

Single-port access in laparoscopic cholecystectomy

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Received: 7 September 2008 / Accepted: 22 January 2009 / Published online: 5 March 2009
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Abstract

Background Single-port access cholecystectomy is a new laparoscopic procedure using only one, transumbilical-placed port. The method has been denominated by some authors as “scarless.” We report one of the initial clinical experiences in Europe with this new technique.

Methods Fourteen patients underwent laparoscopic cholecystectomy using the ASC TriPort. In all cases, a small transumbilical incision was used to insert two 5-mm rigid laparoscopic instruments and a 5-mm 30° telescope via the Triport. Hemostasis control was obtained by using an ultrasonic cutting device (SonoSurg, Olympus), Endo Clips (Covidien), and Lapro-Clips (Covidien).

Results All cases were completed successfully. There were no perioperative port-related or surgical complications. No extra skin incisions were needed. Operative time was longer than in common laparoscopic cholecystectomy.

Conclusions Transumbilical single-port access cholecystectomy (SPACE) is a feasible technique for operating with less scars and reducing postoperative discomfort at the same time. The transumbilical single-port access for laparoscopic cholecystectomy has multiple benefits, such as better cosmetic results, less wound infections, and less incisional hernias. That is why SPACE is even more appropriate for obese patients. Using one-hand specialized instruments, which are curved at the shaft, and a semi-flexible laparoscopic camera (LTFVH, Olympus) will make SPACE more comfortable and more time-saving.

Keywords Single-port access · Cholecystectomy · Scarless surgery

Since the first laparoscopic appendectomy was performed by K. Semm in 1983, laparoscopic surgery has been developed almost to perfection [1]. Its ambition is to achieve a better operative outcome with less tissue lesions by using a smaller access than conventional surgery, resulting in less postoperative infections without jeopardizing safety standards. Common laparoscopic surgery requires several skin incisions for three to six trocars; meanwhile the TriPort device is inserted through only one incision into the abdominal cavity. The ASC TriPort (R-Port, Advanced Surgical Concepts, Dublin, Ireland) allows up to three instruments to be inserted simultaneously through a single incision. By using a transumbilical access, the TriPort device allows laparoscopic surgery with only one—and for choosing the position within the umbilicus—nearly invisible scar. To our knowledge, we report the first initial clinical experiences of laparoscopic cholecystectomy using the single-port transumbilical excess in Europe. Until now experiences with this new laparoscopic technique have been made in the United States and India [2–4]. Romanelli et al. are even conjecturing that “single-port access surgery may be the next generation of minimally invasive surgery” [2].

Patients and methods

Our patients had surgery after obtaining institutional review board approval from the ethical committee of the local hospital, and informed patient consent. The ASC

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TriPort Laparoscopic Access Device is a recently developed laparoscopic multichannel access that allows multiple instruments to pass through one incision at the same time, and ensures the capnoperitoneum regardless of whether a laparoscopic instrument is present in the trocar (Figs. 1, 2, 3, Table 1). The TriPort device consists of an introducer component, a retractor component, and a valve component. With the un-bladed introducer component, the distal ring of the ASC TriPort is delivered into the abdominal cavity. The retractor component retracts the abdominal incision providing an access path for laparoscopic instruments. The retractor component includes one internal ring and two external rings. A doubled over cylindrical plastic sleeve is attached to one of the external rings and scales down, encloses the inner distal ring, and exits between the two outer proximal rings. After ejecting the inner ring into the abdominal cavity with the un-bladed introducer and carefully removing the introducer, the plastic sleeve is then pulled outward. By drawing the inner and the outer ring together as closely as possible, a tension is set up in the retraction sleeve. This tension is required for the retraction of the incision and therefore creating the access for the



Fig. 1 ASC Triport

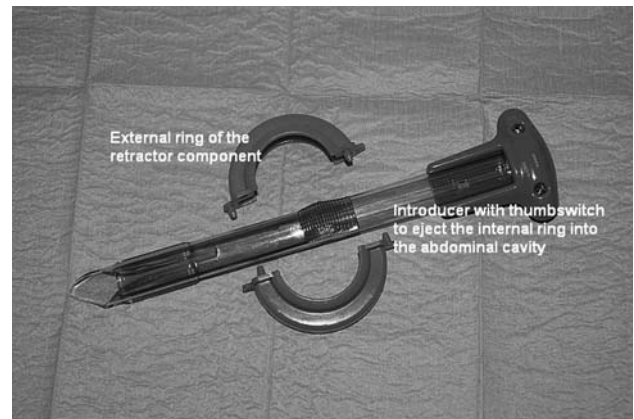


Fig. 2 Introducer and retractor component

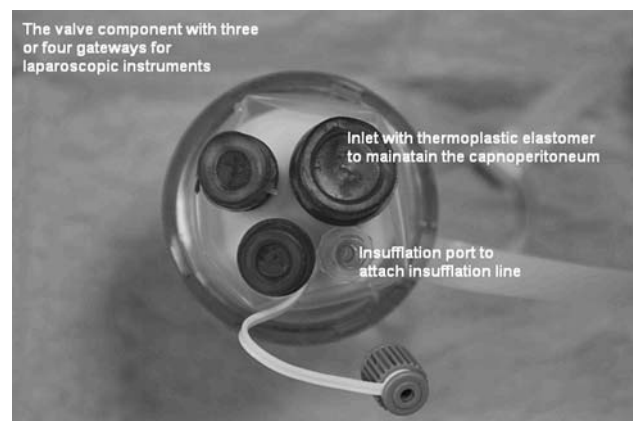


Fig. 3 Valve component

Table 1 Instruments

Instrument	Size (mm)	Manufacturer
Triport	20	Advanced Surgical Concepts
Monopolar hook	5	Olympus
Johann dissector	5	Olympus
Maryland dissector	5	Olympus
Metzenbaum scissors	5	Olympus
SonoSurg	5	Olympus
Endo clips	5	Covidien
EndoEye, camera	5	Olympus
LTFVH, camera	10	Olympus

laparoscopic instruments. The valve component consists of three gateways for one 12-mm and two 5-mm instruments. A thermoplastic elastomer within this valve component maintains the capnoperitoneum during the surgical procedure in general and especially during changes of instruments.

Informed consent was obtained from all patients participating in our study before single-port access laparoscopic

cholecystectomy. For the procedure, the patients were placed in dorsal position. A 2-cm skin incision was made in the umbilicus and deepened to the abdominal rectus fascia. After opening the fascia, the peritoneum was incised after the insertion of the TriPort. CO₂ was insufflated through the TriPort to create a capnoperitoneum up to 12 mmHg. Two inlets of the TriPort were used to insert rigid laparoscopic instruments; one inlet was used to insert a 5-mm rigid 30° video-laparoscope (EndoEye, Olympus Medical, Tokyo, Japan). Additional umbilical skin incision was not necessary in any cases. The following operating steps were similar to common laparoscopic cholecystectomy “in the two-window technique.”

Results

All procedures were completed successfully without any perioperative complications. In all cases, there was no need to extend the skin incision. The whole operation was performed with instruments inserted through the TriPort without any extra incisions. Total operative time was between 115 and 53 minutes.

Discussion

During recent years, laparoscopic surgery has developed rapidly. With great technical progress, the visualization and handling of the instruments has been improved enormously. For that reason many surgical diseases can be treated laparoscopically ensuring the same safety standard as conventional surgery. Applying laparoscopic techniques, operations are less traumatic; thus, the incidence of wound infections and incisional hernias, of which especially overweight patients are affected, has decreased. Furthermore, there is less postoperative bowel paralysis, allowing a faster postoperative feeding progress. After laparoscopic procedures, cosmetic results are much better compared with traditional operations. Postoperative pain is reduced, which results in faster mobilization and a lower number of immobilization-associated complications, such as venous thrombosis and pulmonary embolism [5, 6]. Furthermore less pneumonia, less use of analgesics, and shorter hospital stay characterize laparoscopic procedures. Summarized, the benefit for the patient is faster recovery and better cosmetic result. Even in oncological surgery, laparoscopic procedures have an outcome comparable with open surgery.

Laparoscopic surgery not only benefits from technical improvements; attempts to minimize access-related injuries and complications resulted in the development of natural orifice transluminal endoscopic surgery (NOTES) with its

introduction in 2004 and recently in the invention of single-port access laparoscopy (SPA) [7]. Operations using the NOTES technique avoid external incisions by using a natural orifice, such as the mouth, anus, or vagina, followed by making an internal incision (i.e., in vagina, colon, stomach) to insert the laparoscopic instruments. Therefore, a viscerotomy is performed.

In SPA access to the abdominal cavity is obtained by one small incision, which is concealed perfectly when placed transumbilical. Through this one port, several instruments can be inserted and changed without loss of pressure of the capnoperitoneum.

In contrast to NOTES, SPA does not require the opening of a hollow organ, such as stomach, colon, or vagina. Thus, complications related to visceral closure, such as gastrotomy or colostomy leakage, are avoided. During the preoperative interview, all of our female patients declined transvaginal cholecystectomy, not for medical, but for personal reasons.

The one external incision made with the SPA technique is, as mentioned, nearly invisible if placed within the patient's navel and, therefore, subjectively not seen as a disadvantage compared with NOTES.

With the operation of these patients we report, to our knowledge, the first clinical experience of single-port cholecystectomy using a transumbilical access in Europe. Although the operation time took longer than common laparoscopic cholecystectomy, all procedures were successfully completed. Longer operative time is caused mainly by the use of rigid instruments. The appropriate instruments for the TriPort system have a curved shaft. This special design would avoid the interferences of the rigid instruments and the telescope.

Because of the limited space confined by using only a single port, the hands of the surgeon and the assistant are at risk to disable each other. For that reason, instruments with different lengths should be used. Furthermore, we think that by using a semiflexible endoscopic camera system (LTFVH, Olympus), the procedure would be more comfortable. Especially the visualization and dissection of the cystohepatic triangle (of Calot) would be easier and safer.

Conclusions

We report the first clinical experience of single-port cholecystectomy in Europe. In all cases, no extra incisions were needed. Each operation was completed successfully without any perioperative complications and a quick postoperative recovery for the patients.

In our opinion this method has a great potential as a new variant of laparoscopic procedures with less scars. Thus, SPA is especially suitable for obese patients because of

less incision-related postoperative complications, such as wound infections and trocar hernias.

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