkey

^c Medical Park Hospital, General Surgery Department, Samsun, Turkey

^d Ondokuz Mayıs University Medical Faculty, Department of General Surgery, Samsun, Turkey

^e Akçaabat Haçkâli Baba Public Hospital, Department of General Surgery, Trabzon, Turkey

^f Giresun University Medical Faculty, Department of General Surgery, Giresun, Turkey

^g Ondokuz Mayıs University, Health Science Faculty, Samsun, Turkey

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ABSTRACT

Background: Laparoscopic cholecystectomy is the standard treatment for gallbladder diseases. In recent times, single-incision laparoscopic cholecystectomy (SILC) has developed as a less invasive alternative technique to conventional laparoscopy. In the literature, many studies have compared SILC and conventional laparoscopic cholecystectomy (CLC) procedures but a limited number of studies have compared the two techniques with regard to quality of life (QOL). The choice of surgical procedure was effected by QOL of the patients. The effects of SILC on QOL remain unclear. In this study, we aimed to compare the effects of conventional laparoscopic cholecystectomy (CLC) and single-incision laparoscopic cholecystectomy (SILC) procedures on the clinical outcomes and quality of life of patients by short-term follow-up evaluation.

Material and methods: In this study, 142 patients who underwent cholecystectomy operations with either technique underwent SILC and CLC were evaluated. The quality of life index in the patients was measured with short form 36 (SF 36) test.

Results: The results of mean operative time, length of stay and complication rate for SILC and CLC were similar. The postoperative health-related quality of life (HRQOL) scores were not significantly different between the SILC and CLC patients but only physical functioning score were higher in SILC patients.

Conclusions: SILC is a safe and effective alternative to CLC. To detect the effects of SILC on HRQOL, we need long-term prospective comparative studies.

1. Introduction

Laparoscopic cholecystectomy is the standard treatment for symptomatic stones and benign pathologies of gallbladder [1]. In recent times, SILC has developed as a less invasive alternative technique to conventional laparoscopy [2]. In the literature, many studies have compared SILC and CLC procedures. SILC have many advantages such as less pain, better cosmesis, quicker return to normal life and shorter

hospitalization time but only a limited number of studies have compared the two techniques with regard to quality of life (QOL) [3,4]. The effects of SILC on quality of life remain unclear.

The choice of surgical procedure was effected by QOL of the patients. The impact of the surgical procedures on the physical, psychological and social well-being of the patient is an important factor to choose the therapeutic options for a specific disease. This is called “health-related quality of life” (HRQOL), and it is largely unstudied for

* Corresponding author. Ordu Üniversitesi Tıp Fakültesi Genel Cerrahi Departmanı, Ordu, Turkey. Tel./fax: +90 0452 2250185.

E-mail address: drhamzacinar@gmail.com (H. Cinar).

¹ Tel./fax: +90 0262 444 4276.

² Tel./fax: +90 0362 311 40 40.

³ Tel./fax: +90 0362 312 19 19.

⁴ Tel./fax: +90 0462 227 77 77.

⁵ Tel./fax: +90 0 454 310 16 00.

⁶ Tel./fax: +90 0362 231 2191.

SILC and CLC [5–7]. In this study, we assessed the potential short-term differences in HRQOL and clinical outcomes of patients who had undergone either SILC or CLC for gallbladder diseases.

2. Material and methods

Between December 2009 and January 2018, a total of 144 patients underwent laparoscopic cholecystectomy, of whom 43 had SILC and remaining 101 received CLC upon surgeons' preferences. In this current study, exclusion criteria from SILC group were previous upper abdominal surgery, pancreatitis, two or more attacks of acute cholecystitis, malignancy, conversion to multiport laparoscopic cholecystectomy/open cholecystectomy, American Society of Anesthesiologists (ASA) score IV patients and obesity.

All procedures were performed in two hospitals at two different cities. The clinical data were collected retrospectively throughout the hospital records, The baseline parameters like gender, age, BMI, ASA, previous abdominal surgery, and surgical indications; the perioperative data including the operation time, rate and cause of conversion to open, intraoperative complications, drain usage; and postoperative findings such as complications, reoperation rate, length of stay, and assessment of quality of life were all noted in all of patients. Ethics committee approval was obtained from Medicine Faculty of Ordu University.

In this study, a demographic questionnaire was used to record gender, age, marital status, insurance cover, education and income level of the patients. The Medical Outcomes Study Short Form 36 Health Survey (SF-36) was used for measurement of Quality of life. Ware and Sherbourne developed the SF-36 test which assesses eight health concepts [7]. These are physical functioning (PF), role physical (RP), general health (GH), bodily pain (BP), role emotional (RE), social functioning (SF), vitality (VT) and mental health (MH). The meanings of the eight health concepts of SF 36 are explained in Table 1. The scores of the subgroups, as well as the final global score for the SF-36 questionnaire, vary between 0 (worst possible health status or quality of life) and 100 (best possible health status or quality of life), and a higher score means a good quality of life [7]. There are different language versions of SF-36, including Turkish. Validation of SF 36 in Turkish patients performed by Pinar [8]. Internal consistency was 0.92, and test–retest reliability was 0.94, which is consistent with the findings of Pinar [8]. A staff nurse that was blinded to the type of operation directed the patients the questions of SF-36 questionnaire between one to six months postoperatively during the routine follow-up.

2.1. Statistics

Nominal scale data were used to calculate frequencies (proportions) for each surgical technique and then Fisher's exact test was used for analysing. Ordinal scale data for the two surgical procedures are presented as the mean \pm standard deviation. Mann–Whitney *U* test was used for comparisons between the two procedures. Two-tailed *p* values

were calculated and a *p* value < 0.05 was considered significant. All statistical analyses were conducted with the SPSS statistical software (Version 16.0; SPSS, Inc., Chicago, IL, USA).

2.2. Operative technique

All operations were performed under general anesthesia in the supine position. For SILC, a 20–25 mm umbilical incision was made. Utilizing an open technique we inserted a single SILS Port (Covidien[®]), which is a flexible laparoscopic port that can accommodate up to 3 instruments through it. We insufflated the abdominal cavity to a pressure of 12 mm Hg, and inserted a 30-degree telescope (10 mm) and two instruments, of which one was articulated. We sometimes used a suture grasper (Blue Surgical ApS[®]) to suspend the fundus. We dissected the gallbladder hilum with a roticulating dissector (Roticulator Endo Dissect, 5 mm; Covidien[®]) to expose the cystic duct and cystic artery, of which each was separately clipped with a 5-mm clip applicator (Endoclip 5-mm; Covidien[®]), and divided with an endoshears (Roticulator Endo Mini-Shears; Covidien[®]). We carried out the separation of the gallbladder from its bed with a hook electrocautery device. After the cholecystectomy was completed, we removed the specimen via the SILS port. We closed the fascia with a monofilament non-absorbable suture, and fixed the umbilicus with absorbable cutaneous stitches. For CLC, the surgical technique was similar to that described before [3].

3. Results

Of 144, 43 patients underwent SILC, and 101 patients underwent CLC. In one patient from the SILC patients, we needed the conversion to multiport laparoscopic cholecystectomy for adequately exposing of the anatomical structures. In one patient with acute cholecystitis in the CLC group, we were unable to laparoscopically dissect the Calot's triangle due to severe inflammation, and converted to open cholecystectomy. Both patients were excluded from the study. The number of SILC and CLC patients was 42 and 100, respectively. The genders of patients were 16 males/26 females in SILC and 33 males/67 females in CLC group. The mean age of SILC and CLC patients was 49.7 and 51.03 years respectively. The mean ASA scores was 1.9 in SILC and 2.2 in CLC patients. The number of patients with previous abdominal surgery was 14(33,3%) in SILC and 50(50%) in CLC. The mean BMI was 26.4 kg/m² in SILC and 28.2 kg/m² CLC group. Surgical indications of SILC and CLC were cholelithiasis in 36(85,7%) and 80(80%) patients, acute cholecystitis in 5(11,9%) and 15(15%) patients and polyp in 1(2,4%) and 5(5%) patients respectively. The operating time for SILC varying from 75,3(64–120) minutes was longer than that of CLC 64,6 (42–84), however the difference was not statistically significant (*p* > 0.05). Hospitalization was slightly longer in CLC patients; however the difference was not significant. Average length of stay was 2,1 days after SILC, compared with 2,65 days after CLC (*p* > 0.05). There were no statistical differences between the groups with respect to age, gender,

Table 1

Information about the SF-36 health status scales and the interpretation of low and high scores. Note: For each dimension, item scores are summed (0 for worst health and 100 for excellent health status).

Concepts	Items	Low scores	High scores
Physical functioning	10	A lot of limitations in performing all physical activities	Performs all types of physical activities
Role physical	4	Problems with work or other daily activities as a result of physical health	Has no problems with work or other daily activities as a result of physical health
Social functioning	2	Extreme and frequent interference with normal social activities due to physical and emotional problems	Performs normal social activities without any interference due to physical and emotional problems
Bodily pain	2	Very severe and extremely limiting pain	Has no pain
Mental health	5	Feelings of nervousness and depression	Feels peaceful, happy, and calm all the time
Role emotional	3	Problems with work or other daily activities as a result of emotional problems	Has no problems with work or other daily activities as a result of emotional problems
Vitality	4	Tired and worn-out feeling all of the time	Feels full of energy all of the time
General health	5	Personal health believed to be poor and likely to get worse	Believes personal health is excellent

Table 2
Postoperative complications after either SILC or CLC.

Postoperative complications	SILC	CLC
Intraabdominal Abscesses	0	2
Subhepatic Hematomas	0	2
Trocar-site hernia	2	0
Subcutaneous wound infection	2	1
Wound seroma	1	3
Total	5	8

ASA classification, prior abdominal surgery, BMI, surgical indications, operating time and length of hospital stay.

One of few prominent differences between the two techniques was that drains were used much less frequently in the SILC group than in the CLC group. In the SILC group, drains were used in 7 patients (16,7%) and in the CLC group they were used in 62 patients (62%). The difference between the groups was statistically significant ($p < 0.05$). In CLC, the surgeon has a lot of trocar sites for a drain hole so can use a drain while continuing to prevent cosmetics. In SILC, the surgeon has only one trocar site and is concerned about aesthetics, so would prefer not to use a drain.

Postoperative complications occurred in five patients (11,9%) in the SILC group and in eight patients (8%) in the CLC group ($p > 0.05$) (Table 2). Following SILC, two patients experienced trocar-site hernia and underwent elective mesh repair at 8 and 14 months after initial cholecystectomy. Superficial surgical site infection of paraumbilical incision was developed in the two patients, and was treated successfully with drainage and oral antibiotics. One patient developed wound seroma, and was treated conservatively. In the CLC group, two patients developed subhepatic hematoma that were observed with ultrasound, and was treated conservatively. In this group we observed wound seroma in three patients and one superficial surgical site infection of the paraumbilical incision in one patient, all of whom were treated conservatively. Two patients developed subhepatic abscesses, which were diagnosed with ultrasound and treated with antibiotics only. We recognized no biliary complications in either group.

HRQOL of the patients was analyzed postoperatively by means of the Short-Form 36 Health Survey at 3 months (min 1 - max 6 months). Regarding the overall postoperative HRQOL scores, patients who were able to communicate in either SILC (n:42/42) and CLC(n:95/100) groups comprehended comparable recovery in the postoperative period. As we separately studied the eight subscale scores, we found out that one subscale, namely the physical functioning subscale, showed significant difference between the groups. This score was 86.3 for the SILC group and 75.5 for the CLC group ($p = 0.039$) revealing better physical well-being in the former (Table 3).

4. Discussion

Laparoscopic cholecystectomy performed from a single hole is gaining popularity today and there is a trend for it to replace CLC [9].

Table 3
Health-related quality of life: results of the SF-36 survey with patients who underwent either single port cholecystectomy (SILC) or standard multiport laparoscopic cholecystectomy (CLC).

Item	SILC	CLC	P value
Physical Functioning (PF)	86.3 ± 22.6 (0–100)	75.5 ± 27.0 (0–100)	t = 2.166 p = .039
Role Physical (RP)	93.9 ± 20.7 (0–100)	81.9 ± 36.1 (0–100)	t = 1.941 p = .062
Social Functioning (SF)	86.0 ± 19.8 (25–100)	77.5 ± 22.4 (25–100)	t = 1.260 p = .218
Mental Health (MH)	94.2 ± 20.1 (0–100)	89.7 ± 26.2 (0–100)	t = .676 p = .504
Role Emotional (RE)	72.6 ± 14.3 (36–88)	72.5 ± 15.8 (40–96)	t = .102 p = .920
Vitality (VT)	66.8 ± 16.6 (35–95)	60.5 ± 16.2 (20–85)	t = 1.247 p = .223
Bodily Pain (BP),	72.7 ± 22.0 (20–90)	68.0 ± 25.3(10–90)	t = .534 p = .598
General Health (GH)	64.6 ± 11.5 (35–80)	59.3 ± 17.3 (20–80)	t = 1.437 p = .162
Overall Score	121.1 ± 12.9 (77–139)	115.2 ± 17.8 (59–138)	t = 1.493 p = .147

The benefits of SILC include postoperatively less pain and less pain medication, shorter hospitalization, quicker return to work and better cosmetic results, while limiting operative complications and costs [5,10–12].

In 1997, Navarra G. and his colleagues performed the first single incision laparoscopic cholecystectomy, and also published the first 30 patients series of in the same year [13]. Since then, this technique has been widely applied in appendectomy, gastric binding, colectomy, donor nephrectomy, sleeve gastrectomy, colectomy, adrenalectomy, splenectomy and hepatic hydatid disease [14–22]. Topgul et al. reported a SILC procedure performed safely in a pregnant woman [23].

The prominent fact in favor of SILC was that it would generate improved cosmetic outcomes. Bignell et al. [24] reported that cosmetic outcomes four years after CLC were perceived as excellent by women aged 20–50 years. However, in their randomized controlled trials comparing SILC with CLC both Marks et al. [25] and Phillips et al. [26] showed that SILC was superior to CLC in terms of cosmetic outcomes. Ma et al. [6] compared patients' cosmetic satisfaction using a ten-point scale, and although insignificant reported 9.3 score in the SILC group vs. 8.9 in the CLC group at 2–3 weeks postoperatively. Improved cosmetic results are that important in SILC operations that the surgeon would concern about putting drains. In CLC, the surgeon has a lot of trocar sites for a drain hole so can use a drain. The surgeon has only one trocar site in SILC so that he or she may not prefer to use a drain. In our series, significantly less rate of drain usage after SILC operations verified the strong cosmetic drive of this procedure.

It is suggested that SILC, using only one incision, produces less postoperative pain than CLC, which uses 4 incisions. However, studies have been inconclusive, of which some have found less pain after SILC, but others have found no difference between SILC and CLC in regard with the intensity of pain. Bresadola et al. [27] reported significantly lower postoperative pain scores for SILC patients, whereas Philipp et al. (28) reported increased postoperative pain for SILC compared with CLC. In our SF-36 survey, the comprehension of pain in both groups were identical.

Hospital stays are comparable between SILC and CLC, and there were no statistical differences in trials. The length of hospital stays in these series well corresponded with ours, namely 2.1 days after SILC and 2,6 days after CLC [9,12].

The main disadvantage of SILC has been the duration of the operation, with mean operative time being significantly longer. This fact is related to the technical problems of a new and evolving technique, and the need to complete a learning curve [28,29]. The learning curve of SILC is short and is estimated to be approximately 10 operations [30,31]. It has been demonstrated that education, training and experience can shorten the operative time for SILC [9,32]. In our series, our first SILC operation took 120 min while the most recent SILC operation took 64 min. From these data, it is reasonable to assume that once the learning curve is completed, SILC can be performed in comparable time to CLC.

A recent systematic review showed that the prevalence of surgical

site infection was 4.0% in the SILC group vs. 1.6% in the CLC group, and the site of infection was always at the umbilical incision in both groups; however, this difference was not statistically significant [33]. The trocar site infection rates in our series were 4.76% for SILC and 1.05% for CLC, the difference being statistically insignificant. Furthermore, the prevalence of incisional hernia according to the same review was 1.3% in the SILC group vs. 0.2% in the CLC group, but this difference was again statistically insignificant [33] but Marks et al. [25] reported significantly higher incisional hernia rates for SILC (1.2% in CLC and 8.4% in SILC $p = 0.03$). Our results for incisional hernia again were similar to those in the literature (4.76% in SILC and 0.0% hernia in CLC) and the difference was not statistically significant. Higher rates of surgical site infection and incisional hernia in SILC than in CLC have been ascribed to local ischemia induced by the placement of a single larger port which could weaken the fascia [26,34].

Postoperative complications, which include port-site bleeding, wound infection, bile duct injuries, bile leakage, retained choledocholithiasis, biliary collection or abscess and postoperative hernia were similar between the SILC and CLC groups (10,35). Garg et al. [35] analyzed the postoperative complications of the two techniques and reported that the incidence of complications was higher in SILC (16.0%) than CLC (12.3%) but without statistical significance. Regarding postoperative complications, our rates of 11.9% for SILC and 8% for CLC were not different significantly, and well corresponded with the published data.

The value of measuring patient outcomes is an important component in monitoring the quality of medical care [36]. In our study, we collected information about patients' functional status and well-being. The overall postoperative HRQOL scores were similar between the SILC and CLC patients. We looked the subscale scores, similar results were seen in SILC and CLC patients except for physical functioning, which were higher in SILC patients. Ma et al. [6] were unable to detect a difference in short term results in any of the 8 health status domains for patients who underwent SILC or CLC [6]. Reibetanz et al. [5] found that the HRQOL score was not better after SILC than the standard laparoscopic approach after 17 months postoperatively. It is important to adopt an adequate follow-up period when assessing HRQOL after surgery because the status is likely to continue to change over time due to the wound healing process and scar formation. Although healing is most significant during the first 6 months postoperatively, the HRQOL score continues to get better during the 2 years after laparoscopic cholecystectomy and this process does not plateau before 4–7 years after surgery [37].

According to our study, SILC is a safe and effective alternative to CLC that provides surgeons with an alternative, minimally invasive, surgical option. Overall postoperative HRQOL was not different between SILC and CLC, except for physical functioning, which was higher in SILC patients. However, long-term, prospective, comparative studies are needed to verify the effects of SILC on HRQOL.

Ethical approval

Ordu University Clinical Research Ethics Committee.
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Author contribution

Study design: Hamza Cinar, Koray Topgul, Zafer Malazgirt.
Data collections: Tugrul Kesicioglu, Hamza Cinar, Zeliha Koc, Zeynep Saglam.
Data analysis: Savas Yuruker, Sercan Buyukakincak.
Writing: Hamza Cinar, Koray Topgul, Savas Yuruker, Sercan

Buyukakincak, Ismail Alper Tarim.

Conflicts of interest

The authors declare no conflicts of interest for this article.

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Hamza Cinar.

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