

# Comparison of Double-Incision Laparoscopic Cholecystectomy and Needlescopic Cholecystectomy

Kenju Ko\*, Shigetoshi Yamada, Ken Hayashi,  
Akira Tsunoda, Hiroshi Kusanagi, Nobuyasu Kano  
Department of Surgery, Kameda Medical Center Kamogawa, Chiba, Japan  
Email: [hyun-soo@kameda.jp](mailto:hyun-soo@kameda.jp)

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## ABSTRACT

**Purpose:** Recently, reduced port surgery is becoming popular for laparoscopic surgery. “Reduced” means reducing the size or number of ports, but it is controversial as to which procedure is better. We evaluated double-incision laparoscopic cholecystectomy (DILC) and needlescopic cholecystectomy (NC) as reducing number or size of ports, respectively. **Method:** Patient records for 51 patients undergoing DILC and 22 patients undergoing NC were retrospectively evaluated. The patient and operation related variables of DILC and NC were compared by age, gender, body mass index (BMI), operative time, blood loss, length of postoperative hospital stay, numerical rating scale (NRS) pain score, and frequency to administer NSAIDs postoperatively for three days. **Results:** The operative times of both groups were similar (DILC  $106 \pm 31$  min, NC  $103 \pm 35$  min). Blood loss did not show any difference and each of them was small in amount (DILC  $14 \pm 29$  ml, NC  $22 \pm 31$  ml). Length of postoperative hospital stay of DILC ( $3.2 \pm 0.4$  days) was significantly shorter than that of NC ( $3.5 \pm 0.7$  days). Regarding postoperative pain, frequency to administer NSAIDs and pain score for three days postoperatively showed no significant difference. **Conclusion:** It is thought that DILC and NC have the same operative difficulty. As far as early postoperative pain was concerned, both procedures did not have any difference.

**Keywords:** Double Incision Laparoscopic Cholecystectomy; Single Incision Laparoscopic Cholecystectomy; Thin Forceps; Needlescopic Cholecystectomy

## 1. Introduction

Recently, laparoscopic cholecystectomy (LC) by single port has come to be performed for cosmetic improvement. Single-incision LC has been proved to be superior in cosmetics, body image, and quality of life [1]. Meanwhile, single-incision LC has a disadvantage as a surgical procedure in comparison with conventional LC. Some devices, including additional ports, are often used to keep safety. Additional devices or ports indicate a surgeon’s carefulness, and not a failure to perform an elegant procedure [2,3]. We perform DILC, which has an additional 3.5 mm port with single-incision LC, for more safety.

On the other hand, thin forceps are often used for cosmetics without losing operability of conventional LC. We also have performed NC because operative safety of LC with thinner forceps than conventional LC is reported [4].

In our hospital, both DILC and NC are performed for better cosmetics after all. It is thought that DILC is more cosmetic but more difficult than NC. But it is not obvious that which procedure is superior because there are no reports comparing with postoperative pain, operability, and the others.

Therefore, we retrospectively analyzed and compared clinical outcomes of DILC and NC.

## 2. Patients and Methods

### 2.1. Patients

In this retrospective study, data of 73 patients who had undergone DILC or NC were analyzed. All patients were treated between June 2010 and October 2012 at Kameda Medical Center. The cases given a diagnosis as being severe or moderate acute cholecystitis by the Tokyo guidelines [5] or performed with some kind of preopera-

\*Corresponding author.

tive drainage were excluded. DILC and NC group include 51 case and 22 cases, respectively. Both group patients were completely informed about the technique and had the opportunity to choose the conventional LC procedure.

## 2.2. Methods

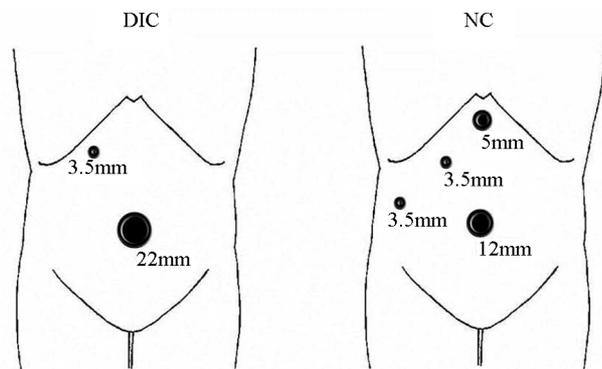
All procedures were performed by some experienced surgeons who have been trained for more than three years. Decision for the procedure either DILC or NC depended on surgeon's preference and experience.

In case of DILC, the operation was started by placing a 22 mm longitudinal incision through the umbilicus. After cutting fascia and peritoneum, multi-channel port (LAPPROTECTOR™ and EZ ACCESS™, Hakko, Japan) was constructed. Additionally, a 3.5-mm port was constructed at right hypochondrium (**Figure 1**).

In case of NC, the operation was started by placing a smaller longitudinal incision than DILC through the umbilicus. A 12-mm umbilical port, a 5-mm subxyphoid port, and two 3.5-mm hypochondriac ports were constructed (**Figure 1**).

In both procedures, epidural anesthesia was not given and total 20 ml of 0.75% ropivacaine was injected into each wound during the operation for relieving postoperative pain. Postoperative pain was managed only with non-steroidal anti-inflammatory drugs (NSAIDs) via the oral or intravenous route if patient complained of pain.

The patient- and operation-related variables of DILC and NC were retrospectively compared by age, gender, body mass index (BMI), operative time, blood loss, length of postoperative hospital stay, numerical rating scale (NRS) pain score, and frequency to administer NSAIDs postoperatively for 3 days.



DILC: double-incision laparoscopic cholecystomy  
NC: needlescopic cholecystectomy

**Figure 1.** DILC has a 22-mm umbilical multi-channel port and 3.5-mm additional port at right hypochondrium. NC has a 12-mm at umbilicus, a 5-mm at subxyphoid, and two 3.5-mm ports at hypochondrium.

## 2.3. Statistical Analysis

Results are expressed as means  $\pm$  standard error of mean. The statistical difference was determined by Student's *t* test or the Cochran-Cox test. Dichotomous variables of independence were evaluated by the  $\chi^2$  test. The results were considered significant when the *P* value were  $P < 0.05$ .

## 3. Results

The DILC included 16 (31%) male and 35 (69%) female with a median age of  $55.9 \pm 2.0$  years, whereas 8 (36%) male and 14 (64%) female were in the NC with a median age of  $57.7 \pm 2.9$  years. Comparison of each group never showed a significant difference in gender and age. The median BMI in the DILC was  $23.9 \pm 0.43$  and in the NC was  $23.9 \pm 0.70$ . Each preoperative severity of inflammation (none/grade I) was 41/10 for DILC and 14/8 for NC according to Tokyo guideline criteria for acute cholecystitis (**Table 1**).

The operative times of each group ( $106 \pm 4.4$  min for DILC vs.  $103 \pm 7.5$  min for NC) were similar. Blood loss did not show any difference and each of them was small in amount ( $14 \pm 4.1$  ml for DILC vs.  $22 \pm 6.6$  ml for NC). Length of postoperative hospital stay of DILC was significantly shorter than NC (**Table 2**).

Regarding postoperative pain, frequency to administer NSAIDs for postoperative three days showed no significant difference as  $2.0 \pm 0.25$  for DILC and  $2.1 \pm 0.47$  for NC. The pain score each day postoperatively for three days did not have any difference although both of them decrease as time passed (**Figure 2**).

One patient in DILC suffered wound infection of umbilicus and took treatment conservatively.

## 4. Discussion

Single-incision LC had been described even a decade ago [6] and became popular with the recent development of surgical technologies. Single-incision LC has less incision and higher cosmetic efficiency in comparison with conventional LC. The high cosmetic value made single-incision LC become more popular. On the other hand, single-incision LC has the disadvantage of operative difficulty because of conflict between forceps. The procedure becomes difficult to perform safely except for experienced surgeons.

It is still controversial regarding the advantages and disadvantages although many reports compare between single-incision and conventional LC [7-11]. For now, the significant difference has not statistically shown which procedure is superior.

Conventional LC basically needs four ports in total including three for manipulation and one for laparoscope. Single-incision LC, however, has just two channels for

**Table 1. Characteristics of the patients.**

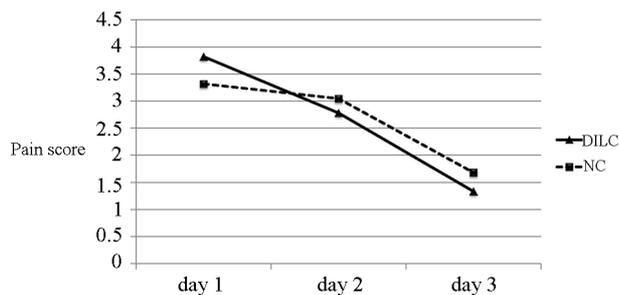
	DILC (n = 51)	NC (n = 22)	P
Sex (male/female)	16/35	8/14	0.68
Age (years)	55.9 ± 2.0	57.7 ± 2.9	0.31
BMI (kg/m <sup>2</sup> )	23.9 ± 0.43	23.9 ± 0.70	0.48
Tokyo guideline criteria for acute cholecystitis (none/grade I)	41/10	14/8	v

DILC: double-incision laparoscopic cholecystectomy; NC: needlescopic cholecystectomy.

**Table 2. Comparison of the perioperative data.**

	DILC (n = 51)	NC (n = 22)	P
Operative time (min)	106 ± 4.4	103 ± 7.5	0.362
Blood loss (ml)	14 ± 4.1	22 ± 6.6	0.134
Length of postoperative hospital stay (days)	3.2 ± 0.06	3.5 ± 0.14	0.021
Frequency to administer NSAIDs for postoperative three days	2.0 ± 0.25	2.1 ± 0.47	0.426
Pain score			
Postoperative day 1	3.8 ± 0.30	3.3 ± 0.38	0.168
Postoperative day 2	2.8 ± 0.23	3.0 ± 0.30	0.251
Postoperative day 3	1.3 ± 0.25	1.7 ± 0.33	0.214
Complication (cases)	1 (wound infection)	none	

DILC: double-incision laparoscopic cholecystectomy; NC: needlescopic cholecystectomy; NSAIDs: non-steroidal anti-inflammatory drugs.



DILC: double-incision laparoscopic cholecystectomy  
NC: needlescopic cholecystectomy

**Figure 2. Relation of the pain score and postoperative days. Both of pain score didn't show any significant difference although they decreased as time passed.**

manipulation because the umbilical port has only three channels in total. It is a natural consequence that single-incision LC, operating through one port, became more difficult because of a smaller number of forceps than conventional LC. Some kind of supporting device such as additional forceps or endoscopic retractors is sometimes used for this problem and we chose a thin 3.5 mm forceps for assistance. It is reasonable to add a forceps because single port LC has just only two usable forceps for handling. It is reported that an additional forceps reduces difficulty of single-incision LC [12]. Furthermore, we placed importance on cosmetics by using thinner 3.5 mm forceps than 5 mm for conventional LC.

On the other hand, some trials downsizing ports are reported without reducing the number of ports for con-

ventional LC [13-16]. A certain report described that operation time became longer by thin forceps and the other did not clarify the merit of thin forceps. However, two systematic reviews concluded that LC with thin forceps can be superior in pain and cosmetics compared with conventional LC [17,18].

Briefly, even if the size of the port is reduced for cosmetic purposes, the operability is secured by the same number of usable forceps as conventional LC. We also have performed LC changing the port 10 mm to 5 mm and 5 mm to 3.5 mm as NC based on this concept. The use of 3.5 mm forceps is an appropriate decision because Tagaya concluded that the most important factor for reducing operative time and achieving a low conversion rate is the use of at least a 3 - 5 mm port for NC [19].

There are not any reports that compared these different operations (DILC and NC) in consideration for operability and cosmetics. Our study never showed any difference by age, gender, BMI, and degree of preoperative inflammation. The operative time and blood loss as index of the operative difficulty did not show any difference. This result showed that the operative difficulty of DILC and NC was almost same. It has been reported [17] that NC has longer operative time than conventional LC while there is not the comparison the operative time between DILC and conventional LC. It is known that the operative time of single incision LC is longer than conventional LC [7]. But it is doubtful whether additional forceps for single incision LC can shorten operative time

the same as conventional LC. Perhaps DILC is expected having longer operation time in comparison with conventional LC. Therefore, it is natural that DILC and NC needed almost same operative time as a result of our study.

However, the surgeon's experience had an effect on the decision of operative procedure in our study, and it might have caused no difference of operative time. The amount of blood loss was a minimal and no differences were seen in either procedure. It was supposed that DILC and NC have almost same operative difficulty although the surgeon's experience differed between these procedures.

Length of hospital stay of DILC group was significantly shorter than NC, but the cause is not clear because NC had no complications which extended hospital stay. For the case which is expected to be difficult, NC might have been chosen because decision of the procedure depended on surgeon's preference and experience.

Regarding postoperative pain, single incision LC was expected to be less painful because of a smaller number of wounds than conventional LC at first. Recently, some reports have shown that single incision LC is more painful than conventional LC [8,9]. However, there is no report found including a comparative review about postoperative pain of DILC and NC like in our report. Our study compared frequency of administering NSAIDs and pain scale for the evaluation of the pain and, as a result, it did not show any significant difference.

There is a report that postoperative analgesia requirements for the LC with needlescopic instruments, which has smaller ports, were 70% lower than for the conventional LC [20]. It is expected that a slightly bigger wound to construct multichannel port for DILC caused strong pain, but our study showed a different result. The effect of number or size of ports on postoperative pain remains an open question.

Regarding complications, no major complications occurred and both procedures seemed to be almost safe.

## 5. Conclusion

It is thought that DILC and NC have the same operative difficulties on account of no difference with operative time and blood loss. Moreover, both procedures can be performed safely without any serious complication. Regarding early postoperative pain, both procedures did not show any difference.

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