Single port versus multiport laparoscopic trans abdominal preperitoneal hernia repair.

Hany Mohamed El-Barbary, FRCS, FACS,

Department of General Surgery, Faculty of Medicine, Ain shams university (ASU)
drhelbarbary69@yahoo.com

Abstract: Background: Single incision laparoscopic surgery (SILS) has been recently introduced in several surgical procedures. There is a paucity in the literature describing the single incision trans-abdominal preperitoneal hernia repair (SILS-TAPP), instead most studies described single incision totally extraperitoneal hernia repair (TEP). Aim of the study: In this study, the author present his experience regarding SILS inguinal hernioplasty using transabdominal pre-peritoneal approach (SILS-TAPP) compared to multiport TAPP. The outcome, advantages and complications encountered in both approaches were highlighted. Results: This study was carried out from January 2014 till December 2015 and all patients were operated by a single surgeon in a secondary level referral private hospital in Eastern province KSA and were followed for one year. This was a prospective clinical study of 77 patients ranging from 18-49 years of age who were operated for non-complicated inguinal hernia, 25 cases using SILSTAPP technique and 52 cases with hernia repair using multiport TAPP. There were sixty five males and twelve females. Average operating time was 127 minutes for SILS-TAPP, and 76 minutes regarding multiport TAPP. There was minimal postoperative pain and accepted cosmetic scars in SILS-TAPP. We had one port site hernia after 3 months in the SILS group. No early postoperative recurrences in both groups after one year follow up. Conclusion: SILS-TAPP is a feasible and safe minimally invasive approach for non-complicated inguinal hernias, especially in patients with low BMI. It has better cosmetic appeal and less postoperative pain than multiport TAPP. On the other hand, multiport TAPP is more suitable in obese patients. SILSTAPP should be done by experienced laparoscopic surgeons in SILS techniques using appropriate instruments.
[Hany Mohamed El-Barbary. **Single port versus multiport laparoscopic trans abdominal preperitoneal hernia repair.** *Life Sci J* 2017;14(1):25-31]. ISSN: 1097-8135 (Print) / ISSN: 2372-613X (Online). http://www.lifesciencesite.com. 4. doi:10.7537/marslsj140117.04.

Key words: Single port hernia repair, TAPP hernia repair

1. Introduction

Background Historically, Erich Mühe performed the first laparoscopic cholecystectomy worldwide in 1985 with his “Galloskop”, a multi-channel single-port trocar. A decade later, Giuseppe Navarra from Italy published 1997 his “one wound cholecystectomy” with standard trocars introduced through one skin incision. In 2008 the first special trocars to perform a laparoscopic operation through one small incision became available (single port laparoscopic surgery). From this time multiport laparoscopy had to compete with NOTES and single port laparoscopic surgery (1).

At present, laparoscopic inguinal hernia repair is universally accepted among patients and surgeons, and it has become a method of choice in recurrent hernia or bilateral inguinal hernia, thanks to the continuous technological developments in laparoscopic instruments and synthetic meshes (2).

The two currently available and popular laparoscopic approaches for inguinal hernia repair are based on placing a synthetic mesh to reinforce the posterior inguinal wall in the preperitoneal space, either by a totally extra-peritoneal approach (TEP), or by a trans-peritoneal approach (TAPP) which has the advantage of a lesser learning curve due to the more confined working space in TEP (3).

There is continuous efforts to minimize the invasiveness of any surgical procedure, together with ensuring maximum efficacy, which is determined by the postoperative recurrence rate (2).

Nowadays, single port laparoscopic hernia repair represents a bridge between traditional laparoscopy and natural orifice endoluminal surgery or NOTES which is still in its infancy (3).

The aim of this study is to evaluate the outcome of SILS inguinal hernioplasty using transabdominal pre-peritoneal approach (SILS-TAPP) compared to multiport TAPP.

2. Patients and methods

This was a prospective clinical study of 77 patients ranging from 18-49 years of age who were operated for non-complicated inguinal hernia, 25 cases using SILS-TAPP technique and 52 cases with hernia repair using multiport TAPP.

This study was carried out from January 2014 till December 2015 and all patients were operated by a single surgeon in a secondary level referral private hospital in Eastern province KSA and were followed for one year.

All patients enrolled in the study were subject to history, clinical examination, laboratory investigations and all patients had preoperative assessment by anesthesiologist. Informed consent was taken from all patients who agreed for surgery.

Surgical technique:

In the TAPP group:

Under general anesthesia, draping of patients was done, after a single dose of prophylactic antibiotic with induction in the form of 3rd generation cephalosporin.

Patients were placed in supine position, with a 10º Trendelenburg tilt while both arms in adducted to patient sides. High resolution laparoscopic monitor placed to the foot of the table and equipment was on one side.

The surgeon operated from the contralateral side of the hernia, and the assistant stands opposite to the surgeon.

After pneumoperitoneum by Veressneddle in Palmer's point, three trocars were used: first 10 mm supra-umbilical trocar for the camera and 2nd and 3rd working trocars were 5mm and 10 mm to the right and left of the optic trocar on the transverse umbilical line (Figure 1). A 30° scope was used for better visualization in all cases.

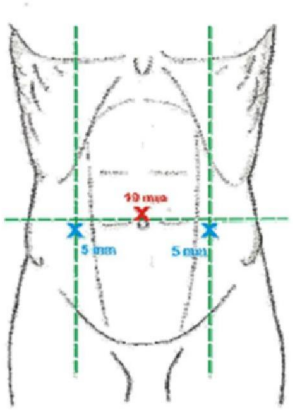

Figure 1: Trocar position. The red mark in the umbilicus for the optic troca and the 2 other working trocars in the transverse umbilical lines.

Laparoscopic exploration to identify the anatomical landmarks and the site and type of hernia according to Nyhus classification was done (figure 2), then preperitoneal dissection started (lazy S shaped) using the scissor and diathermy starting 2 cm above the iliac spine until the umbilical artery on the same side. With creation of medial and lateral pockets in the preperitoneal space the preperitoneal dissection started at the lateral side of the internal inguinal ring and continued medially and caudally. Then, dissection of the hernia sac was done through traction and counter-traction technique by using scissor with monopolar diathermy and peanut dissector (figures 3, 4). Dissection of the sac always starts anteriorly aiming to protect the vas deferens and spermatic vessels from injury.

After completing the dissection, lightweight polypropylene mesh 12x15 cm was inserted through the 10mm port, placed in the appropriate position and fixed by using tacks (figures 5, 6). This is followed by closure of the peritoneal flap by monofilament suture or by tacks (figure 7).

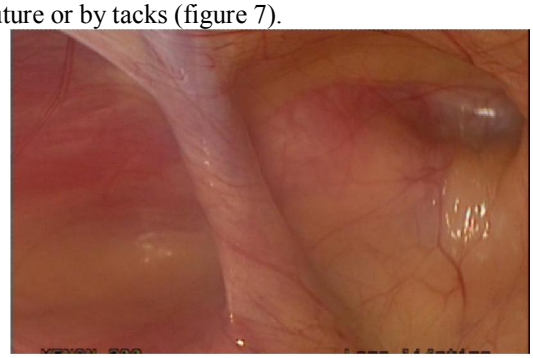

Figure 2: Laparoscopic view of left direct hernia.

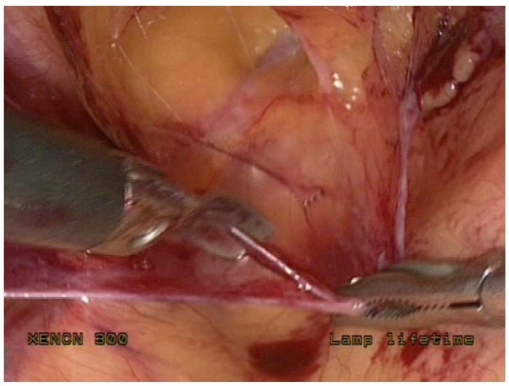

Figure 3: TAPP technique with dissection of the sac using scissors, traction and counter-traction.

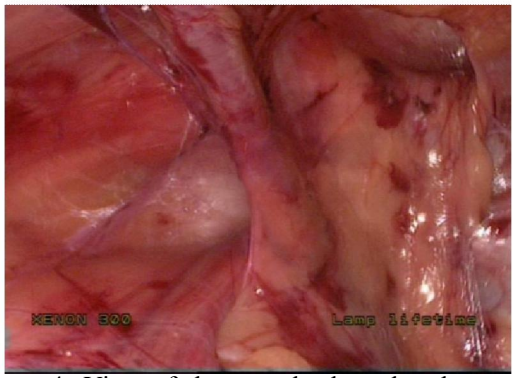

Figure 4: View of the completely reduced sac and dissected myopectineal orifice, noting the inferior epigastric vessels in the middle.

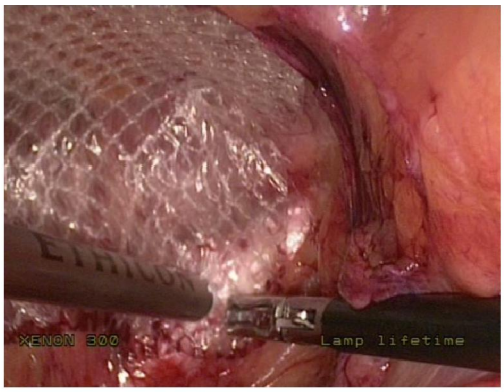

Figure 5: Light weight polypropylene mesh fixation starting at the medial lower edge at Cooper's ligament using absorbable tacks (Secure strap, Ethicon ®)

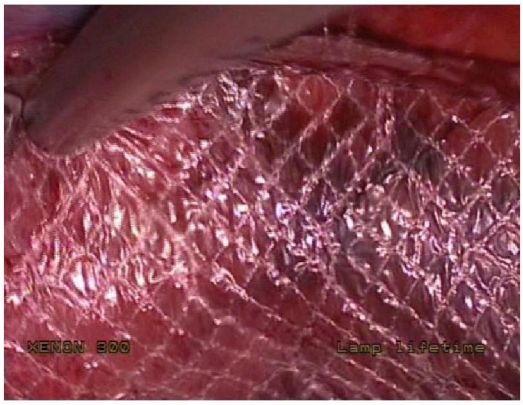

Figure 6: Completion of mesh fixing laterally

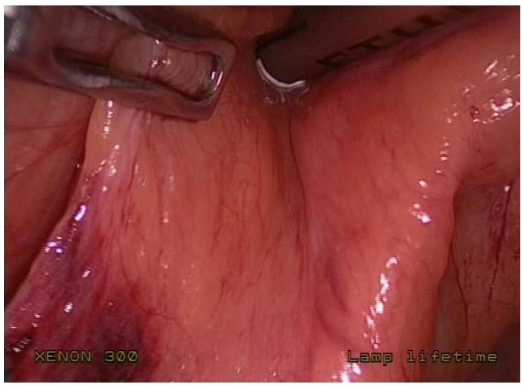

Figure 7: Closure of peritoneal flap

In the SILS-TAPP group:

The same principles applied in this group as regards anesthesia, patient position and preparation but the procedure, previously performed through 3 ports was performed using the single incision approach with the SILS Port system (Covidien). After skin incision, the everted umbilicus was cut from its base transversely by a 2.5 cm incisions of the fascia and peritoneum were made then two stay suture were placed to open the wound (figure 8). The SILS port was placed through the incision and three 10-5-5 mm trocars were inserted through its preplaced spaces (Figure 9). CO2 insufflation was performed via a special, separate channel and 12-mmHg pneumoperitoneum was established (figure 10).

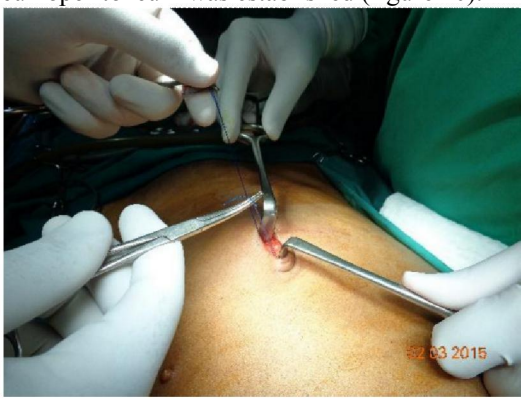

Figure 8: Infraumbilical skin incision and aponeurotic stay sutures.

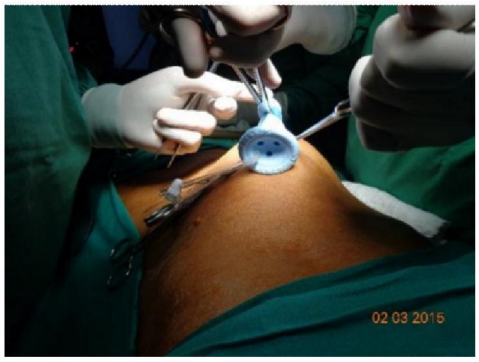

Figure 9: Insertion of SILS trocar (Covidien ®).

Figure 10: SILS trocar placed with pneumoperitoneum started from special channel.

Special roticulating instruments were used for dissecting, grasping and cutting (Covidien ®). All instruments were in a co-axial direction but the roticulating instruments designed for SISL facilitated dissection and manipulation of the mesh (Figure 12).

The patient was placed in a 30° Trendelenburg position, which caused the small bowel loop to move up and allowed for complete visualization of the surgical field with 5 mm, 30° scope.

After the inguinal hernia on the affected side was observed, the peritoneal incision was made in an arc from the pubic tubercle towards the iliac spine in order to create a lower flap.

Next, the hernia sac was dissected from the spermatic cord with monopolar hook, peanut or scissors, (Figure 13) and the hernia ring was covered with a 12 cm ×15 cm polypropylene mesh (Figures 14-16). Closure of the peritoneal flap was done with tacks (figures 17,18). After completion of the procedure, the abdomen was deflated, the SILS port removed and the fascia was closed with non-absorbable sutures and the skin incision was closed with subcuticular suture (figures 19,20).

Figure 11: Surgical team with co-axial instruments inside SILS port.

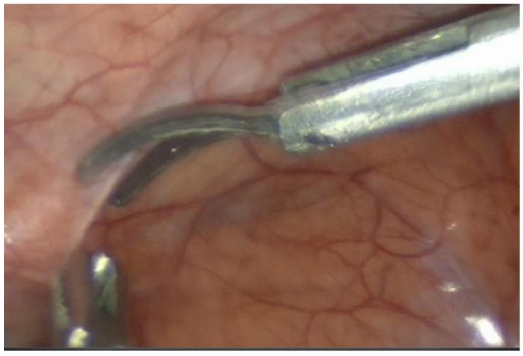

Figure 12: Peritoneal flapping, note roticulating scissors (Covidien ®).

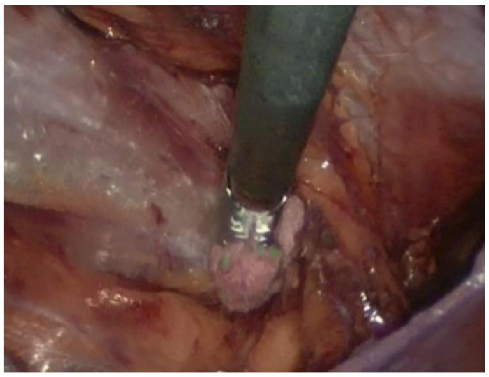

Figure 13: Dissection of hernia sac.

Figure 14: Insertion of mesh from SILS trocar.

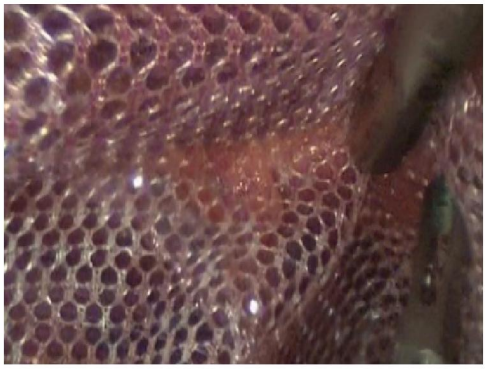

Figure 15: Mesh fixation by tacks.

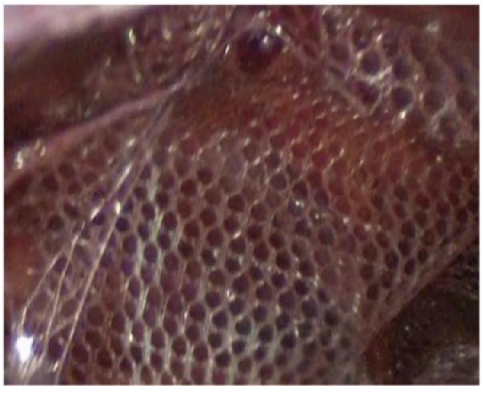

Figure 16: Completion of mesh fixation.

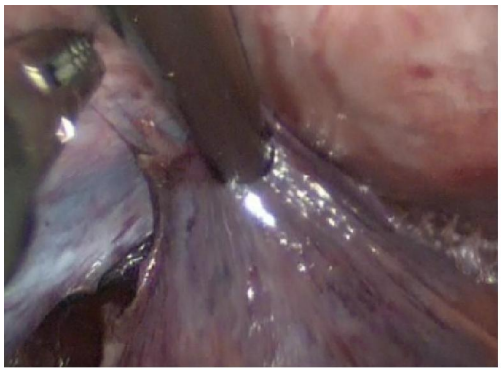

Figure 17: Closure of peritoneum.

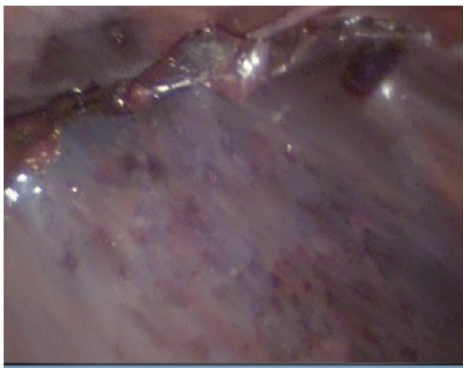

Figure 18: Peritoneum closed.

Figure 19: Cosmetic appearance of the

Figure 20: Another SILS patient. wound after subcuticular closure.

Results were tabulated and statistically studied using SPSS® v.16 software:

Chi square test, Mann-Whitney test, or student-t test as appropriate.

Numerical variables were presented as mean and SD or median and range as appropriate, while categorical variables were presented as frequency and percentage. Any difference with p value < 0.05 was considered statistically significant.

3. Results

Fifty two cases of TAPP were done and twenty five SILS-TAPP were done in this study. The following tables demonstrate the patient preoperative, intra-operative and post-operative criteria.

Table (1) Preoperative patient characteristics

Variables	TAPP	SILS-TAPP	*P* value
Number of cases	52	25	
Age in years	28 ± 5.4	30 ± 7.2	0.177
Males	50	15	<0.001
Females	2	10	
ASA I II	14 38	19 6	<0.001
BMI > 25 <25	47 5	8 17	<0.001

Table (2) Hernia type according to Nyhus classification

Hernia type	TAPP n=52	SILS-TAPP n=25	*P* value
Nyhus Type I (congenital hernia)	NA	NA	NA
Nyhus Type II (small indirect hernia)	24	10	0.808
Nyhus Type IIIa (direct hernia)	10	5	
Nyhus Type IIIb (large indirect hernia)	16	10	
Nyhus Type IIIc (femoral hernia)	1	0	
Nyhus Type IV (recurrent hernia)	1	0	

Table (3) Operative and postoperative data

	TAPP n=52	SILS-TAPP n=25	*P* value	Remarks
Operative time in minutes	76 ± 15	127 ± 37	<0.001	
Hospital stay in days	2.1±1.9	1.5±1.1	0.148	
Median pain score	3.4±1.4	2.3±0.8	<0.001	VAS*
Post-operative complications	5	3	0.709	
Early Recurrences	0	1	0.325	Port site hernia (after 18 monhs)

4. Discussion

Laparoscopy has revolutionized the practice of general surgery. Moreover, laparoscopy has assumed an important role as "the gold standard" in cholecystectomy and recurrent hernias. With less abdominal wall trauma, faster recovery, and better cosmetic results, laparoscopic surgery had undisputed advantages over open surgery (2).

In 1992 Arregui and Dion described the laparoscopic hernia repair using transabdominal pre-peritoneal TAPP technique for inguinal hernia repair. Hernioplasty is performed through 3-trocar access and consists of dissection of the peritoneal flap and mesh attachment at the hernia ring. The possibility to observe other pathologies within the abdominal cavity, visualization and treatment of a contralateral occult hernia are unquestionable advantages of this method (2).

Traditionally, in multiport (TAPP) approach, the operation involves the insertion of the optic trocar at the umbilicus and two ports bilaterally, lateral to the rectus muscles resulting into three scars (3). In SILS-TAPP, the same principals are maintained as in the multiport approach but with reduced number of incisions (4). The first internationally reported SILS-TAPP case was in 2009, since that time, a few studies here published to evaluate its safety and feasibility (2).

In this study, the author present his experience regarding SILS inguinal hernioplasty using transabdominal pre-peritoneal approach (SILS-TAPP) compared to multiport TAPP. The outcome, advantages and complications encountered in both approaches were highlighted. The study was carried out from January 2014 till December 2015 and all patients were operated by a single surgeon in a secondary level referral private hospital in Eastern province KSA and were followed for one year.

In this study, it was found that there was a statistically significant difference in the number of female patients with lower BMI preferring the SILS approach compared to their male counterpart due to its cosmetic appeal. The reason for the better cosmetic result of this approach may be attributed to the fact that the scar could be hidden in the umbilicus (3).

The TAPP repair is suitable for identification and management of inguinal hernia whether unilateral or bilateral, as compared to TEP, without the need of extra dissection of the spermatic cord (3).

In this study, there was no statistically significant difference between multiport TAPP and SILS-TAPP regarding the number or type of inguinal hernias treated by both techniques according to Nyhus classification. However, congenital hernias (Nyhus type I) were excluded from this study.

There are numerous types of SILS ports available in the market. In this study the author used the SILS port of Covidien®. This port is easy to use and does not require special training to assemble or insert.

The SILS-Port Covidien® is a flexible device for single-use with three open channels for the insertion of 5 – 12 mm trocars and one channel with a tube for gas supply. The widening at both ends allows a secure fit under the peritoneum and prevents dislocation into the abdomen (1).

The author used straight and curved instruments at the beginning of this series, then special roticulating instruments specially designed for SILS when available and this resulted into reduction in the total operative time and cost. The cost of the SILS port was also equivalent of that of 3 disposable ports used in the multiport TAPP.

This practice matches the recommendations of Sato *et al.* (3) who stated that the cross method using

the roticulating instruments in SILS reduces instrument clashing, emphasizing good coordination between surgeon and assistant (3). Inguinal hernia repair consumes a lot of healthcare resources because it has a high lifetime risk, 27% for men and 3% for women (5).

On the other hand, the operative time was statistically significantly longer in SILS-TAPP approach than multiport TAPP at the beginning of the study, but this did not add additional risks to the patients as shown by the incidence of post-operative complications. The operative time improved by the end of this case series as a result of improved skills and instrumentations.

The real challenge of SILS is to avoid conflict between the operative instruments and the camera, to maintain the pneumoperitoneum and reduce operative stress. As a result of the limited space with using only a single incision, it is difficult for the surgeon and the assistant to work together resulting into instrument collision (6).

In contrast to classic laparoscopy where the positioning, distance and triangulating ports are significant technical steps, in the case of SILS all the instruments are crowded and placed co-axial in the same spot. Not only that this ergonomic challenge entails collision between instruments and scope, but also diminishes dexterity results into difficulty exposing difficult structures (1, 2).

In this study the surgeon used to stand on the contralateral side of the hernia and the assistant on the opposite side to minimize instrument and hand collision (figure 11).

These technical difficulties are minimized with the experience of the surgeon, as studies show (2).

Apart from cosmesis, the only additional proposed advantage of SILS over traditional laparoscopy is less pot-operative pain (3). This was true in this current study as there was a statistically significant difference between SILSTAPP and multiport TAPP in favor of the SILS approach. The reason is apparently less trauma inflicted by single incision involving the abdominal wall versus multiple incisions (4).

However, in the SILS group there was a case of port site hernia after 18 months due to incomplete fascial closure, which resulted into re-admission of that patient for open repair. This was an overweight male patient, which emphasized our observation that SILS technique may require selecting patients with low BMI.

There was no statistically significant differences between both SILS-TAPP and multiport TAPP in post-operative hospital stay or post-operative wound complications.

As new specialized laparoscopic or Robotic instruments for SILS, which facilitate of the operator's work, and deflectable laparoscopic scopes allowing better visualization, are introduced to the market, aiming at overcoming the steep learning curve, one can assume that SILS will soon have wider application in some cases, where cosmetic results will be of great importance, despite technical difficulties discouraging many surgeons (1- 3).

Conclusion

Based on the results of this study, one can conclude that SILS-TAPP is a feasible and safe minimally invasive approach for non-complicated inguinal hernias, especially in patients with low BMI. It has better cosmetic appeal and less postoperative pain than multiport TAPP. On the other hand, multiport TAPP is more suitable in obese patients. SILS-TAPP should be done by experienced laparoscopic surgeons in SILS techniques using appropriate instruments.

References

1. Carus Thomas (2012). Single Port Laparoscopic Surgery, Advances in Laparoscopic Surgery, Dr Arshad Malik (Ed.), ISBN: 978-953-307-933-2, In Tech, Available from: http://www.intechopen.com/books/advancesinlaparoscopic surgery/single-port-laparoscopic-surgery.
2. Pesta *et al.* (2012) Single incision laparoscopic surgery transabdominal preperitoneal hernia repair – case report. Videosurgery and Other Miniinvasive Techniques. 7 (2): 137-139.
3. Sato et al (2012) The safety and usefulness of the single incision transabdominal preperitoneal (TAPP) technique for inguinal hernia. The Journal of Medical Investigation. Vol 59; 235-40.
4. Bower and Love (2011) Single incision laparoscopic ventral hernia repair. JSLS. 15:165–168.
5. D Abbas et al (2011) Frequency of abdominal wall hernias: is classical teaching out of date? R Soc Med Sh. Rep;2:5.
6. Prasad and Kaur (2012) Sils without Frills. Indian J Surg. 74(3):270–273.

1/16/2017