

Different Types of Single Incision Laparoscopy Surgery (SILS) Ports

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ABSTRACT

Introduction: Single incision laparoscopic surgery (SILS) has become an advancement in minimal access surgery because it offers benefits like less postoperative pain, less invasive and has best cosmetic results. Even though the amount of time taken for SILS surgery is more, this can be brought down by experience and more advances on the type of instruments used. We are going to review different types of SILS ports available in the world today.

Material and methods: Articles of relevant studies are searched from the internet using Google, PubMed, Yahoo, HighWire press, SpringerLink, etc. available at world laparoscopic hospital.

Aims: The main aim of this review is to evaluate different types of SILS ports and their effectiveness in safe laparoscopic surgeries. To know if they offer any less postoperative pain and best cosmetic results than the multiple trocar surgeries, and to know the best SILS port.

Conclusion: Whatever might be the choice of single incision laparoscopic surgery or procedure, the best choice of port depends on many factors like choice of the surgeon, skill of the surgeon, availability of ports, operative time of the procedure and cost effectiveness. To know this, we need more controlled randomized studies on different types of SILS ports in single procedure. We cannot pinpoint which might be the best port for SILS at this point of time.

Keywords: Single incision laparoscopic surgery (SILS), LESS, Minimal access surgery, Single port access (SPA), SILS ports, NOTES.

INTRODUCTION

History of single incision laparoscopic surgery dates back to 1992, where Pelosi performed single puncture laparoscopic appendectomy. In 1997 Navarra et al performed laparoscopic cholecystectomies with two trans-umbilical trocars. Some of the disorders like gallbladder stones, the gold standard treatment of choice is laparoscopic cholecystectomy. But now there are so many advances and refinements in technology and instrumentation that cholecystectomy is being done by SILS and NOTES in some of the centers all over the world. These advances help in making the surgery less invasive and cosmetically the outcome is good and superior to other procedures. In this article, we are going to review the different literature available regarding different types of SILS ports available in the market and to know if they offer any advantage over one another.

SURGICAL TECHNIQUE

Whatever might be the procedure being done, the basic principle is same that multiple instruments or multiple trocars are placed in a single port of entry. The positions for single port access may be different depending on many factors like choice of surgeon, type of surgery and age of the patient.

The different locations commonly used are:

1. A 6 cm long omega-shaped incision made around the upper half of umbilicus.

2. Transumbilical insertion is commonly used and ideal to prevent any visible scar.
3. Some surgeons placed incision in the pubic hairline medially.
4. Incisions are also given above and below the umbilicus to give excellent cosmetic results.

But the choice of incisions mainly depends on the surgeons' preference.

A lot of surgeons are using 30° laparoscopy light source but several teams also use small diameter laparoscopy with angular tip and incorporated light source.¹⁻³

Next is the choice of instrument. Some surgeons have been using regular laparoscopic instruments but because of the advent of new technology, now surgeons are using more and more of curved or angular or flexible laparoscopic instruments. In some cases for multichannel ports, a Roticulator grasper (Covidien) was used.

Next is the choice of single incision laparoscopy surgery ports. There are many different ports, available but we are dealing with only few selected ports which are commonly used. The choice of port completely depends on the surgeons' choice and preference, availability of port and cost factor.

Once the choice of port is made, they are placed in the abdomen for single port access surgery. The dissection and procedure for that particular surgery is performed in the same fashion as standard laparoscopic procedure. On

completion of the procedure, the trocar site facial plane is closed. If the facial incision was enlarged for specimen delivery then they are closed in standard manner. Then the skin is closed with subcuticular suture.

DISCUSSION

Single incision laparoscopy is being performed by many surgeons throughout the world. Many articles and studies are being done because SILS is laying a bridge to more advanced surgery like NOTES (natural orifice transluminal endoscopic surgery). The different procedures performed by single incision ports are cholecystectomy, colonic procedures like colectomy, appendectomy, splenectomy, adrenalectomy, omental resection, liver biopsy and procedures on small bowel. Saber et al reported a SILS series in bariatric surgery specifically by transumbilical sleeve gastrectomies.⁴

All over the world there is so much interest in performing single incision surgeries for best cosmetic outcome that many of the groups have pioneered and mastered this technology.⁵⁻¹⁸

There are so many nomenclatures for SILS (Table 1):²⁷

Now coming to the different types of ports, there are so many surgical teams performing different types of surgeries with different ports (Figs 1A to D). We are going to discuss briefly on some of the commonly used ports.

SILS PORT (BY COVIDIEN)

SILS port is one of the most commonly and widely used port all over the world (Fig. 2). It has a blue, flexible soft-foam port with three access channels for three instruments. There is 5 mm cannula and 5 to 12 mm cannula. The SILS port can adapt depending on the size of instrument while still maintaining pneumoperitoneum.

GELPORT (BY APPLIED MEDICAL)

GelPort laparoscopic system has gel seal cap with the enhanced retractor and protection of Alexis wound retractor.

The Alexis wound retractor has 360° of atraumatic, circumferential retraction and protection (Fig. 3). This port is being used by many surgeons. In many of the studies GelPort system has being used.¹⁹⁻²⁰ One surgical team also proposed use of GelPort to increase the freedom of motion.²¹

TRIPORT AND QUADPORT (BY ADVANCED SURGICAL CONCEPTS)

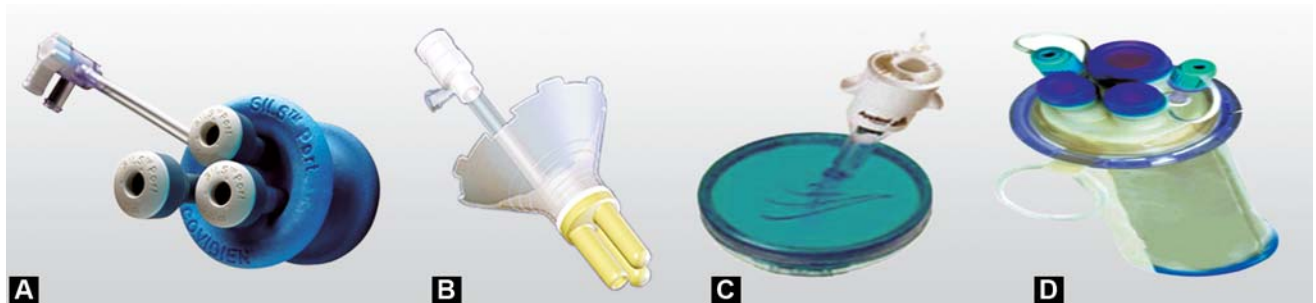
It has a multi-instrument access port for single incision laparoscopic surgery (Fig. 4). ASC has also developed quadport, here the incision required is 2.5 to 6.5 cm in

Table 1: Synonym of SILS

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| <ul style="list-style-type: none"> • Single incision laparoscopic surgery • TUES (Transumbilical endoscopic surgery) • SILS™ • LESS™ (Laparoendoscopic single-site surgery) • SPA™ (Single portal access) • E-NOTES (Embryologic natural orifice transluminal endoscopic Surgery) • SAS (Single access surgery) • S3 (Single site surgery) • Single port surgery • CL1P (Cirugia laproscopy pica de 1 puerto, one-port laparoscopic surgery) • NOTUS (Natural orifice transumbilical surgery) • SAVES (Single access video endoscopic surgery). |
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Fig. 2: SILS Port



Figs 1A to D: Commonly used ports all over the world are: (A) SILS Port (Covidien, Norwalk, Connecticut, USA), (B) ASC Triport (Advanced Surgical Concepts, Wicklow, Ireland), (C) GelPort (Applied Medical, Rancho Santa Margarita, California, USA), (D) Uni-X (Pnavel Systems, Morganville, New Jersey, USA)



Fig. 3: Alternative to SILS Port



Fig. 4: Triport and Quadraport

length that allows upto four instruments to be used simultaneously.

ANCHORPORT (R) (BY SURGIQUEST)

Surgiquet has developed a port called AnchorPort (R), which is used in single incision laparoscopy procedure. It has an integrated elastometric, stretchable cannula system that goes into elongated adjustments according to the patients' abdomen wall thickness (Fig. 5). It also has a distal tip where it anchors the cannula to the abdominal wall and prevents it from coming out.

Whatever might be the choice of ports, the most important thing is safety of the patient. Any surgery performed by single incision laparoscopy can be done by the conventional laparoscopic instruments or sometime you require special specifically designed laparoscopic instruments. The choice of the ports depends on the surgical team, cost factor, and the availability of these ports. Most of the studies indicate the main advantages of single incision laparoscopy surgery ports, which include less postoperative pain, less chance of infection, and less chances of port site hernias. Multiport laparoscopy surgery has a published data on port site hernias with an estimate of 0.14%.²² But all

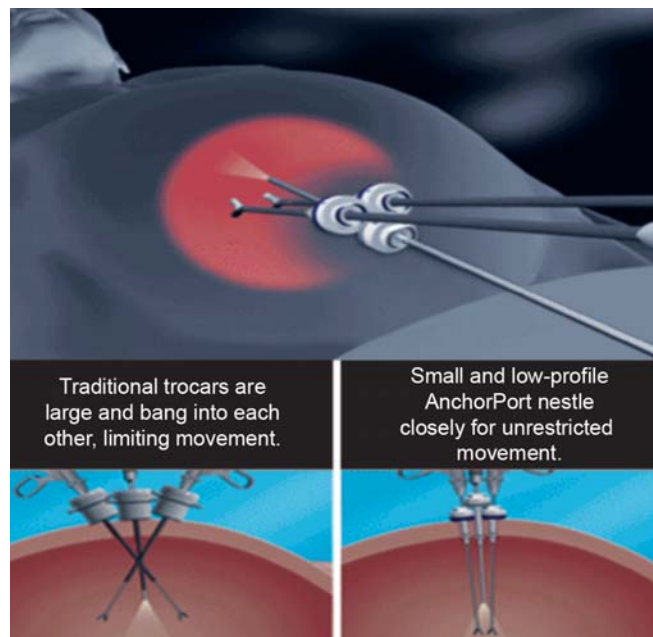


Fig. 5: AnchorPort

these advantages have to be evaluated by further studies. At SAGES conference in 2009, almost 500 cases of single incision laparoscopic cholecystectomy were reported.²³⁻²⁵ The main factor for safety of single incision laparoscopy surgery depends on the surgeon himself. There is a steep learning curve required for the safety of the procedure. One of the surgical teams has advised a "stepwise down" approach.²⁶ One article has given a good list of problems and solutions seen during single incision laparoscopic surgery (Table 2).²⁷

Table 2: Problems in SILS

| Problems |
|---|
| <ul style="list-style-type: none"> • Clashing of instruments • Lack of ideal operative ports • Interference and deflection of laparoscope's light source by operating instruments • Interference of wires or tubing that connect perpendicularly to instruments (i.e. cautery) • Difficulty with retraction of organs or structures • Change of surgeon's mindset • Lack of time and patience to learn • Loss of proprioception due to crossed instrument. |
| Solutions |
| <ul style="list-style-type: none"> • Use of curved, reticulating, or flexible instruments • Use of very low-profile trocars • Staggering heights and heads of trocars • Use of novel multichannel ports • Use of a laparoscope with a light source on the back of the camera • Use of a flexible-tip endoscope • Use of an extra-long 5 mm angled laparoscope (50 cm) • Use of a 908 adaptor for the light source (for sharp change in its direction parallel to the laparoscope) • Use of instruments that connect at their distal ends, any necessary wires or tubing (i.e. cautery) • Use of extra-long bariatric size instruments • Use of retracting sutures • Continuous medical education. |

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Potential solutions

- Design of innovative retracting platforms
- Implementation of magnetically anchored instruments deployed through a single incision
- Implementation of robotic platforms
- Design of sigmoid-shaped instruments
- Additional basic surgical principles
- Sound surgical judgment
- Maintenance of equivalent operative exposure
- Low threshold for the use of additional ports at the initial incision site or
- Prompt conversion to conventional laparoscopy or to open surgery.

The table shows commonly encountered problems in SPA surgery (see Table 2).

Different types of instruments for laparoscopic surgery have to be developed like retractors, dissection and laparoscopic cameras to make the surgeon more efficient. As we lead into the next phase of minimal access surgery, we need to develop procedures, instruments and ports easily available and affordable so that they can be used for large volume of patients.

CONCLUSION

After review of all the articles and many studies we still cannot come to the conclusion about the best port available in single incision laparoscopy. The different single incision laparoscopy ports have different features from one another. Each one has its own unique features. So, the choice of single incision laparoscopy port depends on surgeon, availability and cost factor. To ascertain which port is better, we need to do further studies and research. Whatever might be the choice of the port, the surgical procedure and patients should not be comprised.

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