

# Should we use visual entry techniques in patients with previous laparotomies?

P. G. Paul<sup>1</sup> · Reena Garg<sup>1</sup> · Aditya S. Khurd<sup>1</sup> · Tanuka Das<sup>1</sup> · Manju Thomas<sup>1</sup> · K. T. Radhika<sup>1</sup>

Received: 26 April 2016 / Accepted: 14 June 2016 / Published online: 21 June 2016  
© Springer-Verlag Berlin Heidelberg 2016

**Abstract** Laparoscopic surgery has become the method of choice for treating an ever increasing number of gynaecological disorders that require surgery. However, primary port insertion is a potentially dangerous step especially in patients with previous laparotomies. The aim of this study is to identify whether visual entry technique has any advantage over the closed one in patients with previous laparotomies. This is a retrospective observational case control study of 2541 patients with previous laparotomies who underwent laparoscopic surgery from January 1992 to September 2003 at Vijaya Hospital, Kochi and from October 2003 to October 2015 at Department of Endoscopy, Paul's Hospital, Kochi, India. The control group comprised of 1261 patients, operated between January 1992 and September 2003 at Vijaya Hospital, Kochi, in whom closed technique of abdominal access for primary port creation was used. The study group

comprised of 1280 patients, operated between October 2003 and October 2015 at Department of Endoscopy, Paul's Hospital, Kochi, in whom visual entry (EndoTIP) was used for primary port creation. Procedures included in both groups were total laparoscopic hysterectomy, laparoscopic myomectomy, laparoscopic ovarian cystectomy, laparoscopic conservative surgery, laparoscopic tubal reanastomosis, laparoscopic sacrocolpopexy, laparoscopic sacrocervicopexy, laparoscopic adhesiolysis and laparoscopic sterilisation. There was no evidence of intestinal or vascular injury during visual entry using a blunt EndoTIP cannula. There were three cases of bowel injury with the closed, blind entry technique using a sharp linear trocar in the control group. The *p* value (Chi-square test) is 0.04, which is statistically significant. Visual entry, as an approach to abdominal access in patients with previous laparotomies, wherein chances of encountering peritoneal and bowel adhesions are very high, is safer than the closed blind entry technique in preventing bowel injuries.

✉ P. G. Paul  
drpaulpg@gmail.com

Reena Garg  
drreenagarg@gmail.com

Aditya S. Khurd  
adityakhurd@gmail.com

Tanuka Das  
das.tanuka@gmail.com

Manju Thomas  
manjumthomas@gmail.com

K. T. Radhika  
dradhikanambiar@gmail.com

**Keywords** Previous laparotomy · Visual entry · EndoTIP · Primary port

## Background

Laparoscopic surgery has become the modality of choice for treating an ever increasing number of gynaecological disorders that require surgery [1]. Major complications from gynaecologic laparoscopy are rare. However, abdominal access is a potentially dangerous step especially in patients with previous laparotomies [2–5]. These patients pose a higher risk of encountering adhesions between the anterior abdominal wall and underlying bowel and omentum. There are numerous reports of incidences of bowel and vascular injuries during primary port insertion using the conventional closed technique

<sup>1</sup> Centre for Advanced Endoscopy & Infertility Treatment, Paul's Hospital, Vattekkattu Road, Kaloore, Kochi, Kerala 682 017, India

[6, 7]. To minimise entry-related injuries, several techniques, instruments and approaches have been described. These include closed technique, open (Hasson's) technique, direct trocar insertion, shielded disposable trocars, optical Veress needle, optical trocars, radially expanding trocars and reusable visual access cannula [8–15].

We have been performing Laparoscopic procedures since 1992 and were using the closed technique for primary port insertion at the umbilicus; using a 10-mm pyramidal tip trocar. Carbon dioxide pneumoperitoneum with a pressure of 15 mmHg was created using a Veress needle at the umbilicus before inserting the primary port. We encountered few cases of bowel injury during primary port insertion in patients with previous laparotomies, and it prompted us to change our entry technique. Few studies have shown the superiority of visual entry techniques in reducing this complication [16, 17]. So we changed our technique of primary port insertion at the umbilicus to a visual entry technique using a threaded cannula in patients with previous laparotomies since 2003. The aim of this study is to identify whether visual entry technique has any advantage over the closed one in patients with previous laparotomies.

## Methods

This is a retrospective observational study of patients with prior laparotomies who underwent laparoscopic surgery from January 1992 to September 2003 at Vijaya Hospital, Kochi and from October 2003 to October 2015 at Paul's Hospital, Kochi, India. The institutional ethical committee of Paul's Hospital approved the study. Informed consent was obtained from all the patients for operative laparoscopy. All patients with previous laparotomies were included in the study.

From January 1992 till September 2003, the first author performed 5601 operative laparoscopic procedures at Vijaya Hospital, Kochi. Out of them, 1261 patients had history of previous laparotomies and this group served as the historical control group wherein the first author used the closed technique for primary trocar entry.

Seven thousand three hundred seventy-six patients underwent operative laparoscopy at Paul's Hospital from October 2003 to October 2015. Out of them, 1280 patients had previous laparotomies, in whom visual entry technique was used for primary port creation. All operations were performed by the first author.

## Surgical technique

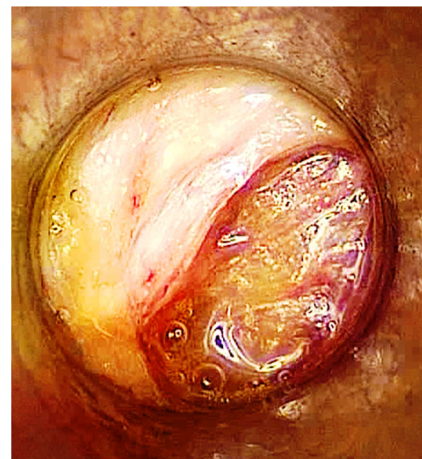
Pneumoperitoneum was created using Veress needle at the Palmer's point in both the groups. The site for primary port insertion was chosen to be intraumbilical in the case of patients with Pfannenstiel incision and pelvic masses less than

12 weeks in size and 4 cm supraumbilical in cases with mid-line vertical incisions and masses greater than 12 weeks size.

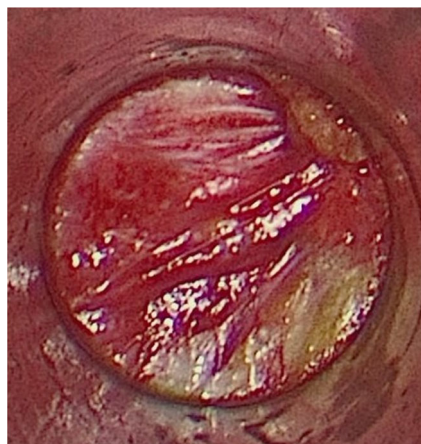
In the closed technique, primary port insertion was done with a 10 mm reusable pyramidal tip trocar. During the procedure, the anterior abdominal wall was lifted with the hand. Two ancillary 5-mm trocars lateral to the right and left epigastric vessels and a midline suprapubic trocar were inserted under vision.

In visual entry technique, primary port insertion was done by using Ternamian EndoTIP (Karl Storz, Tuttlingen) [15]. EndoTIP consists of a 10-cm hollow stainless steel cannula with a single thread winding diagonally on its outer surface without a sharp trocar. A telescope stopper is fixed 5–6 cm above from the tip of the 0° 10-mm telescope which maintains telescope at a fixed place so as to prevent uncontrolled movement of the telescope during introduction. A transverse or a vertical skin incision approximately 15 mm is made, and anterior rectus sheath is exposed. A small incision of 7 mm is made on the anterior rectus sheath, and the EndoTIP (along with 0° telescopes and camera) cannula's blunt end is engaged into the incision, and the cannula is rotated clockwise using the surgeon's left hand, using controlled rotating motion under vision (Fig. 1). Rotation is continued to traverse the rectus muscle and posterior rectus fascia until the translucent pre-peritoneal space is reached (Figs. 2, 3, 4). If the translucency of peritoneum is confirmed, then cannula is rotated further to open the peritoneum gradually under direct visual control. The surgeon stops the advancement of the cannula if adhesions, vessels or bowel are seen. In that case, the cannula is lifted slightly to disengage the cannula's blunt end and free rotated to enter a clear adhesion free area under visual control.

Procedures included in both groups were total laparoscopic hysterectomy, laparoscopic myomectomy, laparoscopic ovarian cystectomy, laparoscopic conservative surgery, laparoscopic tubal reanastomosis, laparoscopic sacrocolpopexy, laparoscopic sacrocervicopexy, laparoscopic adhesiolysis and laparoscopic sterilisation.



**Fig. 1** Picture showing the partially opened anterior rectus sheath with EndoTIP

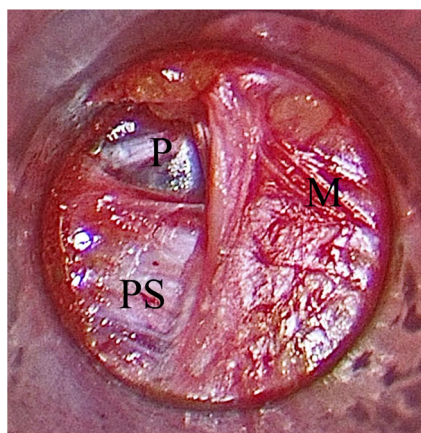


**Fig. 2** Picture showing the rectus muscle

Data regarding patient characteristics like age, body mass index (BMI), parity, history of previous surgeries, previous abdominopelvic infections and operative details, type of incision, number of surgeries, any previous post operative complications, presenting complaints, the present operative procedure, the characteristics of peritoneal adhesions encountered during abdominal access, intraoperative complications, post-operative events, conversion to laparotomy and duration of hospital stay were evaluated. Statistical analysis was performed using the Chi-square test.

## Findings

Patient characteristics are shown in Table 1. In the control group, the total number of patients operated was 1261. The mean [range] age of the patients was 41.36 [12–75] years. The mean [range] body mass index (BMI) was 25.34 [18–48]. Of all the patients, 71.4 % had one surgery, 22.4 % had two surgeries, 6.1 % had three or more surgeries previously. Anterior abdominal wall adhesions were found in 29.18 % (Omental—25.5 % and bowel adhesions—3.64 %) patients.



**Fig. 3** Picture showing the partially opened rectus muscle (*M*), posterior rectus sheath (*PS*) with underlying peritoneum (*P*)



**Fig. 4** Picture showing the translucent peritoneum with few small blood vessels

There were three cases of bowel injury during primary trocar insertion, where one required laparotomy conversion [Table 2].

In the study group, the total number of patients operated was 1280. EndoTIP insertion for primary port creation was performed on these patients. The mean [range] age was 40.23 [11–75] years, and mean [range] body mass index was 26.77 [16–43]. Of all the patients, 43.3 % had one surgery, 38.6 % had two surgeries and 18 % had three or more surgeries previously. Anterior abdominal wall adhesions were found in 48.4 % (Omental—42.9 % and bowel adhesions—5.46 %) patients. There was no incidence of intestinal injury during primary port establishment using EndoTIP. In the study group, there was no laparotomy conversion.

Patient characteristics of both the groups are comparable. The statistical analysis, comparing the incidence of adhesions and injuries encountered, was done using the chi-square test. Since the number of adhesions in the study group was higher than in the control group, the risk of injury in the study group was higher ( $p$  value  $< 0.001$ ). However, we did not have any injury in the study group using visual entry and had 3 cases of bowel injury in the control group using the closed technique. The results are significant statistically ( $p$  value = 0.040).

Details of patients who suffered bowel injury during entry using closed technique are as follows. The first patient who underwent diagnostic laparoscopy for evaluation of primary infertility had a previous laparotomy in childhood for suspected abdominal Koch's. It is not an uncommon condition in India and is characterised by dense omental and bowel adhesions to the anterior abdominal wall. After inserting the primary trocar, bowel lumen was seen. Dense adhesions between the abdominal wall and multiple small bowel loops were present. Laparotomy and bowel repair were done. The second patient had multiple fibroids and was planned for laparoscopic hysterectomy. She had two previous caesarean sections with midline scars. Small bowel adherent to the anterior abdominal wall in the midline and was injured during primary trocar entry. Total laparoscopic hysterectomy with bilateral



**Table 1** Patient characteristics

	Control group closed technique (Nos1261)	Study group EndoTIP (Nos1280)
Age (years)		
Mean (Range)	41.36(12–75)	40.23 (11–75)
BMI (kg/m <sup>2</sup> )		
Mean (range)	25.34(18–48)	26.77 (16–43)
Parity		
Celibate (%)	27(2.1 %)	5(0.4 %)
Nulligravida (%)	414(32.8 %)	102(8 %)
Parous (%)	820(65 %)	1173(91.6 %)
Patients with previous laparotomies		
Previous 1 laparotomy	900(71.4 %)	555 (43.3 %)
Previous 2 laparotomies	284(22.5 %)	494 (38.6 %)
Previous 3 or more laparotomies	77(6.1 %)	231(18 %)
Anterior abdominal wall adhesions	368(29.18 %)	620(48.4 %)
Omental adhesions	322(25.5 %)	550(42.9 %)
Bowel adhesions	46(3.64 %)	70(5.46 %)
No adhesions	893(70.82 %)	660(51.56 %)
Entry complications (Bowel injuries)	3	0

salpingo-oophorectomy, followed by laparoscopic repair of the single entry wound on the bowel was performed. The third patient was planned for laparoscopic salpingectomy for symptomatic bilateral hydrosalpinx. She had undergone two previous caesarean sections and an open appendectomy with midline scar. Primary trocar went through and through the small bowel loop adherent to the umbilicus. Laparoscopic bilateral salpingectomy and small bowel repair were done. All three patients had an uneventful recovery.

## Discussion

Primary trocar entry can be potentially dangerous in patients with previous laparotomies because of the risk of injuring the bowel due to adhesions to the anterior abdominal wall. Various techniques and approaches have been proposed to avoid these injuries. Current data regarding the safety of any single method are lacking [18, 19]. We used reusable EndoTIP for visual entry in such high-risk patients with previous surgeries, as we prefer reusable instruments for our laparoscopic surgeries.

In a study of 360 women who had previously undergone laparotomies, Brill et al. found that adhesions were present between the anterior abdominal wall and underlying omentum or bowel in 27 % of patients with pfannenstiel incision, 55 % of patients after midline incision below the umbilicus and 67 % of patients with midline incisions above the umbilicus [20]. Leverant et al. studied 215 patients who underwent the laparoscopic procedure for gynaecologic indications. They

reported no anterior abdominal wall adhesions in patients with the previous laparoscopy. Fifty-nine percent of patients with a vertical midline incision and 28 % of patients with pfannenstiel incision had adhesions to the anterior abdominal wall [21]. We also found an incidence of 29.18 and 48.4 % peri-umbilical adhesions in the control group and the study group, respectively. The statistical analysis comparing the incidence of adhesions in the two groups showed a relative risk of 1.373 [95 % CI 1.936–2.685] signifying the higher chances of having bowel injury in the study group. The study group had three times more number of previous laparotomies (18 %) as compared to the control group (6.1 %). Also, the study group had a higher BMI than the control group. In spite of all these compounding high risk factors, the incidence of inadvertent primary entry injury in the study group remains nil.

In our study, we encountered three bowel injuries during primary port entry using the closed technique in a total of 1261 patients (control group) who were high risk for intra-abdominal adhesions due to their prior surgeries. However, no case of any injury was found in 1280 high-risk patients (study group) in whom visual entry technique was used for primary port entry. All three patient's bowel injuries were recognised and repaired intraoperatively. Bowel injuries have gone undetected at the time of laparoscopy in 10 to 25 % of cases [22, 23], and the mortality from an undiagnosed trocar injury is 33 % [23]. Recognising surgical errors and repairing them in real-time are vital, as opposed to delay in recognition and repair; as time is a very important and a critical element, when it comes to bowel and vascular injuries. Although surgeons will never be able to avoid all surgical incidences, they

**Table 2** Details of patients with bowel injury

No.	Year	Age (years)/ B.M.I.(kg/m <sup>2</sup> )	Previous surgeries	Diagnosis	Entry method	Injury	Laparoscopic surgery performed
1	1999	30/21	1 (Laprotomy for abdominal Koch's disease)	Primary infertility	Closed	Dense adhesions between the abdominal wall and multiple small bowel loops. Single primary trocar entry wound on the bowel	Diagnostic laparoscopy, laparotomy & repair of small bowel injury
2	2001	46/27	2 (LSCS)	Multiple fibroids	Closed	Small bowel adherent to the anterior abdominal wall in the midline. Single primary trocar entry wound on the bowel.	TLH with BSO with laparoscopic repair of small bowel injury
3	2003	45/26	3 (LSCS-2, appendicectomy-1)	Bilateral hydrosalpinx	Closed	Small bowel adherent to the umbilicus. Primary trocar went through and through the bowel	Laparoscopic adhesiolysis and bilateral salpingectomy with laparoscopic repair of small bowel injury

LSCS lower segment caesarean section, TLH with BSO total laparoscopic hysterectomy with bilateral salpingo-oophorectomy

are expected to recognise and remedy their errors, as soon as possible.

Reich et al. first advocated a high insufflation pressure (HIP) method for peritoneal entry, wherein a high intra-abdominal pressure of 30 mmHg is created using a Veress needle followed by insertion of a trocar in the deepest part of the umbilicus without elevation of the anterior abdominal wall. The high-pressure setting used is lowered as soon as safe abdominal entry is documented. The high pressure generates a greater distance between the peritoneum and large abdominal vascular structures, allowing a safer umbilical trocar insertion. In addition, the straight down initial thrust avoids bowel stuck immediately below the umbilicus. In spite of these safety measures, they encountered two primary trocar bowel injuries in 3041 procedures [24]. Vilos et al. in their study encountered one injury in 2498 procedures [25]. Molloy et al. reported on a review of 51 publications including Veress/trocar, open and direct entries. Entry-related bowel injury rates were 0.04 % (Veress/trocar), 0.11 % (open) and 0.05 % (direct entry); corresponding vascular injury rates were 0.04 %, 0.01 % and 0 %, respectively [26]. Hashizume et al. have reported needle and trocar entry injuries in 156 patients in a series of 17,626 patients who underwent operative laparoscopy in Japan [2].

The open entry technique has a lower incidence of vascular injury but a potentially higher chance of bowel injury [3, 25]. Chaperon et al. reported bowel injury rates as 0.04 % with the closed method and 0.19 % with open method of laparoscopic access [3]. Merlin et al. systematically reviewed various entry techniques used by surgeons and gynaecologists for the primary port creation and found that the major complications during access were bowel injuries. They opined that the higher risk, seen with open technique than with closed method, may have been influenced by patient selection bias [27].

A recent Cochrane review on laparoscopic entry techniques, which included 46 RCTs and evaluated 13 entry techniques, concluded that there is insufficient evidence to recommend one laparoscopic entry technique over another with regards to difference in the incidence of visceral or vascular injury. They also opined that these studies had small numbers and excluded many patients with previous abdominal surgery and women with raised BMI, and these patients may have unusually high complication rates [28]. Ray Garry's commentary on the previous 2008 Cochrane review states that inadequacy of the size of the various studies analysed inevitably led to the conclusion that there is no evidence of benefit in terms of safety of any technique [29]. This holds true even for the recent 2015 Cochrane review.

Our incidence is higher than these studies because our group is entirely a high-risk group of patients with prior laparotomies. Most published peritoneal entry articles exclude high-risk patients from their statistics. The existence of learning curve for laparoscopic surgeons is a proven fact. The higher incidence in the control group cannot be attributed to

the inexperience of the surgeon in the earlier part of the study as the surgeon already had 8 years experience of successfully performing more than 10,000 laparoscopic sterilisations even before the study period.

We did not encounter any case of bowel injury in the study group which had more patients with three or more previous laparotomies (18 %) as compared to the control group (6.1 %). This can be attributed to the use of visual entry method in the study group.

We used EndoTIP for visual entry as it is a reusable visual cannula without a sharp trocar. In our center, we try to use reusable instruments as far as possible to make the procedure cost-effective. The advantages of this visual entry technique are the elimination of axial penetration force, the absence of a sharp trocar and a visually controlled entry. Another benefit of this technique is its ability to video capture the cannula, tissue and force interface. Thereby, it offers the unique ability of archiving primary port entry mishaps for replay, error analysis and accident causation investigation in real time [30]. In patients with high BMI, the Endotip trocar can go oblique while negotiating the abdominal wall layers and therefore to avoid such difficulty, it should always be kept perpendicular to the abdominal wall [31, 32].

Limitation of our study is its retrospective design and less number of patients. Since the bowel injury during primary port creation is a very rare complication, the study needs a large number of patients to make a significant correlation.

## Conclusion

Visual entry, as an approach to abdominal access in patients with previous laparotomies, wherein chances of encountering peritoneal and bowel adhesions are very high, is safer than the closed blind entry technique in preventing bowel injuries.

**Contributions of authors** Dr. P. G Paul, operating surgeon, has contributed in planning and conducting of the research work. Dr. Reena Garg has contributed in planning the concept and design of the study, data collection and analysis and preparation of the manuscript. Dr. Aditya S Khurd has contributed in the data collection, analysis and preparation of the manuscript. Dr. Tanuka Das has contributed in the data collection and analysis. Dr. Manju Thomas and Dr. Radhika KT have contributed in the preparation of the manuscript.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest. The authors alone are responsible for the content and writing of the paper.

**Ethics approval** The study was formally approved by ethical committee of Paul's Hospital, Kochi, Kerala, India.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

## References

- Garry R (1999) Towards evidence based laparoscopic entry techniques: clinical problems and dilemmas. *Gynaecol Endosc* 8:315–326
- Hashizume M, Sugimachi K (1997) Needle and trocar injury during laparoscopic surgery in Japan. Study group of endoscopic surgery in Kyushu, Japan. *Surg Endosc* 11:1198–1201
- Chapron CM, Pierre F, Lacroix S, Querleu D, Lansac J, Dubuisson JB (1997) Major vascular injuries during gynecologic laparoscopy. *J Am Coll Surg* 185:461–465
- Jansen FW, Kolkman W, Bakkum EA, de Kroon CD, Trimbos-Kemper TCM, Trimbos JB (2004) Complications of laparoscopy: an inquiry about closed versus open-entry technique. *Am J Obstet Gynecol* 190:634–638
- Magrina J (2002) Complications of laparoscopic surgery. *Clin Obstet Gynecol* 45:469–480
- Fuller J, Scott W, Ashar B, Corrado J (2005) Laparoscopic trocar injuries: a report from a U.S. Food and Drug Administration (FDA) Center for Devices and Radiological Health (CDRH) Systematic Technology Assessment of Medical Products (STAMP) Committee 1–14
- Philips PA, Amaral JF (2001) Abdominal access complications in laparoscopic surgery. *J Am Coll Surg* 192(4):525–536
- Palmer R (1974) Safety in laparoscopy. *J Reprod Med* 13:1–5
- Hasson HM (1971) A modified instrument and method for laparoscopy. *Am J Obstet Gynecol* 110:886–887
- Dingfelder JR (1978) Direct laparoscopic trocar insertion without prior pneumoperitoneum. *J Reprod Med* 21:45–47
- Nezhat FR, Silfen SL, Evans D, Nezhat C (1991) Comparison of direct insertion of disposable and standard reusable laparoscopic trocars and previous pneumoperitoneum with veress needle. *Obstet Gynecol* 78:148–150
- McGurgan P, O'Donovan P (1999) Optical veress as an entry technique. *Gynaecol Endosc* 18:379–392
- Kaali SG (1993) Introduction of the Opti-trocar. *J Am Assoc Gynecol* 1:50–53
- Turner DJ (1999) Making the case for the radially expanding access system. *Gynaecol Endosc* 8:391–395
- Temamian AM (1997) Laparoscopy without trocars. *Surg Endosc* 11:8159–8168
- Marret H, Harchaoui Y, Chapron C, et al. (1998) Trocar injuries during laparoscopic gynaecological surgery. Report from the French Society of Gynaecological Laparoscopy. *Gynaecol Endosc* 7:235–241
- Mettler L, Ibrahim M, Vinh VQ, Jonat W (1997) Clinical experience with an optical access trocar in gynecological laparoscopy-pelviscopy. *J Soc Laparoend Surg* 1:315–318
- Vilos GA, Temamian A, Dempster J, Laberge PY, The Society of Obstetricians and Gynaecologists of Canada (2007) Laparoscopic entry: a review of techniques, technologies, and complications. *J Obstet Gynaecol Can* 29:433–465
- Ott J, JaegerLansky A, Poschalko G, Promberger R, Rothschedl E, Wenz R (2012) Entry techniques in gynecologic laparoscopy—a review. *Gynecol Surg* Volume 9, Issue 2, : 139–146
- Brill AI, Nezhat F, Nezhat CH, Nezhat C (1995) The incidence of adhesions after prior laparotomy: a laparoscopic appraisal. *Obstet Gynecol* 85:269–272
- Levrant SG, Bieber EJ, Barnes RB, et al. (1997) Anterior abdominal wall adhesions after laparotomy or laparoscopy. *J Am Assoc Gynecol Laparosc* 4(3):353–356
- Brosens I, Gordon A (2001) Bowel injuries during gynecological laparoscopy: a multinational survey. *Gynaecol Endosc* 10:141–145

23. Bhoyrul S, Vierra A, Nezhat CR, Krummel T, Way LA (2000) Trocar injuries in laparoscopic surgery. [abstract no O-145]. *Fertil Steril* 73(suppl 1):S55
24. Reich H, Robeiro SC, Rasmussen C, Rosenberg J, Vidali A (1999) High-pressure trocar insertion technique. *J Soc Laparoendosc Surg* 3:45–48
25. Vilos GA, Vilos AG, Abu-Rafea B, et al. (2009) Three simple steps during closed laparoscopic entry may minimize major injuries. *Surg Endosc* 23:758–764
26. Molloy D, Kalloo PD, Cooper M, Nguyen TV (2002) Laparoscopic entry: a literature review and analysis of techniques and complications of primary port entry. *Aust N Z J Obstet Gynaecol* 42:246–254
27. Merlin T, Hiller J, Maddern G, Jamieson GG, Brown AR, Kolbe A (2003) Systematic review of the safety and effectiveness of methods used to establish pneumoperitoneum in laparoscopic surgery. *Br J Surg* 90:668–670
28. Ahmad G, Gent D, Henderson D, O'Flynn H, Phillips K, Watson A (2015) Laparoscopic entry techniques. *Cochrane Database Syst Rev* 8:CD006583. doi: 10.1002/14651858.CD006583.pub4
29. Garry R (2009) Surgeons may continue to use their chosen entry technique. *Gynecol Surg* 6:87–92
30. Ternamian AM, Vilos GA, Vilos AG, Abu-Rafea B, Tyrwhitt J, MacLeod NT (2010) Laparoscopic peritoneal entry with the reusable threaded visual cannula. *J Minim Invasive Gynecol* 17(4):461–467
31. Ternamian AM, Deitel M (1999) Endoscopic threaded imaging port (EndoTIP) for laparoscopy: experience with different body weights. *Obes Surg* 9(1):44–47
32. Ternamian A (2012) Laparoscopic abdominal entry by the Ternamian threaded visual system. In: Tinelli A (ed) *Laparoscopic entry—traditional methods, new insights and novel approaches*. Springer-Verlag, London Limited, pp. 33–60