

LAPAROSCOPIC THREE-TROCAR CHOLECYSTECTOMY AT BJELOVAR GENERAL HOSPITAL

Darko Koščak and Josip Lovrić

Department of Surgery, Bjelovar General Hospital, Bjelovar, Croatia

SUMMARY – A modified European technique of laparoscopic cholecystectomy with the use of three trocars, employed in 599 patients at Bjelovar General Hospital from July 1999 till July 2004, is described. The indications and patient selection for this operative method are the same as for laparoscopic cholecystectomy performed with four trocars. There is no modification in the preoperative procedure and treatment, anesthesia, patient's position and preparation for the operation either. The instrumentarium and equipment used on laparoscopic cholecystectomy were manufactured by Olympus. In 577 (96%) cases, the procedure was completed laparoscopically, whereas conversion to open procedure was required in 22 (4%) cases. A fourth trocar had to be placed in 20 (3.5%) of 577 (96%) successful three-trocar procedures of laparoscopic cholecystectomy. The procedure took about 45 min on an average. Considering complications, shoulder pain developed in 60, minor hematoma in 12, and nausea for more than 12 hours in 40 patients. There was no mortality. Bile leak from the gallbladder bed that spontaneously stopped within 72 hours and postoperative drain bleeding that resolved spontaneously requiring no blood transfusion were recorded in one patient each. The mean patient stay at hospital was 2.7 days. It is concluded that laparoscopic cholecystectomy with a reduced number of incisions, i.e. with three trocars, is as successful procedure of gallbladder removal without increasing the rate of complications. However, a fourth trocar should be placed or conversion to open procedure performed whenever indicated by the local finding.

Key words: *Cholecystectomy, laparoscopic – methods; Cholecystectomy, laparoscopic – instrumentation; Cholecystectomy, laparoscopic – complications; Cholelithiasis – surgery; Hospital Bjelovar; Croatia*

Introduction

Cholecystectomy, i.e. operative removal of the gallbladder, is the most common procedure in abdominal surgery today. Some 10% to 15% of the adult population, mostly overweight women, multiparae and elderly individuals, suffer from cholelithiasis. Cholecystectomy is the treatment of choice in the management of cholelithiasis. Until several years ago, cholecystectomy was exclusively done by an open procedure at Department of Surgery, Bjelovar General Hospital, whereas now it has been performed by the laparoscopic procedure in the majority of cases. Recently, the advantages of lapar-

oscopic cholecystectomy have been definitely confirmed, thus it has become the method of choice in the treatment of patients with symptomatic cholelithiasis in Croatia and worldwide^{1,2}. Laparoscopic cholecystectomy was introduced at our hospital as a routine procedure for the operative treatment of symptomatic cholelithiasis in 1995 because of the very good results obtained by this method in terms of rapid patient recovery, reduced hospital stay, and fast resuming all daily activities and work ability. Like in open procedure, gallbladder lithiasis causing major discomfort is the most common indication for laparoscopic cholecystectomy. In the past, there were many contraindications for laparoscopic cholecystectomy; nowadays, most procedures can be started laparoscopically and completed this way if allowed so by the finding. However, if the intraoperative finding does not ensure safe visualization and ex-

Correspondence to: *Darko Koščak, MD, MS*, Department of Surgery, Bjelovar General Hospital, Mihanovićeveva 8, HR-43000 Bjelovar, Croatia
E-mail: darko.koscak@bj.t-com.hr

posure of all structures, conversion to open procedure is done.

Initially, laparoscopic cholecystectomy was performed by use of four trocars. Since July 1999, the procedure has generally been done by use of three trocars. The fourth trocar was used for gallbladder clamping and visualization of Calot's triangle³, whereas some authors report on the introduction of the fourth trocar for intraoperative cholangiography⁴.

The aim of this report is to present the advantages and shortcomings of this operative method, and to compare them with retrospective analyses found in Croatian and international literature, thus to contribute to better understanding of the issue.

Patients and Methods

Data on 599 patients admitted to Department of Surgery, Bjelovar General Hospital between July 1999 and July 2004 for symptomatic cholelithiasis were analyzed. The patients underwent laparoscopic cholecystectomy with three trocars. The indications and patient selection for this type of operation are the same as those for the four-trocar procedure. There is no modification

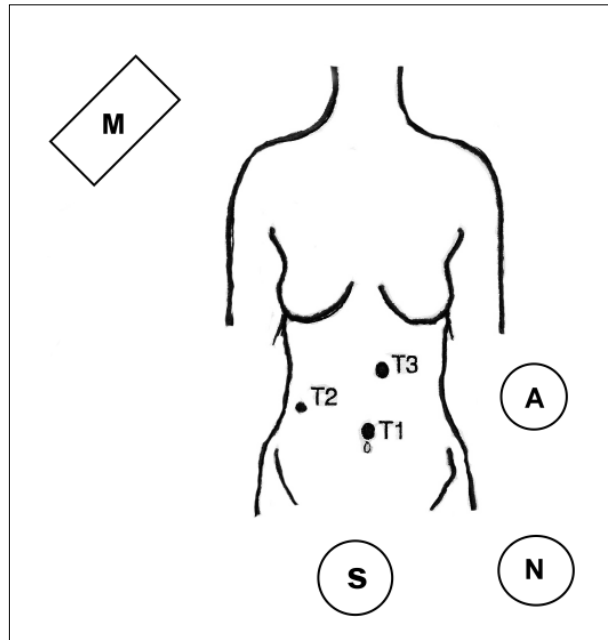


Fig. 1. Sites of trocar placement for three-trocar technique and position in operating theater: T1-T3, trocar sites; S, operating surgeon; A, assistant surgeon; N, scrub nurse; M, monitor and laparoscopic equipment.

in preoperative procedures, anesthesia, patient's position and preparation for operation either. The Olympus instrumentarium and equipment have been used on laparoscopic cholecystectomy procedures.

Patients were admitted to hospital on the day before the operation. Preoperatively, they received enema, and sedative and s.c. heparin in the evening before the operation. The procedure was performed in general anesthesia with endotracheal intubation, with complete muscular relaxation and ventilation monitoring. We have adopted the European or French type of surgery, where the patient lies on the operating table in supine position, with legs apart, resting on leg plate. On laparoscopic cholecystectomy we use a 0° laparoscope, which is introduced through the incision made on the upper edge of the umbilicus. The second 5-mm trocar is placed on the right, along the anterior axillary line, above the umbilicus, and the third 10-mm trocar in the middle between the umbilicus and xyphoid along the median clavicular line on the left (Fig. 1). If the structures in Calot's triangle could not be visualized within 20-30 minutes because of severe inflammatory lesions of the gallbladder or residual adhesions from previous abdominal procedures, conversion to open procedure was performed. When difficulties were encountered with the three-trocar technique, caused by large pending liver lobes precluding exposure of the gallbladder and Calot's triangle, large and solid adhesions, large gallbladder, bleeding from its bed, or ambiguous anatomic relations, we decided to place the fourth trocar subcostally on the right. Conversion to open procedure was done when neither the introduction of the fourth trocar and additional instruments warranted safe completion of the operation.

There were no differences in the postoperative care of patients operated on with three or four trocars. The patients received 1.5-2 L of infusion to start oral fluid intake as soon as nausea disappeared. Liquid diet was given on postoperative day 1, and biliary diet from postoperative day 2 on. Antibiotics were prescribed to patients operated on for gallbladder empyema or acute cholecystitis, or in case of intraoperative bile leak from the gallbladder. The majority of patients were discharged from the hospital in 2 to 3 days of the surgery.

Results

There were 599 patients, 482 (80%) female and 117 (30%) male (Fig. 2), age range 23-84 (mean 49.4) years.

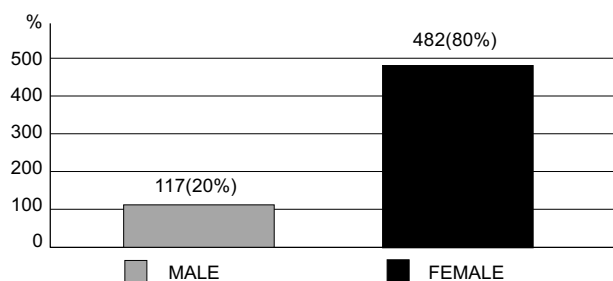


Fig. 2. Laparoscopic cholecystectomy patient sex distribution.

Single or multiple comorbidities were present in 29 of 599 patients: diabetes mellitus in 12, hypertension in ten, and treated myocardopathy in seven patients. Twelve (2%) patients had previously undergone abdominal surgery; ten of these patients had an oblique post-appendectomy incision in the right lower part of the abdomen, whereas two patients had lower median laparotomy after gynecologic surgery.

The procedure of cholecystectomy was performed laparoscopically in 577 (96%) patients, whereas conversion to open procedure was required in 22 (4%) patients (Fig. 3). In 18 (82%) of these 22 patients, the reason for conversion were numerous solid adhesions on the inflamed gallbladder with adjacent organs, where the introduction of the fourth trocar failed to ensure safe continuation of the procedure. In all these patients, the decision on conversion to open procedure was made within the first 30 minutes of the operation. In the remaining three patients, conversion was done due to technical problems with laparoscopy instrumentation that could not be resolved during the procedure. These included the loss of monitor image in one case, and laparoscope error in two cases. In one female patient, conversion was required for the finding of gallbladder carcinoma which, unfortunately, failed to be detected by pr-

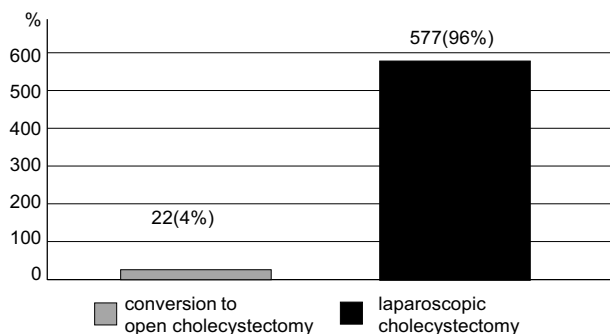


Fig. 3. Total number of laparoscopic cholecystectomies and conversion to open cholecystectomy

operative ultrasonography. Of 577 patients with successful laparoscopic cholecystectomy, the placement of the fourth trocar was necessary in 20 (3.5%) cases. The three-trocar procedure took about 45 minutes on an average.

The complications observed included shoulder pain in 60, minor hematoma in 12, and nausea persisting for more than 12 hours in 40 patients. There was no intraoperative hemorrhage or lesion to hepatocystic duct, abdominal organs or great retroperitoneal blood vessels. Postoperative hemorrhage was recorded in one case; however, it regressed spontaneously requiring no blood transfusion. Bile leak from the gallbladder bed, observed in one case, also resolved spontaneously within 72 hours. There was no death after laparoscopic cholecystectomy (Table 1). The postoperative use of analgesics was considerably reduced; most patients required two to three ampules of analgesics (methamizole, diclofenac) within the first 24 hours. The mean length of postoperative hospital stay was 2.7 days.

Table 1. Complications associated with laparoscopic cholecystectomy at Bjelovar General Hospital

Complication	Number of patients
Shoulder pain	60
Minor hematoma	12
Nausea > 12 h	40
Bile duct lesion	0
Bile leak	1
Intraoperative hemorrhage:	
– requiring blood transfusion	0
– requiring conversion	0
Postoperative hemorrhage:	
– requiring blood transfusion	0
– requiring laparotomy	0
– spontaneously resolved	1
Death	0

Discussion

The first laparoscopic cholecystectomy in Croatia was performed on May 14, 1992, at University Department of Surgery, Sveti Duh General Hospital in Zagreb, to be soon adopted by surgeons in smaller hospitals all over Croatia. Because of the very good results in terms of rapid patient recovery, short hospital stay and fast return to daily activities, laparoscopic cholecystectomy was introduced as a routine procedure for operative treat-

ment of symptomatic cholelithiasis at our hospital in July 1995. The major benefit for the patient is avoidance of the large operative incision that used to cause considerable discomfort to the patient and was frequently associated with the development of postoperative complications. Laparoscopic cholecystectomy is associated with reduced postoperative pain and need of analgesic, earlier mobilization and regular diet. The average hospital stay was 2-3 days *versus* 7-8 days with open procedure cholecystectomy. Sick-leave was reduced from 1-1.5 month to 10-15 days. In addition, the procedure is associated with an excellent cosmetic outcome, leaving three to four scars that virtually disappear within a short period of time. Laparoscopic procedure is associated with facilitated breathing and expectoration, earlier and easier mobilization, and a negligible rate of wound infection and postoperative herniation⁵⁻¹⁰.

Lawinski in 1991 and Slim in 1995 described the technique of laparoscopic cholecystectomy with three trocars by the American operative method. In Croatia, Čala was the first to employ and describe three-trocar laparoscopic cholecystectomy by the modified European or French operative method in 1994^{2,11,12}. At our hospital, three-trocar laparoscopic cholecystectomy has been used since July 1999. It should be noted that patients operated on by this technique do not complain of pain under the right costal arch nor experience costochondritis that may develop in patients with a trocar placed close or causing damage to the costal arch¹³⁻¹⁷. In the literature, such complaints have been reported in 7% to up to 37% of cases¹¹. In our patient cohort, 60 patients complained of postoperative shoulder pain and 40 patients of nausea persisting beyond 12 hours.

The use of analgesics is lower in laparoscopic cholecystectomy with three trocars, thus reducing the cost of treatment¹⁸. In our patients, the use of analgesics was considerably reduced after three-trocar laparoscopic cholecystectomy in comparison with four-trocar procedure, the majority of patients requiring 2-3 ampules of analgesic (methamizole, diclofenac). A minor hematoma may occur at the site of trocar insertion, usually around the umbilicus, which resolves in several days¹⁹⁻²². In our patients, hematoma occurred in 12 cases and spontaneously resolved in several days, requiring no additional treatment nor causing major discomfort to patients. The reduction from four to three abdominal wall incisions is associated with a reduced risk of complications potentially associated with subcostal insertion through the wall on the right, including costochondritis,

hematoma, wound infection and postoperative hernia. Literature data report on bile leak from the gallbladder bed in 1%-2% of patients, mostly requiring no additional treatment if abdominal drain has been placed. Bile leak resolves in several days. In our patient cohort, bile leak was recorded in one patient and resolved spontaneously within 72 hours. In case of common biliary duct lesion surgical intervention is required; the lesion should preferably be intraoperatively detected and treated. Various authors report on great biliary duct lesions in 0.15% to 0.80% of cases^{16,23-27}.

Intraoperative hemorrhage is the most common cause of conversion to open procedure. It may occasionally be impossible to stop bleeding by endoscopic technique, and conversion to open procedure remains the only way to do it²³. In our cohort, there was only one case of postoperative bleeding that spontaneously resolved and did not require blood transfusion.

Nowadays, patients more readily decide to undergo this operation because of the better cosmetic outcome of laparoscopic cholecystectomy, which has resulted in a decreased number of patients presenting with advanced chronic cholecystitis or its complications. The rate of conversion is now 2%-4%, and most surgeons agree that it is better to do one more than one less conversion. Conversion is definitely required if cystic duct cannot be clearly visualized within 30 minutes; some authors have reduced this time window to 15 minutes. In our patients, the time of operation was 45 minutes on an average (range 25-90 minutes). The cost of operation is reduced by the three-trocar technique, and patients return to work earlier^{3,19,28-30}. In our patients, the mean hospital stay was 2.7 days.

Recently, the new techniques of laparoscopic cholecystectomy have enabled the operation to be performed with a reduced number of trocars, from three to two, in order to additionally decrease surgical invasiveness and time to recovery³¹.

Conclusion

Laparoscopic cholecystectomy is currently the gold standard in the treatment of cholelithiasis. Using the procedure with a reduced number of incisions, i.e. with three trocars, the operative goal of gallbladder removal is successfully achieved without increase in the rate of complications. The time of operation and length of hospital stay are not increased but reduced. The postoperative use of analgesics is also reduced, thus further con-

tributing to cost reduction, along with one trocar and one instrument less required. The time of sick-leave and total cost of treatment are reduced, while the cosmetic outcome is improved.

However, the fourth trocar should be introduced or conversion to open procedure performed whenever dictated by the local finding.

References

- PERKO Z, MIMICA Z, ČALA Z, VELNIĆ D, DRUŽIJANČIĆ N. Less invasive laparoscopic cholecystectomy: initial experience and literature review. *Lijec Vjesn* 2001;123:313-6.
- POLITO DS, FLORIO G, CISTERINO S, PINNA GF, NAZZARO A, FAVA A. Three-trocar video laparoscopic cholecystectomy: a retrospective study. *Chir Ital* 2002;54:55-7.
- TRICHAK S. Three-port *vs* standard four-port laparoscopic cholecystectomy. *Surg Endosc* 2003;17:1434-6.
- CARAVATI F, CERIANI F, MORONI M. Laparoscopic cholecystectomy with three trocars: 10-year experience. *Chir Ital* 2004;56:81-8.
- SLIM K, PEZET D, STENCL D, et al. Laparoscopic cholecystectomy: an original three trocar technique. *World J Surg* 1995; 19:394-7.
- BORČIĆ V. Žučni sustav. In: BRADIĆ I, SUTLIĆ Ž, ŠOŠA T, eds. *Kirurgija*. Zagreb: Medicinska naklada, 1995:551-74.
- ČALA Z. Laparoscopska kolecistektomija. Minimalno invazivna kirurgija. Johnson & Johnson Company. Ethicon Endo-Surgery 1993;1:4-9.
- MAJEROVIĆ M. Laparoscopska kolecistektomija. Zagreb: Zagreb University School of Medicine, Postgraduate Course Handbook, 1993;1-59.
- WELTY G, SCHIPPERS E, GRABLOWITZ V, LAWONG AG, TITTELA A. Is laparoscopic cholecystectomy a mature operative technique? *Surg Endosc* 2002;16:820-7.
- KANG KJ, LIM TJ. Tip for microlaparoscopic cholecystectomy: easy removal of the gallbladder after laparoscopic cholecystectomy using the three-port technique. *Surg Laparosc Endosc Percutan Tech* 2003;13:118-20.
- ČALA Z. Laparoscopic cholecystectomy using three trocars. *Croat J Gastroenterol Hepatol* 1994;3:41.
- PERKO Z, ČALA Z, CVITANOVIĆ B, VELINIĆ D, RAŠIĆ Ž, PAVIĆ P, VUKUŠIĆ D. Optički troakar i ultrazvučni pregled trbušne stijenke u pripremi za laparoscopsku operaciju. *Lijec Vjesn* 1955;117 (Suppl 3):30.
- BERNARD HR, HARTMANN TW. Complications after laparoscopic cholecystectomy. *Am J Surg* 1993;165:533-5.
- ADAMS DB, BOROWICZ MR, WOOTTON DR, et al. Bile duct complications after laparoscopic cholecystectomy. *Surg Endosc* 1993;7:79-83.
- COX MR, GUNN IF, EASTMAN MC, HUNT RF. Open cholecystectomy: a control group for comparison with laparoscopic cholecystectomy. *Aust N Z J Surg* 1992;62:795-801.
- NENNER RP, IMPERATO PJ, ALCORN CM. Serious complications of laparoscopic cholecystectomy in New York State. *N Y State J Med* 1992;92:179-81.
- LOMANTO D, De ANGELIS L, CECI V, DALSSASSO G, SO J. Two-trocar laparoscopic cholecystectomy: a reproducible technique. *Surg Laparosc Endosc Percutan Tech* 2001;11:248-51.
- ČALA Z, PERKO Z, VELNIĆ D. Comparison of the results of laparoscopic cholecystectomy performed in the usual way and with a lesser number of trocars. *Lijec Vjesn* 2000;122:1-5.
- STRINGA, BERBER E, FOROUTANI A, MACHO JR, PEARL JM, SIPERSTEIN AE. Use of the optical access trocar for safe and rapid entry in various laparoscopic procedures. *Surg Endosc* 2001;15:570-3.
- ENDO S, SOUDA S, NEZU R, YOSHIKAWA Y, HASHIMOTO J, MORI T, UCHIKOSHI F. A new method of laparoscopic cholecystectomy using three trocars combined with suture retraction of gallbladder. *J Laparoendosc Adv Surg Tech A* 2001;11:85-7.
- CHAHIN F, DWIVEDI A, CHAHIN C, AGRAWAL S, ALNAJJAR S, SILVA YJ. The laparoscopic challenge of cholecystitis. *JLS* 2002;6:155-8.
- BOSCH F, WEHRMAN U, SAEGER HD, KIRCH W. Laparoscopic or open conventional cholecystectomy: clinical and economic considerations. *Eur J Surg* 2002;168:270-7.
- McGUINNESS C, CHOYA, GAJRAJ H. An unusual complication of laparoscopic cholecystectomy. *Ann R Coll Surg Engl* 1992; 74:441.
- FRAZEE RC, ROBERTS JW, SYMONDS R, et al. What are the contraindications for laparoscopic cholecystectomy? *Am J Surg* 1992;164:491-4.
- KAGAYA T. Laparoscopic cholecystectomy *via* two ports, using the Twin-Port system. *Hepatobil Pancreat Surg* 2001;8:76-80.
- JAN YY, CHEN HM, WANG CS, CHEN MF. Biliary complications during and after laparoscopic cholecystectomy. *Hepatogastroenterology* 1997;44:370-5.
- SLIM K, PEZET D, CHIPPONI J. Three-trocar laparoscopic cholecystectomy. *Laparoendosc Surg* 1996;6:135-6.
- PEZZULLO LS, D'ITRA E, CAPPABIANCA A, PEZZULLO MG. Acute cholecystitis: emergency treatment, videolaparoscopic technique and indications for conversion. *Chir Ital* 2003; 55:61-4.
- BARCZYNSKI M, HERMAN RM. A prospective randomized trial on comparison of low-pressure (LP) and standard-pressure (SP) pneumoperitoneum for laparoscopic cholecystectomy. *Surg Endosc* 2003;17:533-8.
- SAFRANEK J, SEBOR J Jr, GEIGER J. Conversion of laparoscopic cholecystectomy. *Rozhl Chir* 2002;81:236-9.
- MORI T, IKEDA Y, OKAMOTO K, SAKATA K, IDEGUCHI K, NAKAGAWA K, YASUMITSU T. A new technique for two-trocar laparoscopic cholecystectomy. *Surg Endosc* 2002;16:589-91.

Sažetak

LAPAROSKOPSKA KOLECISTEKTOMIJA POMOĆU TRI TROKARA U OPĆOJ BOLNICI BJELOVAR

D. Koščak i J. Lovrić

Prikazuje se modificiran europski način izvođenja laparoskopske kolecistektomije pomoću tri trokara, koji je u razdoblju od srpnja 1999. do srpnja 2004. godine u Općoj bolnici u Bjelovaru primijenjen kod 599 bolesnika. Indikacije za ovaj način operiranja jednake su kao i za dosadašnji način s četiri trokara, a razlike nema niti u odabiru bolesnika. Prijeoperacijska priprema i obrada, anestezija, položaj bolesnika i priprema bolesnika za operaciju se ne razlikuju. Upotrebljavao se je instrumentarij i oprema za laparoskopsku kolecistektomiju tvrtke Olympus. U 577 (96%) slučajeva zahvat je izvršen laparoskopski, a u 22 (4%) slučaja učinjena je konverzija u otvoreni postupak. Od 577 (96%) uspješno izvedenih kolecistektomija laparoskopskim putem s tri trokara kod 20 (3,5%) slučajeva bilo je potrebno postaviti i četvrti trokar. Operacijski zahvati u prosjeku su trajali oko 45 minuta. Od komplikacija je bol u ramenu nastupila kod 60, manji krvni podljev u 12, te mučnina duže od 12 sati kod 40 bolesnika. Nije zabilježen niti jedan smrtni slučaj. U jednog bolesnika došlo je do curenja žuči iz ležišta žučnjaka, što je spontano prestalo kroz 72 sata. Poslijeoperacijsko krvarenje na dren nastupilo je kod jednog bolesnika, što je spontano prestalo i nije zahtijevalo transfuziju krvi. Bolesnici su boravili u bolnici prosječno 2,7 dana. Izvođenjem laparoskopske kolecistektomije s manjim brojem incizija, a to znači kroz tri trokara, uspješno se postiže isti cilj, tj. odstranjenje žučnog mjehura, ali bez porasta broja komplikacija. Kadgod to nalaže lokalni nalaz, treba postaviti četvrti trokar ili učiniti konverziju u otvoreni postupak.

Ključne riječi: Kolecistektomija, laparoskopska – metode; Kolecistektomija, laparoskopska – instrumentarij; Kolecistektomija, laparoskopska – komplikacije; Kolecistektomija – kirurgija; Bolnica Bjelovar; Hrvatska