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Original Research Article

Two-sites incision laparoscopic cholecystectomy



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ABSTRACT

Introduction: Laparoscopic cholecystectomy has become the gold standard in treating patients presenting cholecystitis. Standard laparoscopic cholecystectomy involves access to the abdominal cavity through two or three incisions outside the umbilicus, which are potential infection sites and may determine poor cosmetic outcomes.

In order to eliminate the aforementioned disadvantages of “traditional” laparoscopic surgery methods, several modifications have been recently introduced, which are significantly less invasive. Effort is being made to reduce the amount of trocars accessing the abdominal cavity via the abdominal wall, or to eliminate them completely.

Aim: The aim of the work was to describe a modification of traditional laparoscopic cholecystectomy, which consists of reducing the amount of integumental incisions.

Material and methods: From October 2009 through July 2011, 21 patients were operated on using laparoscopic cholecystectomy in the general surgery department in Kędzierzyn-Koźle District Hospital. Our control group consisted of 25 patients, operated on schedule between March and July 2011 in the same hospital.

Results and discussion: Postoperative course was uneventful. Aesthetic results were regarded as “very good” by both patients and surgeons. One advantage of the described method is the possibility to convert to “traditional” laparoscopic cholecystectomy at any point during the operation.

Conclusions: Described method is a safe and efficient alternative for standard laparoscopic cholecystectomy and may be introduced virtually in every surgery department operating by means of laparoscopic techniques.

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1. Introduction

Laparoscopic cholecystectomy has become the gold standard in the treatment of patients presenting cholecystitis symptoms. It was 1987 when Philippe Mouret introduced this new method into clinical practice.¹ Standard laparoscopic cholecystectomy involves access to the abdominal cavity through two or three incisions outside the umbilicus, which are potential infection sites and may determine poor cosmetic outcomes, as well as causing postoperative pain.

In order to eliminate the aforementioned disadvantages of "traditional" laparoscopic surgery methods, several modifications have been recently introduced, which are significantly less invasive. Effort is being made to reduce the amount of trocars accessing the abdominal cavity via the abdominal wall, or to eliminate them completely. In some cases, as in sleeve gastrectomy or adjustable gastric band placement, implementation of a single incision access may eliminate up to five or six other incision sites outside the umbilicus.²⁻⁴ Depending on the type of modification, techniques of laparoendoscopic single-site surgery (LESS) are divided into natural orifice transluminal endoscopic surgery (NOTES) and single incision laparoscopic surgery (SILS), usually localized in the umbilicus – one port umbilical surgery (OPUS). When operating with one port only, specially designed, curved instruments are essential to obtain proper operating angle.

Single incision laparoscopy was introduced by Navarra,⁵ and since then, was implemented both in adults⁶⁻¹⁰ and in children^{11,12,16,21} in numerous procedures.^{1,11,13,14,18,22}

These modifications of "classic" laparoscopic cholecystectomy result in diminished postoperative pain, reduced rates of complications and duration of hospitalizations, and better cosmetic results – cholecystectomy without a visible scar. In order to perform LESS, specially designed equipment is needed. Several manufacturers provide surgeons various single ports with multiple access lumens (SILS) or an elastic membrane (Gelport). Moreover, in order to obtain a proper operating angle between the instruments, it is essential to use bent (articulated) operating instruments.

2. Aim

The aim of the work was to describe a modification of traditional laparoscopic cholecystectomy, which consists of reducing the amount of integumental incisions.

3. Material and methods

Authors describe a modification of standard cholecystectomy by reducing the number of skin incisions to two: one in the umbilicus and the other on the left flank. Two and one standard trocars were introduced through each of the incisions, respectively. Standard, straight (not articulated) instruments were used. It was essential to use straight instruments, as these are not as price burdening and are widely used throughout surgery departments. In order to immobilize and suspend the gallbladder, one transabdominal

suture was used. Further course of laparoscopy was standardized.

In the period from October 2009 to July 2011, in the general surgery department of the district hospital in Kędzierzyn-Koźle, 21 patients were operated on by means of the described technique.

The experimental group consisted of 5 men and 16 women. Their age ranged from 21 to 63 years with a mean age of 40.9 years. All the patients were operated on as a scheduled procedure. Their ASA score was I to II. The mean time from first symptoms to the operation was 11.9 months (range 0–36). All patients signed a declaration of approval for the study.

The control group had 25 patients: 8 men and 17 women. Their age ranged from 25 to 80 years with a mean age 48.8 years. Our patients from the control group were chosen from those operated on as a scheduled procedure as well. Their ASA score was I to III.

3.1. Operative techniques

All the surgeries were performed by the same surgeon (Mariusz Lipka).

In the supine patient, a horizontally oriented, semilunar incision in the upper pole of the umbilicus was made about 15–18 mm. Dissection of the skin from underlying fascia was then performed. A Varesse needle was introduced and a 10–12 mmHg pneumoperitoneum was created. A 10 mm straight trocar or 30° oblique optics was introduced followed by a 5 mm trocar placed laterally in the same skin incision via an adjacent fascia cut. Another small incision for a 10 mm trocar was made in the left lateral epigastrium (Fig. 1). Next, the patient's position was modified to anti-Trendelenburg, rotated towards the operator. Both operator and the assistant were standing on the left side of the patient. After introduction of standard (straight) laparoscopic instruments, a 2/0 Vicryl gallbladder suspension transintegumental suture was placed in the upper right quadrant of the abdomen (Fig. 2). The suture was placed intramurally; however, bile leak was noted at times within the abdominal cavity and was immediately aspirated and rinsed.

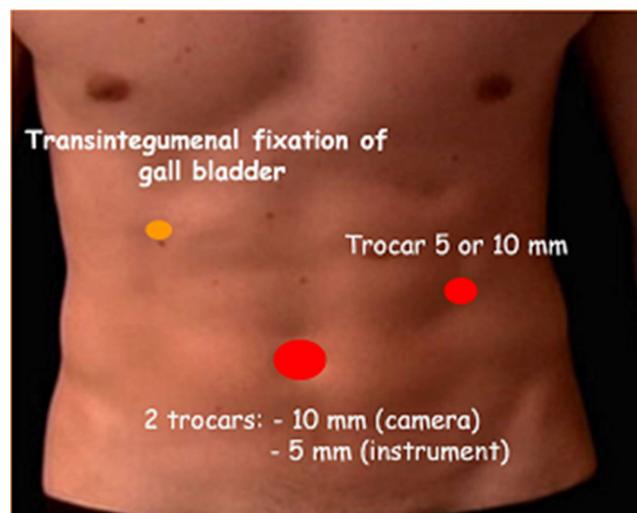


Fig. 1 – Surgical access (scheme).

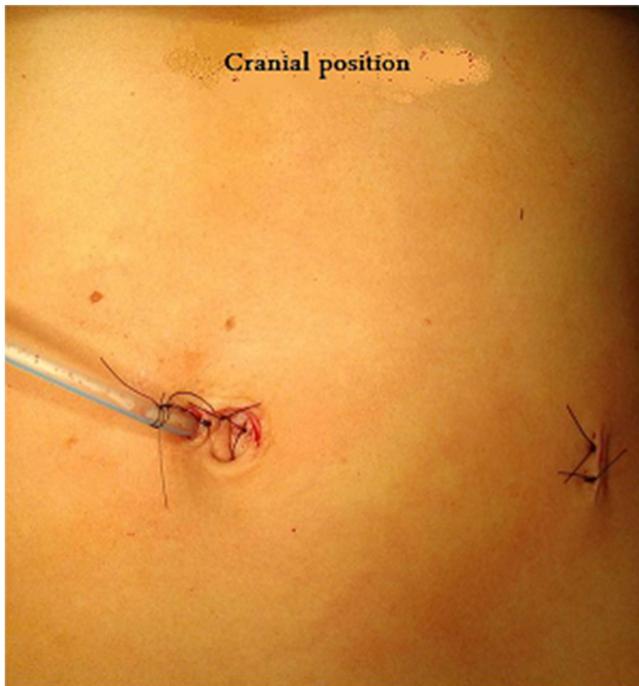


Fig. 2 – Postoperative appearance.

After visualization of Calot's triangle, a standard laparoscopic cholecystectomy procedure was performed using a standard laparoscopic set (Rudolf and Stryker Storz). All the anatomical structures were closed with titanium clips, leaving two clips on the stumps of gallbladder vessels and the gallbladder duct. Gallbladder removal was performed by using an electrocoagulation hook from the neck to the fundus. Accurate hemostasis control was performed with traction provided by the gallbladder still attached to the liver before its final liberation, followed by rinsing of the operated area. As a standard procedure, a Redon 10 mm drain was introduced through the umbilical incision. The gallbladder was removed via the umbilicus in a protective latex sac, which was prepared by ligating a sterile surgical glove. Fascia was closed by a 2/0 Polysorb running suture. The skin closure was performed by a 4/0 single or interrupted suture (Fig. 3). If the procedure lasted



Fig. 3 – Preparation of gall bladder from the lodge – transintegumental fixation.

for more than 60 minutes, one dose of i.v. antibiotic was administered. Standard postoperative pain control was managed by 0.1 g of ketoprofen i.v. ad lib.

4. Results

Results were assessed by a questionnaire designed by the authors (Tables 1–3). The questionnaire was given to patients during the control doctor's visit between 7 and 20 days after leaving hospital.

1. Postoperative course was uneventful. There were no early or late complications reported, including infections of the postoperative wound, hernia or postoperative wound dehiscence.
2. Postoperative pain in the first 24 hours postoperatively was regarded by patients as intense, but after drain removal from the navel, pain threshold was moderate.
3. Cosmetic effect was described as excellent by all patients.
4. Aesthetic result was regarded as 'good' by both patients and surgeons and was superior to that achieved by means of "classic" laparoscopic cholecystectomy.
5. A standard set of laparoscopic instruments was sufficient to perform the modified operation.
6. The cost of the operation was equal to standard laparoscopy.
7. The duration of the operation was similar to standard laparoscopic cholecystectomy in our ward, and was performed by the same surgeon.

5. Discussion

Laparoscopic cholecystectomy has become the gold standard in patients presenting cholecystitis symptoms. Currently, efforts are being made to reduce the number of skin incisions in effort to obtain a better cosmetic effect and to reduce the frequency of complications.

Operating laparoscopically, using single-access is not a new concept.^{5,15,16} It was introduced 15 years ago and attempts have recently been made to implement it into a wider field of laparoscopic surgery.^{16–18}

When a new operating method is being introduced, researchers should focus on its safety, feasibility, efficacy and clinical advantages.

Performing a laparoscopic operation by one-site access challenges the surgeon to adapt to new method of instrumentation.¹⁹ Due to vicinity of the operating instruments introduced by parallel ports and their vicinity to the fascia, normal ergonomic triangulation is missing, and therefore, SILS laparoscopy is technically demanding and establishes a new learning curve, making the duration of operation initially longer.²⁰

Chow et al.²¹ describe a single incision laparoscopic cholecystectomy, supported by two puppeteering gallbladder sutures, which provide appropriate gallbladder tension for preparation. The authors used one articulated instrument, introduced by umbilical incision, common for its trocar and a

Table 1 – Questionnaire designed by the authors.

No	Question	Answers
1.	Pain in the first 24 h after the surgery	(a) I have no pain (b) There is mild pain not needing medication (c) I have moderate pain – requires regular medication (codeine or nonnarcotic) (d) I have severe pain controlled only by narcotics (e) I have severe pain, not controlled by medication
2.	Pain during the first 7 days after the surgery	(a) I have no pain (b) There is mild pain not needing medication (c) I have moderate pain – requires regular medication (codeine or nonnarcotic) (d) I have severe pain controlled only by narcotics (e) I have severe pain, not controlled by medication
3.	Pain after 2–3 weeks after the surgery	(a) I have no pain (b) There is mild pain not needing medication (c) I have moderate pain – requires regular medication (codeine or nonnarcotic) (d) I have severe pain controlled only by narcotics (e) I have severe pain, not controlled by medication
4.	Appearance	(a) There is no change in my appearance (b) The change in my appearance is minor (c) My appearance bothers me but I remain active (d) I feel significantly disfigured and limit my activities due to my appearance (e) I cannot be with people due to my appearance
5.	Hernia	(a) It is formed hernia in postoperative scar (b) There is no hernia
6.	Overall quality of life	(a) Outstanding (b) Very good (c) Good (d) Fair (e) Poor (f) Very poor

30° camera. The cosmetic result was regarded as “very good”. However, the operation time was significantly longer than in standard cholecystectomy (average 127 minutes, range 60–276 minutes).

Erbella and Bunch²² describe a single incision laparoscopic cholecystectomy, supported by three suspending transabdominal sutures implemented in a community hospital, based on standard instrumentarium (including articulated dissectors). The operation time was short (22–75 minutes, mean 30 minutes), the patients were discharged home the same day, and their recovery time before returning to everyday activities, including work, was brief (2–7 days). No major complications were noted. However, one must note that authors operated on carefully selected patients, with no acute symptoms of cholecystitis or pancreatitis. Authors advise to perform such a procedure in patients with early disease, classic biliary colic or dyskinesia, a BMI less than 40 kg/m², and no previous abdominal operations.

Piskun and Rajpal¹⁶ describe a modification of standard cholecystectomy, utilizing no incisions outside the umbilicus. Authors employed two transumbilical trocars and two transabdominal gallbladder stay sutures. Piskun et al. regard the results of the operation as “very good” and underline such a modification may reduce postoperative wound complications. Other authors proved modifications of the SILS method

were safe and effective, as well as showing applicability in more complicated cases (i.e., after other abdominal operations, when intraabdominal adhesions are present). Łosin et al.¹¹ describe cases of children treated by SILS cholecystectomy (1 case) or its modifications (2 cases). In one of cases, three standard, low-profile trocars were introduced in parallel via the umbilicus, and in the last case, when a need for a third port outside the umbilicus occurred because of former abdominal surgery, they used a 3 mm instrument in the left epigastrium. Wróblewski et al.¹⁸ describe another modification of laparoscopic cholecystectomy for achieving a non-visible scar. They introduced two trocars via an umbilical incision, whereas the third port was introduced by means of an incision in the suprapubic median line within the pubic hair-bearing region. Kurpiewski et al.^{15,23} describe a modification of SILS technique, similar to that described by Piskun and Rajpal,¹⁶ consisting of introducing three trocars via a vertical umbilical incision, followed by two gallbladder suspension sutures. Thus, it was proven that it is possible to perform a reduced number of integument incisions without referring to special-istic instrumentarium, such as disposable single incision ports, which makes it more applicable in Polish economic realities.

The medical device manufacturers provide the surgeons with a great variety of different, advanced tools in order to

Table 2 – Answers of study group.

Patients	Questions																											
	1.					2.					3.					4.					5.		6.					
	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	a	b	c	d	e	f
1.			x			x					x					x						x	x					
2.			x			x					x					x						x	x					
3.			x			x					x					x						x	x					
4.			x			x					x					x						x	x					
5.				x			x				x					x						x	x					
6.		x				x					x						x					x			x			
7.		x				x					x					x						x	x					
8.		x				x					x					x						x	x					
9.		x				x					x					x						x	x					
10.					x						x					x						x	x					
11.		x				x					x					x						x	x					
12.		x				x					x					x						x	x					
13.		x				x					x					x						x	x					
14.		x				x					x					x						x	x					
15.		x				x					x					x						x	x					
16.		x				x					x					x						x	x					
17.		x				x					x					x						x	x					
18.		x				x					x					x						x	x					
19.		x				x					x					x						x	x					
20.		x				x					x					x						x	x					
21.		x				x					x					x						x	x					

make operations with single-incision access progressively more feasible.²⁴ Articulated instruments restore the triangulation in the operating field.⁴ On the other hand, this trend leads to increased operational costs.

When performing cholecystectomy, various conditions are to be expected. Due to long periods of ineffective, conservative treatment, connected with poor access to public healthcare, and delayed surgical intervention, the gallbladder wall may

Table 3 – Answers by control group.

Patients	Questions																											
	1.					2.					3.					4.					5.		6.					
	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	a	b	c	d	e	f
1.			x			x					x					x					x	x						
2.			x			x					x					x						x	x					
3.			x			x					x					x						x	x					
4.			x			x					x					x						x	x					
5.			x			x					x					x						x	x					
6.			x			x					x					x						x			x			
7.		x				x					x					x						x	x					
8.			x			x					x					x						x	x					
9.			x			x					x					x						x	x					
10.					x						x					x						x				x		
11.			x			x					x					x						x	x					
12.			x			x					x					x						x			x			
13.			x			x					x					x						x	x					
14.			x			x					x					x						x	x					
15.				x			x				x						x					x			x			
16.			x			x					x					x						x	x					
17.			x			x					x					x						x	x					
18.			x			x					x					x						x			x			
19.			x			x					x					x						x			x			
20.			x			x					x					x						x			x			
21.		x				x					x					x						x	x					
22.		x				x					x					x						x	x					
23.			x			x					x					x						x			x			
24.			x			x					x					x						x			x			
25.			x			x					x					x						x	x					

present with edematous, hyperemic or even partially gangrenous signs. SILS or the method described by the authors is technically demanding, and thus, is not appropriate for extremely advanced cases, especially at the beginning of the learning curve.

Considering disadvantages of the method, two major groups should be mentioned. Firstly, multiple trocars insertion at one site (umbilicus) results in elevated risk of umbilical hernia formation, when compared to "traditional" laparoscopy. Secondly, engaging SILS technique is connected with elevated costs, due to specific equipment needs (SILS port, articulated instruments).

The method described by the authors is not burdened with the second disadvantage, as the lateral placement of the third instrument provides good articulation and the procedure is performed by means of standard laparoscopy set.

Authors proposed a modification of standard laparoscopic cholecystectomy. Such a modification, or of similar methodology, was formerly described by other authors.^{11,15-18,21-26} Although some authors emphasize the need for at least two or even three sutures for appropriate Calot's triangle visualization,^{15,16,22,23} in our opinion, in most cases, one suspension suture is enough to obtain a clear operating field. The method is possible to be introduced virtually in every general surgery department practicing standard laparoscopic cholecystectomy, as it does not require any additional instruments or produce extra costs.

However, this procedure is recommended for those surgeons who are experienced in laparoscopic advanced procedures.¹⁹ The duration of the operation is slightly longer than in the traditional method, which is connected with technical difficulties and parallel introduction of one of the instruments and camera. The feasibility of instrumental manipulation increases when using oblique optics. Therefore, the described method is recommended in "simple", non-complicated cases.

One of the advantages of the method is the possibility of converting to standard laparoscopic cholecystectomy at any point of the operation. Aesthetic results are better than in "classic cholecystectomy," which, in the authors' mind, is connected with lack of visible scar tissue in midline. What is important, based on authors' experience, is that its implementation does not increase complications rate.

6. Conclusions

Based on the material presented by the authors, the following conclusions may be made:

1. Implementation of the described method does not elevate the costs and does not require any additional instruments.
2. The operation time is similar to standard laparoscopic cholecystectomy.
3. Aesthetic result is better than in standard laparoscopic cholecystectomy.
4. Described method implementation does not increase the risk of early or late complications.
5. Described method is a safe and efficient alternative for standard laparoscopic cholecystectomy and may be

introduced virtually in every surgery department operating by means of laparoscopic techniques.

Conflict of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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