



## Original research

## Laparoscopic single site (LESS) and classic video-laparoscopic cholecystectomy in the elderly: A single centre experience



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## ABSTRACT

Laparoscopic cholecystectomy (LC) is the gold-standard surgical method used to treat gallbladder diseases. Recently Laparoendoscopic single site surgery (LESS) has gained greater interest and diffusion for the surgical treatment of several pathologies. In elderly patients, just few randomized controlled trials are present in the literature that confirm the clinical advantages of LESS compared with the classic laparoscopic procedures. We present in this paper the preliminary results of this randomized prospective study regarding the feasibility and safety of LESS cholecystectomy versus classic laparoscopic technique. We demonstrated that LESS technique compared with traditional technique show some advantages like: acceptable operative times, lower post-operative discomfort and sometimes reduction added complications. In addition we also demonstrate that fewer incisions and less scarring which mean less pain, and fewer parietal complications are related to this surgical procedure. In conclusion in the elderly LESS cholecystectomy technique is to be considered a suitable alternative to traditional three-port cholecystectomy.

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## 1. Introduction

Nowadays, the gold standard surgical procedure for cholecystectomy is the laparoscopic approach. This technique is different from the open approach for the better cosmetic results, less post-operative pain and quicker gain of a good health state [1].

A new challenge for surgeons in the 90's and in 2000's was the possibility of reaching a reduction of the number and size of the ports, better cosmetic results, less scars, less post-operative pain. So the laparo-endoscopic single site surgery (LESS) was proposed, and it gained greater interest and diffusion. In LESS it is possible to perform a "scar-less surgery". All instruments are positioned in only one multiport trocar through the umbilicus; in this way the scar is hidden [2–4]. LESS procedures are indicated for biliary

tract, bariatric and colonic surgery [5,6].

However, even more patients are elderly (over 70ys) so we want to demonstrate the feasibility of LESS technique also in this kind of patients. We show results of this randomized prospective study about the opportunity to perform LESS cholecystectomy versus classic laparoscopic technique in the elderly patients.

## 2. Materials and methods

## 2.1. Study design

This retrospective study is based on the data of our personal experience. We collected data from April 2011 to April 2015 at our tertiary care center. 75 patients were enrolled. In group A (n = 35) three-port classic laparoscopic cholecystectomy was performed, whereas patients in group B (n = 40) underwent LESS cholecystectomy. Exclusion criteria were: (1) age < 70 years (2) signs of acute cholecystitis or choledocholithiasis or acute pancreatitis, (3) ASA grade III or more, (4) lack of written consent, (5) BMI > 30 kg/m<sup>2</sup> and (6) previous abdominal surgery. The same surgeon performed all the procedures.

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## 2.2. Operative technique

All procedures were performed as elsewhere described [7–9].

All patients underwent under general anaesthetics and oro-tracheal intubation. Antibiotic therapy was performed 1 h before surgery (ceftriaxone 2 g i.v.). We prepare the operation room in same way as classic laparoscopic cholecystectomy. If necessary naso-gastric tube was placed and it is removed just after the end of operation. Post-operative pain was registered at 6, 12, and 24 h. A visual analogue scale (VAS) with a horizontal score ranging from “no pain” (score 0) to “worst possible pain” (score 10) was used. Wound satisfaction score (very unsatisfied = 1, unsatisfied = 2, acceptable = 3, satisfied = 4, very satisfied = 5) was registered for each patient on the fifth postoperative day.

## 2.3. Classic laparoscopic cholecystectomy

All patients were placed in reverse Trendelenburg position. Using Hasson technique, Pneumoperitoneum (12 mmHg) was created with a 12-mm umbilical trocar. In this trocar a 10-mm 30° videolaparoscope (Olympus, Southend-on-Sea, Essex, UK) was inserted. We place two trocars, a 12-mm trocar in left flank and a 5-mm trocar in right flank (French technique). An electric hook cautery was used to obtain gallbladder dissection.

## 2.4. LESS technique

Recently, a laparoscopic multichannel access that allows multiple instruments to pass through one incision at the same time was developed (TriPort Laparoscopic Access Device (Olympus)). Using this access we can obtain a good pneumoperitoneum despite we use all the instruments in the same trocar [10–12]. We perform a 1.5–2 cm skin incision through the umbilicus to place the trocar and after fascia identification; we place the trocar in the same way as open technique. Thanks to a self-expandable diaphragm on its end, the port itself comes inside a cylindrical plastic sheet. This diaphragm is inserted inside a blunt and flat 12-mm trocar, and once advanced through the fascia, is delivered into the abdominal cavity to expand and self-seal.

Three gel entrances are present in the port: one of 12-mm and two of 5-mm, together with one entry for the gas [13–19].

Our technique provides an electric hook cautery (33 cm) in the right hand and an endograsper for bariatric surgery (45 cm) in the left hand to avoid conflict between hand using the same port. A 0° endoscopic camera with flexible head (ENDO-EYE; Olympus) was used. Pain-control was reached using two intravenous infusion of paracetamol 1000 mg in the operating room and 6 h after surgery. Patients drink 8 h after surgery and CBG was determined. Patients had their first light meal 12 h later. Patients were discharged after the restart of intestinal peristalsis.

## 2.5. Statistics

Data were handled, stored, and analysed using the SPSS package. The *t*-test for unpaired data and the chi-square test were used when appropriate. Significance was accepted with 95% probability. Data are reported as mean ± SD.

## 3. Results

The baseline characteristics of patients are shown in Table 1. No statistically significant differences between group A and group B were found (see Table 1).

In two patients (one in group A and one in group B) a 5-mm trocar is added for the presence of hypertrophy of left hepatic

**Table 1**  
Patient characteristics.

	Group A (n = 35)	Group B (n = 40)	P value
Male/female ratio <sup>a</sup>	10:25	18:22	ns
Age (years) <sup>b</sup>	72 ± 0.5	73 ± 1	ns
BMI (Kg/m <sup>2</sup> ) <sup>b</sup>	27 ± 1.7	27 ± 0.8	ns
Comorbidities (number of) <sup>b</sup>	3 ± 0.8	2 ± 1	ns
ASA status (I:II) <sup>a</sup>	18:17	21:19	ns

<sup>a</sup>  $\chi^2$  test.

<sup>b</sup> Student's *t*-test.

lobe; in other five patients (three in group A and two in group B) to control bleeding and to place a closed sub hepatic drain. In LESS procedures mean operative time (see Table 2) was longer than classic LC ( $P < 0.04$ ). Respect to our previous report [7], we note an improve in our experience and in instruments use in both group. Pain score (Table 3) analysis showed no statistically significant differences regarding abdominal pain while wound satisfaction score (Table 3) showed statistically significant differences between the two groups. In LESS group, because of the presence of a smaller umbilical medication, patients are more satisfied.

## 4. Discussion

In this retrospective study, we showed that there are no differences between classic laparoscopic cholecystectomy and LESS cholecystectomy in regard of postoperative pain and in-hospital stay in elderly. Of note, a better wound of satisfaction in LESS patients is found. In our experience the most relevant pain in laparoscopic surgery is linked to the umbilical trocar, so in young people there are not important differences in the two techniques, but in the elderly, where the pain is less tolerable the possibility to reduce the scar allows to reduce the pain and to reach a reduction of hospital stay. Elderly patients and their families demonstrated great benefits from an earlier return to home.

Recently, Moug et al. showed that older people are not significantly differently compared to younger people [20]. In a this systematic review, the authors suggest that age itself should not be a factor when considering the best surgical option for older patients.

LESS cholecystectomy might be safely performed in carefully selected elderly patients

which are older than 70 years. LESS technique allows a reduction of pain; a considerable impact on wound satisfaction of the patients and of his family and a reduction in terms of hospital stay, because of the pain is very well managed in the first 12 h.

In the elderly, only surgeons who are already expert in Laparoscopic surgery and LESS surgery can perform LESS technique. The length of the procedure might be crucial for the better results in elderly patients. Moreover a very long operation or the occurrence of complications might be dangerous especially in the “old-old” So for “beginners” this procedure can be very difficult owing to the reduced angle of movement.

We want also underline that LESS is feasible with the same instruments as traditional laparoscopic surgery. Moreover principles

**Table 2**  
Surgical data.

	Group A (n = 35)	Group B (n = 40)	P value
Surgery time	37.5 ± 11.0	40.5 ± 8.0	.04
Blood loss	ns	ns	
Conversion	0	0	ns
Adverse events	1	1	ns
Wound infections			

**Table 3**  
Postoperative Outcomes.

	Group A (n = 35)	Group B (n = 40)	P value
<b>Abdominal post-operative time (VAS scala)</b>			
6 h	3.7 ± 0.8	3.8 ± 1.2	ns
12 h	4.1 ± 0.9	4.3 ± 1.9	ns
24 h	2.7 ± 1	2.5 ± 2	ns
Wound satisfaction score	3.6 ± 0.7	4.7 ± 0.9	0.03
Hospital stay (days)	1.3 ± 0.5	1.2 ± 0.7	ns

suggested for conventional laparoscopic cholecystectomy are the same for this technique [20,21]. In the elderly we have to perform LESS in selected and compliant patients, for example following also patient demand, and, therefore, to laparoscopic surgeons is asked to become proficient with this kind of procedures, according the guidelines and the consensus in geriatric surgery [22–25].

Study limitations: (1) small number of patients enrolled, in a monocenter study; (2) we used data only of ideal patients (no previous abdominal surgery, BMI < 30 kg/m<sup>2</sup>, uncomplicated disease).

## 5. Conclusions

In conclusion, LESS technique compared with traditional technique allows acceptable operative times, lower post-operative discomfort, and in selected cases without added complications. Advantages can be summarized into fewer incisions and less scarring, which mean less pain and fewer parietal complications [19].

In the elderly LESS cholecystectomy technique is a considerable alternative to traditional three-port cholecystectomy, in carefully select patients with uncomplicated disease, and no previous abdominal surgery.

## Ethical approval

Ethical approval was requested and obtained from the “Azienda Ospedaliera Federico II” ethical committee.

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## Author contribution

**GA:** Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

**AR:** Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

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## Conflicts of interest

All Authors have no conflict of interests.

## References

- [1] E.C. Tsimoyiannis, K.E. Tsimogiannis, G. Pappas-Gogos, et al., Different pain scores in single transumbilical incision laparoscopic cholecystectomy versus classic laparoscopic cholecystectomy: a randomized controlled trial, *Surg. Endosc.* 24 (2010) 1842.
- [2] C.K. Huang, J.C. Tsai, C.H. Lo, et al., Preliminary surgical results of single-incision transumbilical laparoscopic barbaric surgery, *Obes. Surg.* (2010 Jan 30).
- [3] L. Boni, G. Dionigi, E. Cassinotti, et al., Single incision laparoscopic right colectomy, *Surg. Endosc.* 24 (2010) 3233.
- [4] T.E. Langwieler, T. Nimmesgern, M. Back, Single-port access in laparoscopic cholecystectomy, *Surg. Endosc.* 23 (2009) 1138.
- [5] M.G. Neto, A. Ramos, J. Campos, Single port laparoscopic access surgery, *Tech. Gastrointest. Endosc.* 11 (2009) 84.
- [6] S. Dutta, Early experience with single incision laparoscopic surgery: eliminating the scar from abdominal operations, *J. Pediatr. Surg.* 44 (2009) 1741.
- [7] G. Aprea, E. Coppola Bottazzi, F. Guida, S. Masone, G. Persico, Laparoendoscopic single site (LESS) versus classic video-laparoscopic cholecystectomy: a randomized prospective study, *J. Surg. Res.* 166 (2) (2011 Apr) e109–112.
- [8] A. Rocca, F. Calise, G. Marino, S. Montagnani, M. Cinelli, B. Amato, G. Guerra, Primary giant hepatic neuroendocrine carcinoma: a case report, *Int. J. Surg.* 12 (Suppl 1) (2014) S218–S221.
- [9] D. Loffredo, A. Marvaso, S. Ceraso, N. Cinelli, A. Rocca, M. Vitale, M. Rossi, E. Genovese, B. Amato, M. Cinelli, Minimal invasive surgery in treatment of liver metastases from colorectal carcinomas: case studies and survival rates, *BMC Surg.* 13 (Suppl 2) (2013) S45.
- [10] M.E. Hagen, O.J. Wagner, K. Thompson, et al., Supra-pubic single incision cholecystectomy, *J. Gastrointest. Surg.* 14 (2010) 404.
- [11] A. Chow, S. Purkayastha, O. Aziz, et al., Single-incision laparoscopic surgery for cholecystectomy: an evolving technique, *Surg. Endosc.* 24 (2010) 709.
- [12] R. Tacchino, F. Greco, D. Matera, Single-incision laparoscopic cholecystectomy: surgery without a visible scar, *Surg. Endosc.* 23 (2009) 896.
- [13] H. Rivas, E. Varela, D. Scott, Single-incision laparoscopic cholecystectomy: initial evaluation of a large series of patients, *Surg. Endosc.* 24 (2010) 1403.
- [14] Y. Hirano, T. Watanabe, T. Uchida, et al., Single-incision laparoscopic cholecystectomy: single institution experience and literature review, *World J. Gastroenterol.* 16 (2010) 270.
- [15] J.R. Romanelli, T.B. Roshek III, D.C. Lynn, et al., Single-port laparoscopic cholecystectomy: initial experience, *Surg. Endosc.* 24 (2010) 1374.
- [16] F. Brody, K. Vaziri, J. Kasza, et al., Single incision laparoscopic cholecystectomy, *J. Am. Coll. Surg.* 210 (2010) e9.
- [17] A.M. Merchant, M.W. Cook, B.C. White, et al., Transumbilical Gelpport access technique for performing single incision laparoscopic surgery (LESS), *J. Gastrointest. Surg.* 13 (2009) 159.
- [18] T.H. Hong, Y.K. You, K.H. Lee, Transumbilical single-port laparoscopic cholecystectomy: scarless cholecystectomy, *Surg. Endosc.* 23 (2009) 1393.
- [19] J. Erbella Jr., G.M. Bunch, Single-incision laparoscopic cholecystectomy: the first 100 outpatients, *Surg. Endosc.* 24 (2010) 1958.
- [20] S.J. Moug, K. McCarthy, J. Coode-Bate, M.J. Stechman, J. Hewitt, Laparoscopic versus open surgery for colorectal cancer in the older person: a systematic review, *Ann. Med. Surg. (Lond)* 4 (3) (2015 Aug 12) 311–318.
- [21] R. Bittner, Laparoscopic surgery: 15 years after clinical introduction, *World J. Surg.* 30 (2006) 1190–1195.
- [22] B. Amato, M. Donisi, C. Rispoli, N. Rocco, L. Iannone, S. Testa, R. Compagna, G. Vigliotti, V. Salvati, M. Gentile, L. Sivero, Enhanced recovery after surgery (ERAS) program in the elderly: is it feasible? *Chir. (Turin)* 26 (4) (2013) 307–308.
- [23] C. Rispoli, N. Rocco, L. Iannone, B. Amato, Developing guidelines in geriatric surgery: role of the grade system, *BMC Geriatr.* 9 (SUPPL.1) (2009) A99.
- [24] B. Amato, L. Sivero, G. Vigliotti, et al., Surgery for cancer in the elderly: state of the art, *Chir. (Turin)* 26 (4) (2013) 313–315.
- [25] M. Vacante, V. D'Agata, M. Motta, G. Malaguarnera, A. Biondi, F. Basile, M. Malaguarnera, C. Gagliano, F. Drago, S. Salamone, Centenarians and supercentenarians: a black swan. Emerging social, medical and surgical problems, *BMC Surg.* 12 (Suppl 1) (2012) S36, <http://dx.doi.org/10.1186/1471-2482-12-S1-S36>.