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# FEASIBILITY OF SINGLE INCISION LAPAROSCOPIC SURGERY WITH DOUBLE PORT; EXPERIENCE OF 101 CASES

**Ilhan Ece*, Huseyin Yilmaz, Serdar Yormaz, Mustafa Sahin**

Department of Surgery, Selcuk University, Faculty of Medicine, Konya, Turkey.

Corresponding Author:- **Ilhan Ece**
**E-mail:** ilhanece@yahoo.com

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**ABSTRACT**

This clinical trial was aimed to present the laparoscopic interventions that were performed for various intra-abdominal organs using two ports through a single incision. The present study consisted of 101 patients who underwent single incision surgery. All of the operations were performed using two ports through a single umbilical incision and suspension-traction suture technique. Cholecystectomies were performed similar to the standard technique and the gallbladder was removed through the umbilicus. Splenectomy was performed on three patients with the assistance of a vascular sealing device. Similarly, appendectomy was performed on 16 patients diagnosed with acute appendicitis. The operative time was 56.4±28.6 minutes, and the blood loss was negligible. The mean age of the patients was 44.4±12.1 years. None of patients required a conventional laparoscopy. Most patients were discharged on the first operative day on oral diet. A bile leakage and a wound infection were noted at short time follow-up. The surgical wound healed in all patients with an inconspicuous scar. The main follow-up time was 16 months, and no hernias developed. In this study, the operation duration and the complication rates were similar to standard laparoscopy, whereas more satisfactory outcomes were obtained with respect to esthetics and achieved a significant cost advantage with a least risk of incisional hernia.

## INTRODUCTION

In 1987, Phillipe Mouret was performed the first laparoscopic cholecystectomy using video technology, marking the beginnings of the minimally invasive revolution in General Surgery. Laparoscopic cholecystectomy is currently the standard treatment of symptomatic cholelithiasis. Generally, it is associated with excellent visualization, decreased blood loss, less postoperative pain, earlier convalescence, and superior cosmesis. After acceptance of cholecystectomy as the gold standard for laparoscopic surgery, it has rapidly improved and is widely used for other intra-abdominal organ surgeries [1]. Since laparoscopy has been used, continuous efforts have been made to lower the number of ports in order to reduce the trauma and the associated scars [2-5].

In order to reduce the trauma occurred due to laparoscopic surgery, natural orifice transluminal endoscopic surgery (NOTES) was first proposed in animal models, and has been performed on humans [6,7]. However, NOTES was not generally accepted due to technical difficulties. Unlike NOTES, single incision laparoscopic surgery (SILS) can be applied using standard medical instruments and has a shorter training period. The use of SILS port facilitates surgery but also increases the risk of incisional hernia [8].

We were used a suspension-traction suture technique for performing laparoscopic surgeries more easily with a single incision and two ports. The aim of this study was to examine the feasibility and intraoperative safety of this technique, which is eliminates the single port costs, and minimizes the risk of incisional hernia related to placement of single port through the umblicus.

## MATERIALS AND METHODS

In this retrospective study, 101 two-port laparoscopic surgery through a single incision was performed in the Surgery Clinic of a university hospital. All patients were informed of the method and the possibility of conversion to conventional multi-port laparoscopy or open surgery. Cholecystectomy, appendectomy, splenectomy, and partial cystectomy were performed on 81, 16, 3 and 1 patients, respectively (Table 1). The splenectomy indication was idiopathic thrombocytopenic purpura and all cases were transferred from the Hematology Department for operation. Patients with complicated gallbladder diseases (masses and abscesses), liver cirrhosis, peritonitis, previous upper abdominal surgery, severe obesity, or patients who were high-risk for general anesthesia were excluded.

All of the operations were performed using two ports through a single umbilical incision. In order to lower the number of trocars and to minimize the umbilical incision, the suspension-traction suture technique was used in all of the patients for the traction of the organs.

### *Surgical technique*

We performed single-incision multi-puncture surgeries with two standard laparoscopic trocars assisting each other at a single-fulcrum point in the umbilicus. The first 10-mm trocar was inserted into the abdomen through the inferior aspect of the umbilicus by means of an inverted U-shaped incision performed within the umbilical circle for splenectomies and transumbilically for cholecystectomies and appendectomies (Figure 1A). Two 10-mm trocars were used in splenectomies, whereas one 5 mm trocar and one 10 mm trocar were used in the other patients (Figures 1B). Once pneumoperitoneum was obtained, a conventional 10 mm-30° angulated video laparoscope was introduced through the 10-mm trocar and inspected the peritoneal cavity to decide upon the feasibility of the technique. The second trocar was advanced into the abdomen through a different facial defect created 1 cm above the 10-mm trocar in which the laparoscope was pushed forward. The operator stood between the legs of the patient in choleystectomy, and an assistant stood on the right side of the operator to control the laparoscope. The patient's head and right side were elevated in a supine position.

In cholecystectomies, a 2-0 prolene suture was placed into the abdomen from the right mid-clavicular line and passed through the fundus and removed from the abdomen near the access site. After traction of the fundus, a second traction suture was passed through Hartman's pouch, and the gallbladder was completely retracted (Figure 1C). The cystic duct and artery were dissected at the Triangle of Calot, and were cut using a 5-mm endoclips cyst diameter was 8 cm and it was placed in the segment 7 of the liver. The mean age of patients undergoing SILS was 44.4±12.1 years. Mean body mass index (BMI) for all patients was 28.8±2.9 kg/m$^2$. The operations were (Autosuture, Endo-Clip$^{TM}$, MA, USA) on the proximal and distal aspects. The suture that passed through Hartman's pouch was stretched and the gallbladder was totally detached from the liver by means of an L-hook cautery, however, a 5-mm LigaSure™ Atlas vessel sealing system (Valleylab, Boulder, CO, USA) was also used in difficult cases. The gallbladder was held with a clamp and removed through the transumbilical incision.

In splenectomy, a transparenchymal three-step continuous prolene suture applied from the cranial to the caudal part was removed from the abdomen below the 12$^{th}$ costal margin, and the spleen was tractioned. The spleen was detached from its suspending ligaments and the splenic hilum was reached (Figure 1D). The spleen was sealed via the Ligasure™ at the hilum where the splenic artery divided into small branches, and then it was sealed, and the splenectomy was completed. No laparoscopic clips, sutures, or staplers were used. An endobag was inserted through the umbilicus and the spleen placed into endobag was removed piecemeal with a tissue forceps.

In appendectomies, the prolene suture inserted through McBurney's point was removed from the abdomen together with appendix after it was passed through the meso-appendix. Thus, the appendix was suspended to the abdominal wall. The meso-appendix was separated by the Ligasure™, 2 sutures were placed and bound on the radix of the appendix. The radix of the appendix was cut with endoscissors and appendix was removed from the abdomen using an endobag.

In cystectomy, Gauze pads soaked with hypertonic NaCl (20% NaCl) were placed around the site where the cyst protruded from the surface of the liver, in Morrison's pouch, and in the subhepatic area. The content of the cyst was aspirated as much as possible using a 5 mm laparoscopic needle and hypertonic NaCl was injected into the cyst and left for 10 minutes. The hypertonic solution in the cyst was re-aspirated. The cyst wall was punctured using endoscopic scissors. The puncture site was enlarged by a 10 mm Ligasure™. The daughter vesicles in the cyst were crushed between the 10 mm endoscopic aspirator inserted into the cyst through the puncture site and the cyst wall, and aspirated completely. The protruding wall of the aspirated cyst was excised by the Ligasure™, placed in a plastic bag, and removed with the trocar.

In all patients, two separate fascial defects were separately sutured with absorbable suture material after removal of the trocars. The skin closure was performed with two absorbable sutures intradermally (Figure 2).

## RESULTS

Eighty-one cholecystectomy, 16 appendectomy, 3 splenectomy, and 1 partial cystectomy were performed with single insicion and two ports (Table 1). The hydatid completed with a single incision in all patients, and no additional incision or standard laparoscopy was required. The mean time of operation was 56.4±28.6 minutes, and

the mean blood loss was 50±10 mL in splenectomy, whereas the blood loss in other operations was negligible.

Since the traction with suspension sutures was not sufficient in four patients in whom cholecystectomy was performed, traction of the gallbladder was assisted by the blunt tip of a Veress needle that was inserted at the level of Hartmann's pouch. The gallbladder was perforated in only 3 patients during detachment from the liver. In such cases, the gallbladder was evacuated via an aspirator and the operation was continued. The intra-abdominal area was irrigated with sterile saline after removal of the gallbladder. In a patient in whom cholecystectomy was performed, a bile leakage with a flow rate of 100 mL/day continued for 3 days, and was treated by placing a drain through the umbilicus. ERCP was planned but bile leakage decreased spontaneously and stopped in postoperative day 3. Placement of the trocars on the same vertical line enabled free movement as compared to placement of the trocars on a horizontal line and facilitated the manipulation in all patients.

No post-operative complications developed such as leakage, hemorrhage, abdominal wall abscesses. Only one patient treated with oral antibiotics for a wound infection. All patients received an oral liquid diet in the evening of the operative day and advanced to a regular diet the next morning. A nasogastric catheter was not applied to the patients except for those in whom splenectomy was performed. The patients who underwent splenectomies were discharged after 1.6 days (range, 1-6 days) on average, whereas the others were discharged after 1.4 days (range, 1-4 days). The main follow-up time was 16 months, and no hernias developed.

**Table 1. The distribution and characteristics of patients according to two-port operation through a single incision**

| Distribution | Cholecystectomy n=81 | Appendectomy n=16 | Splenectomy n=3 | Partial cystectomy n=1 |
|---|---|---|---|---|
| Age (years) | 46.1±9.8 | 29.4±5.7 | 34±5.0 | 42 |
| Gender (M/F) | 24/57 | 5/11 | 0/3 | 0/1 |
| BMI ($kg/m^2$) | 29.2±1.6 | 24.5±0.9 | 26.8±1.2 | 31 |
| Operation time (minutes) | 54.5±18.9 | 62.5±5.8 | 70±12.4 | 105 |
| Blood loss (ml) | Minimal | Minimal | 50±10 | Minimal |
| Hospital stay (days) | 1.6±1.1 | 1.2±0.6 | 2±1 | 4 |
| Complication | | | | |
| -Bile leakage | 1 | - | - | - |
| -Wound infection | - | 1 | - | - |

**Figure 1. The trans-umblical (A) incision was made to insert trocars (B) into the abdomen, gallbladder (C) and spleen (D) was tractioned with prolen sutures**

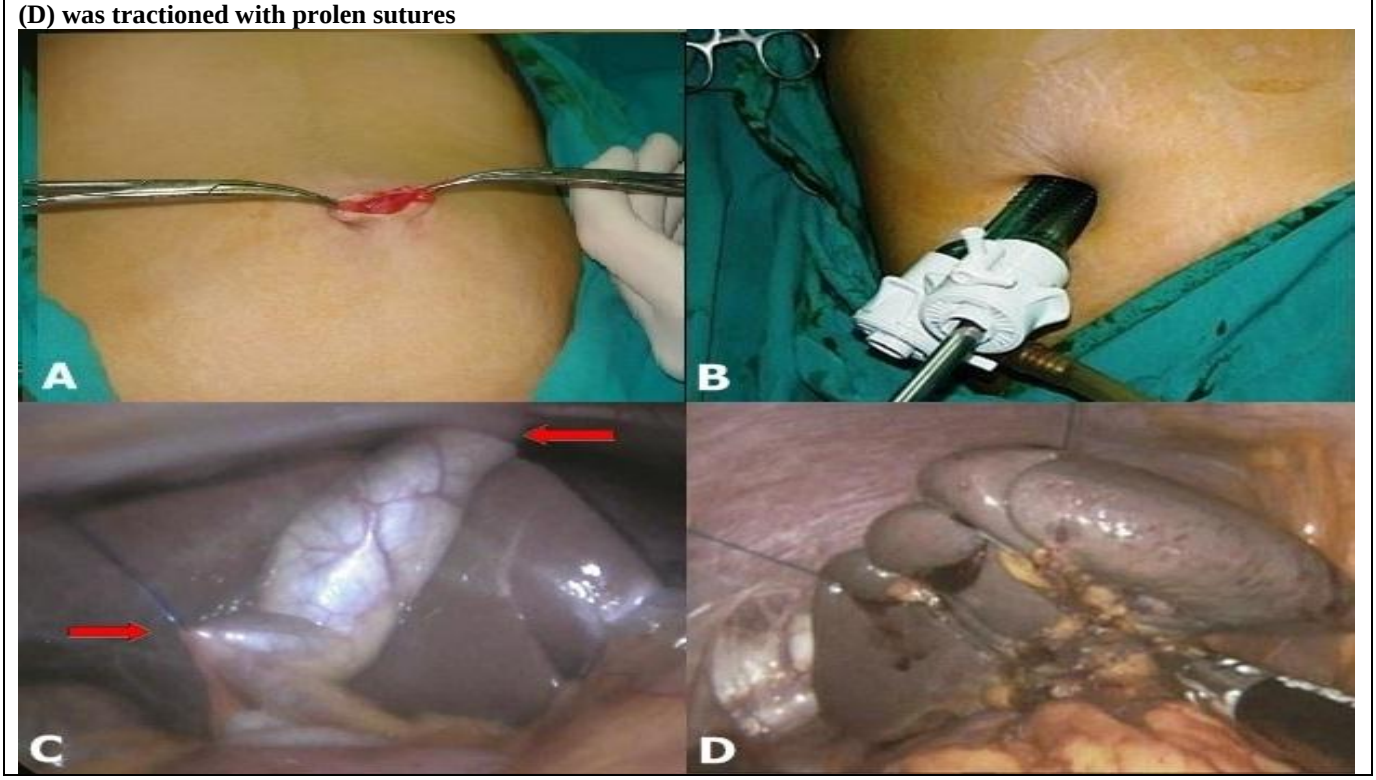
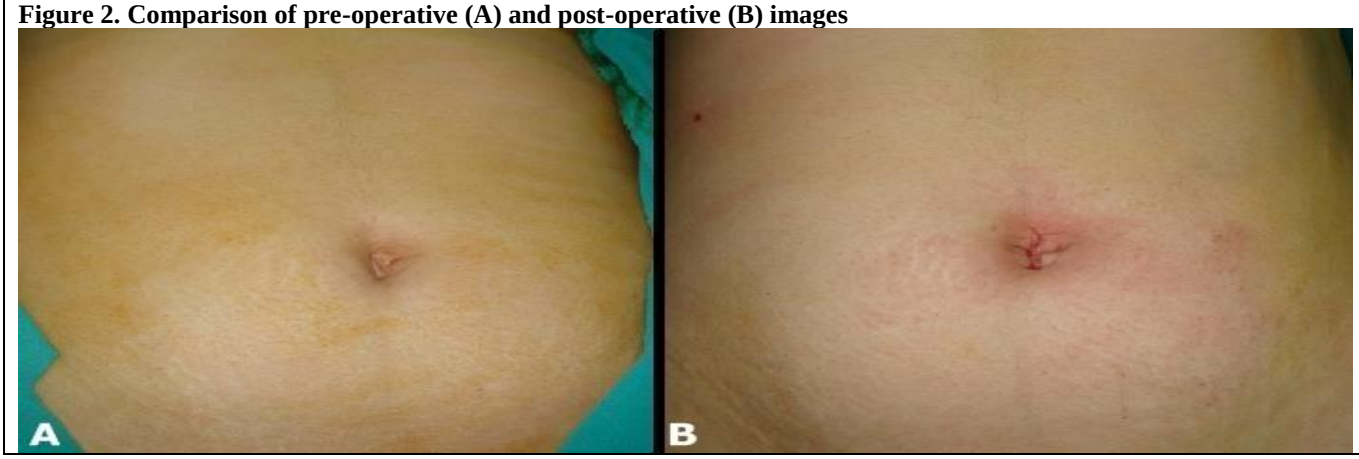


**Figure 2. Comparison of pre-operative (A) and post-operative (B) images**




## DISCUSSION

In the last decade, the importance of decreasing the number of ports to reduce the pain and scars during laparoscopic interventions and to obtain more beneficial outcomes regarding the cosmetics have been taken into consideration by surgeons. Although performing cholecystectomy through a single incision has gained popularity in the mid-1990s, it has been generally accepted. The operations that have been performed through a natural orifice become popular in the recent years since the conventional instruments cannot be used and the image obtained via the standard laparoscopy cannot be provided [6,7]. Furthermore, a long training period, requirements of different clinicians such as a gynecologist and endoscopist, and leakage from the accessed intra-abdominal organ, are the other negative features [9]. During the operations performed through a single incision via the transumbilical approach, a similar image with that of standard laparoscopy can be obtained [10,11].

In the present study, besides allowing the trocars to be placed one on the other during the operation, the umbilical incision led to the minimization of the post-operative scar. The access sites of trocars were separately sutured in all patients to prevent an incisional hernia. The skin closure was performed by two absorbable sutures and successful cosmetic outcomes were observed on the 3$^{rd}$ month follow-up visit.

In the literature, most of the studies investigating SILS were those performed through a wider single umbilical incision using 3 ports [12,13], and the large incision increase the risk of incisional hernia. In this study, all of the surgeries were performed through a single umbilical incision using 2 trocars. This was facilitated by the suspension-traction suture technique. Parenchymal bleeding was prevented by means of continuous sutures that have passed through the spleen, particularly in the splenectomy. The amount of bleeding was approximately 50 mL with the successful use of vascular sealing device [14,15]. Although using a single hand was difficult at the beginning, the intra-operational manipulations gradually became easier after 2- or 3-case training periods, and the operation duration was remarkably shortened. In addition, the problem with the camera assistant consistently pushing the instrument used by the surgeon out of sight to provide an image has been overcome within the training period. While the first operation performed for a gallbladder completely full of stones was completed in 190 minutes, the mean operative time was shortened to 50 minutes after the 7$^{th}$ patient in a manner consistent with the literature [16]. Since the operation was performed via a 10 mm Ligasure™, two 10 mm trocars were used in splenectomies and partial cystectomy, whereas both of the trocars were changed to 5 mm trocars due to the use of a 5 mm laparoscope in cholecystectomies and in some of the appendectomies.

In the present series with 101 patients, two-port laparoscopic surgery through a single incision was performed successfully. No major complications occurred. Moreover, perforation of the gallbladder in three patients did not lead to any complications during or after surgery. After the training period involving a few patients, a similar operative period with conventional laparoscopy, and much better cosmetic outcomes were obtained with maintaining the SILS-Port cost. In many clinics, endovascular staplers are routinely used for laparoscopic splenectomy. However, some authors have been reported the successful usage of the vessel sealing equipments in hilum dissection and ligation of hilar vessels without any major complications [17,18]. It is an economically beneficial operation because the equipment requirements are limited to a 30-degree standard laparoscope, vessel sealing equipment, and endobag. No need for expensive equipments such as SILS port, endovascular staples or endoscopic suture materials, therefore it can be carried out at every medical center with the requisite experience.

Although cosmesis is the most apparent benefit of SILS. The number of patients in this series is inadequate, however, to make any definitive conclusions regarding the effect of this technique on pain and recovery and is the subject of a future larger, prospective study. In conclusion, we believe that the use of two-trocar method through a single incision in operations will become more widely

accepted for selected patients due to better cosmetic outcomes and cost effectivity, with a lower incisional hernia rate.

**Conflict of Interest:** Authors have no conflicts of interest or financial ties to disclose.

**REFERENCES**


1. Yu SC, Yuan RH, Chen SC, Lee WJ. (1999). Combined use of mini-laparoscope and conventional laparoscope in laparoscopic cholecystectomy, preservation of minimal invasiveness. *J Laparoendosc Adv Surg Tech*, 9, 57–62.
2. Piskun G, Rajpal S. (1999). Transumbilical laparoscopic cholecystectomy utilizes no incisions outside the umbilicus. *J Laparoendosc Adv Surg Tech*, 9, 361–364.
3. Hodgett SE, Hernandez JM, Morton CA, Ross SB, Albrink M, Rosemurgy AS. (2009). Laparoendoscopic Single Site (LESS) Cholecystectomy. *J Gastrointest Surg*, 13, 188–192.
4. Barbaros U, Dinccag A. (2009). Single incision laparoscopic splenectomy, the first two cases. *J Gastrointest Surg*, 13, 1520–1523
5. Brunner W, Schirnhofer J, Waldstein-Wartenberg N, Frass R, Weiss H. (2010). Single incision laparoscopic sigmoid colon resections without visible scar, a novel technique. *Colorectal Dis*, 12(1), 66-70.
6. Forgione A, Maggioni D, Sansonna F, Ferrari C, Di Lernia S, Citterio D, Magistro C, Frigerio L, Pugliese R. (2008). Transvaginal endoscopic cholecystectomy in human beings, preliminary results. *J Laparoendosc Adv Surg Tech*, 18, 345–351.
7. Decarli L, Zorron R, Branco A, Lima FC, Tang M, Pioneer SR, Zanin I Jr, Schulte AA, Bigolin AV, Gagner M. (2008). Natural orifice translumenal endoscopic surgery (NOTES) transvaginal cholecystectomy in a morbidly obese patient. *Obes Surg*, 18, 886–889.
8. Milas M, Devedija S, Trkulja V. (2014). Single incision versus standard multiport laparoscopic cholecystectomy, Up-dated systematic review and meta-analysis of randomized trials. *Surgeon*, 11, 15-8.
9. Fuchs KH, Breithaupt W, Kuhl HJ, Schulz T, Dignab A. (2010). Experience with a training program for transgastric procedures in notes. *Surg Endosc*, 24, 601-9.
10. Marescaux J, Dallemagne B, Perretta S, Wattiez A, Mutter D, Coumaros D. (2007). Surgery without scars, report of transluminal cholecystectomy in a human being. *Arch Surg*, 142, 823–826.
11. Ersin S, Firat O, Sozbilen M. (2010). Single-incision laparoscopic cholecystectomy, is it more than a challenge? *Surg Endosc*, 24(1), 68-71.
12. Dutta S. (2009). Early experience with single incision laparoscopic surgery, eliminating the scar from abdominal operations. *Journal of Pediatric Surgery*, 44, 1741–1745.
13. Tacchino R, Greco F, Matera D. (2009). Single-incision laparoscopic cholecystectomy, surgery without a visible scar. *Surg Endosc*, 23, 896–899.
14. Barbaros U, Dinccag A, Deveci U, Akyuz M, Tükenmez M, Erbil Y, Mercan S. (2007). Use of electrothermal vessel sealing with LigaSure device during laparoscopic splenectomy. *Acta Chir Belg*, 107(2), 162-165.
15. Yuney E, Hobek A, Keskin M, Yilmaz O, Kamali S, Oktay C, Bender O. (2005). Laparoscopic splenectomy and LigaSure. *Surg Laparosc Endosc Percutan Tech*, 15, 212–215.
16. Choi SH, Hwang HK, Kang CM, Lee WJ. (2012). Single-fulcrum laparoscopic cholecystectomy, a single-incision and multi-port technique. *ANZ J Surg*, 82(7-8), 529-34.
17. Gelmini R, Romano F, Quaranta N, Caprotti R, Tazzioli G, Colombo G, Saviano M, Uggeri F. (2006). Sutureless and stapleless laparoscopic splenectomy using radiofrequency, LigaSure device. *Surg Endosc*, 20(6), 991-4.
18. Aydin C, Kayaalp C, Olmez A, Tatli F, Kirimlioglu V. (2008). Laparoscopic splenectomy with a vessel sealing device. *Minim Invasive Ther Allied Technol*, 17, 308–312.