

DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20174038>

Original Research Article

Risks and benefits of two different entry techniques for laparoscopic gynecological surgeries

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Received: 24 June 2017

Revised: 09 July 2017

Accepted: 24 July 2017

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ABSTRACT

Background: Primary abdominal access still remains a challenge for laparoscopic surgery despite rapid advances. This study was conducted to prospectively analyse and compare risks and benefits of two different entry techniques namely, veress needle and direct trocar in laparoscopic gynaecological surgeries so as to obtain consensus on the optimal method to be followed to create pneumoperitoneum.

Methods: This was a prospective randomized study conducted at Deen Dayal Upadhyay hospital, under Delhi government. During the period January 2014 to June 2016, 800 patients (20-65 years) operated laparoscopically by the same team of surgeons for various gynaecological conditions, were randomized in two groups: Veress needle group (VN) and Direct trocar group (DT). Each group comprised of 400 patients. Comparison of various parameters was done between the two groups.

Results: Incidence of major complications in terms of visceral injuries was 0.75% (3/400) in DT group and nil in VN group. Open conversion rate (2/400 i. e. 0.5%) and number of attempts required to create pneumoperitoneum were also more in DT group. Failed access in previous surgery cases was 1.2% (1/38) in VN and 14.8% (4/27) in DT group. Incidence of port site bleeding (n=3) was also more in DT group. Although the incidence of minor complications such as extraperitoneal insufflations (n=5) and no. of failed access (n=6) were more in VN group, there was no incidence of any life-threatening complication.

Conclusions: In our experience, there is clear evidence of advantage of using veress needle in preventing major complications. Veress needle is therefore safer, convenient and effective technique of creating pneumoperitoneum.

Keywords: Direct Trocar, Laparoscopy, Pneumoperitoneum, Veress needle

INTRODUCTION

Over the past decades rapid advances have been made in laparoscopic surgery in terms of skills and technology but the primary abdominal access still remains the main challenge facing the surgeon. The primary access complication rate has not decreased significantly over the past 25 years.¹ 50% of laparoscopic major complications are related to primary access.² The veress needle is the

oldest method among various techniques practiced.³ Direct trocar insertion is a faster and one step procedure. However, being a blind procedure, it does not eliminate the risk of bowel and vascular injury.^{4,5} Overall incidence of major injuries at the time of laparoscopic entry is 1.1 per 1000.⁶ According to a recent Cochrane database of systematic reviews published in Cochrane library 2015, there was no evidence of advantage using any single technique for preventing major vascular or visceral

complications. Due to imprecision and lack of reporting of study methods the evidence obtained was of poor quality.⁷ The controversy regarding the best and safest method for the creation of pneumoperitoneum still persists, and every laparoscopic surgeon wants to know the safest entry technique to be followed. So, in this study risks and benefits of two different entry techniques commonly practiced by gynaecologists are analysed.

METHODS

This is a prospective study of 800 patients, aged 20-65 years, who underwent laparoscopic surgeries for various indications in the gynaecology department of Deen Dayal Upadhyay Hospital during January 2014 to June 2016. The ethics committee of the hospital approved the study protocol. The surgeries were performed by the same team of surgeons having experience in laparoscopy. Patients had given informed, written consent to undergo laparoscopic surgery and for enrolment in the study. 400 cases were allotted to veress needle entry (VN-Group A) and 400 cases to direct trocar entry (DT-Group B). The method was selected by closed envelope method of randomization.

Patients with previous abdominal surgeries with transverse suprapubic and low midline scar as well as obese patients (BMI up to 40 kg/m²) were included in the study if they were fit for anaesthesia. All patients with vertical midline or paramedian scar reaching up to umbilicus were excluded. In both groups after pre-anaesthetic fitness and pre-op preparation, patient was given general anaesthesia and then placed in modified lithotomy position, with operating table in horizontal position.

For veress needle entry, after checking its patency and spring action, a 5mm skin incision was given in the umbilical area in mid sagittal plane. The anterior abdominal wall was lifted in the midline with one hand and with the other dominant hand; veress needle was grasped at its shaft like a dart. With gentle progressive pressure exerted by dorsiflexion of the wrist, the tip of veress needle was advanced through various layers of abdominal wall, avoiding any lateral deviation. The angle of veress needle varied from 45° in thin to 90° in very obese patients. There was a sensation of initial resistance, followed by a giveaway sensation at two points;

corresponding to anterior and posterior rectus sheath. As the needle entered the peritoneal cavity, a distinct click could be heard as the blunt tip portion of needle springs forwards into the peritoneal cavity. To confirm proper placement of veress needle, aspiration- instillation test was done in all cases. For this 10ml syringe containing 5 ml saline was connected to the veress needle. Here precaution was taken, not to move the tip of veress needle inside the abdomen. First, aspiration was done to assess whether any blood, bowel or urine contents enter the barrel of the syringe. When nothing came out, 5 ml of saline was instilled, which flowed into the abdominal cavity without resistance if the needle was intraperitoneal. Aspiration was done again and if peritoneal cavity was truly reached no saline returned. The syringe was disconnected from veress needle and insufflation line connected to it. CO₂ insufflation started at 1 litre per minute. An initial intra-abdominal pressure less than 10 mm Hg further confirmed correct placement of veress needle. When intra-abdominal pressure reached 12-14 mm Hg, the veress needle was removed and primary trocar introduced after enlarging the incision. The two safety tests to confirm proper placement of veress needle as described above, were followed stepwise in all cases.

For direct trocar entry patient was placed in modified-lithotomy position. An 11mm incision was given in periumbilical area in mid sagittal plane. Anterior abdominal wall was lifted with non-dominant hand of surgeon or with the help of an assistant. Trocar of 10mm was inserted at an angle of 45° to 90° depending on the build of patient, with twisting semi-circular motion through skin incision. Entry into the peritoneal cavity was felt by the surgeon by feeling of giveaway sensation. The correct position of inserted trocar was confirmed by introducing laparoscope and direct visualisation of the abdominal contents before insufflation is started. Data analysis was performed using Chi-square test and Student’s T test. Significant P value was <0.001.

RESULTS

Out of 800 laparoscopic surgical procedures performed over the time period of two and half years, laparoscopic tubal occlusion was the commonest procedure (629) followed by laparoscopic hysterectomy (94) as shown in Table 1.

Table 1: Indications of surgery.

Indication	VN (n=400) Frequency	DT (n=400) Frequency	Total	%
B/L Tubal occlusion	310	319	629	78.6
Total Laparoscopic Hysterectomy	50	44	94	11.75
Diagnostic Laparoscopy with chromotubation	22	26	48	6
Diagnostic Laparoscopy with misplaced IUCD	6	4	10	1.25
Laparoscopic ovarian cystectomy	9	5	14	1.75
Laparoscopic tubal recanalization	3	2	5	0.625
Total	400	400	800	100

There were 65 patients (8.1%) having previous abdominal scar. 38 were in VN group and 27 in DT group (Table 2). There was no failure in cases of previous 1 surgery in either group. In cases of previous 2 surgeries

there was only 1 failure in VN group (1.2%) whereas there were 4 failures (14.8%) in DT group. Thus, VN technique was found to be significantly more successful in cases of previous abdominal scar.

Table 2: Distribution of patients with previous abdominal scar and no. of failed entry.

Group	No. of failure/ No. of 1 LSCS	No. of failure/ No. of 2 LSCS	No. of failure/ previous Minilap	No. of failure/ others	Total	% of failure
VN	0/26	1/6	0/4	0/2	1/38	1.2
DT	0/20	4/4	0/2	0/1	4/27	14.8

Table 3: Distribution of patients according to BMI.

BMI (kg/m ²)	Normal Weight (18.5-25)	Overweight (25-30)	Obese class I (30-35)	Obese class II (35-40)	Frequency of failure	%
No. of failure/Total cases VN	2/310	2/76	1/12	1/2	6/400	1.5
No. of failure/Total cases DT	0/304	1/82	2/13	1/1	4/400	1

Distribution of patients according to BMI is shown in Table 3. 19% (76) of the patients were overweight (BMI: 25-30) and 3.5% (14) were obese (BMI: 30-40) in VN group. Failure to access occurred only in 2 obese patients in the VN group. There were 3 failures in obese patients in DT group.

Complication distribution

In our study, the total complication rate was found to be 3% (n=12) in DT group as compared to 2.7% (n=11) in

VN group. The incidence of complications can be seen in Table 4. In a study conducted by Jiang et al, meta-analysis of 7 randomized trials was done and concluded that VN entry technique carried significantly higher risk of complications as compared to DT entry.

8 Similar results were reported in a randomized control trial by Muneer et al. Both these studies concluded higher total complication rate with VN group. 9 But in our study, total complication rate was more in DT group than VN group.

Table 4: Incidence of complications.

Complications	Type of entry				P value
	VN		DT		
	Frequency	%	Frequency	%	
Visceral injury	0	0	3	0.75	0.249
Vascular injury	0	0	0	0	-
Conversion to laparotomy	0	0	2	0.5	0.499
Failed entry	6	1.5	4	1	0.752
Extra peritoneal insufflation	5	1.25	0	0	0.062
Port site bleeding	0	0	3	0.75	0.249
Total	11	2.7	12	3	0.832

Visceral injuries

In present study, visceral injuries occurred in 3 cases (1 small bowel and 2 omental injuries) in the DT group incidence being 0.75% (n=3). There was no incidence of visceral injury in VN group (n=0).

Vascular injuries

There was no incidence of vascular injuries in either group in present study. In the Cochrane review, there was a lower risk of vascular injury in the DT group.⁷

Table 5: No. of Attempts.

No. of attempts	Type of entry				P value
	VN		DT		
	Frequency	%	Frequency	%	
1	338	84.5	284	71	
2	62	15.5	74	18.5	
3	0	0	42	10.5	< 0.001
	400	1	400	1	

Number of attempts

Veress needle entry was successful in the first attempt in 84.5% of cases whereas direct trocar entry was successful in 71% of cases, the difference being statistically significant. This is shown in Table 5.

Failed access

Failure to create pneumoperitoneum was declared after 3 attempts after which another method (open method) or different site was tried. 6 cases of failed entry occurred in the VN group (1.57%) whereas 4 cases of failed entry occurred in DT group (1%). Out of the 6 cases of failed entry in VN group, 1 was extremely obese (BMI=39), 1 was previous 2 surgeries and 4 had EPI. In the DT group, all 4 cases of failed access had a history of 2 previous abdominal surgeries. Thus, although higher incidence of failed entry occurred in VN group it was more successful in cases with previous abdominal surgeries. In a study by Roberto Angilio et al, in 2013, 2.07% (4/193) cases of failed entry with VN and 0.52% (1/183) cases occurred with DT.¹⁰ Muneer et al found no cases of failed entry in either group.⁹

Extra-peritoneal insufflations (EPI)

There was no incidence of EPI in the DT group whereas EPI occurred in 5 cases in VN group (1.25%). This difference was found to be statistically insignificant. There was also no incidence of subcutaneous emphysema or gas embolism in either group. In a study by Ahmed et al no case of EPI with DT and 5.9% with VN out of which 3.4% cases of subcutaneous emphysema and 2.5% cases of preperitoneal insufflation.⁷ Similar results were found by Roberto Angilio et al in 2013.¹⁰ No events were recorded for mortality or gas embolism.

Conversion to laparotomy

In our study rate of conversion to laparotomy was 0.5% (2/400) in DT group. One case was of small bowel injury, diagnosed intra-operatively, in which laparotomy was done to repair the bowel. In second case, omental injury occurred by trocar and bleeding could not be controlled laparoscopically, so laparotomy was done. Both patients

were discharged in satisfactory condition on day 7. No case required conversion in VN group.

Time taken to create pneumoperitoneum

In our study mean time to create pneumoperitoneum was 103.60±51 seconds in DT group and 162.49±43 seconds in VN group. Roberto Angilio et al found the mean time taken was 71 sec (25-103) with DT and 212 sec (120-198) with VN.¹⁰ Results are comparable with previous studies in terms that VN required more time to create pneumoperitoneum.

DISCUSSION

We compared the two laparoscopic entry techniques in terms of safety and efficacy in order to obtain consensus as to which is the optimal method of entry into the peritoneal cavity for laparoscopic gynecological surgeries.

The study was conducted at a government hospital of Delhi, where laparoscopic gynaecological surgeries are performed in large numbers and so we had a good study group to analyse and compare the two most commonly practiced entry techniques. In a similar study conducted by Nezhat et al, patients with history of past abdominal surgery were excluded.¹¹ In our study, patients with previous low vertical or transverse scar were included. Contrary to the earlier studies, the results of our study showed that, the oldest method of veress needle entry was found to be safer, when proper technique and recommended steps were followed.² There was evidence of advantage of using veress needle in terms of preventing major visceral injuries. It was successful in majority of cases in first attempt and no case required conversion to laparotomy. Although the incidence of extraperitoneal insufflations was more with this technique, it can be further reduced if stepwise aspiration- instillation test, followed by checking initial intra-abdominal pressure (<10 mmHg) is done in all cases to confirm proper placement of veress needle. Previous prospective studies have also concluded that intra-abdominal pressure of 10 mmHg or below indicated correct placement of veress needle regardless of women's body habitus, parity and age.¹²⁻¹⁴ 9.5% (38) of the patients had previous abdominal scar (transverse suprapubic or low vertical) in this group and this technique was found

to be safe and successful in these cases also, if precise operative technique was deployed. No significant difference was observed in failure to access in both groups in obese patients.

CONCLUSION

In conclusion, the study shows benefits with the use of veress needle as compared to direct trocar entry technique when performed by surgeon having experience in laparoscopy. Use of veress needle for creating pneumoperitoneum clearly showed superior benefits of no incidence of life threatening visceral and vascular injuries. The benefits of minimally access surgery could be given to the patient as no conversion to laparotomy was required. It was safe and more successful in cases of previous abdominal surgery as well as in obese patients and in the first attempt. We recommend that this old technique using veress needle should be used more frequently, as a preferred method to create pneumoperitoneum in various laparoscopic procedures. However, we recommend studies with larger sample size to further evaluate its safety and outcome as no single technique or instrument has been proven to eliminate injury associated with laparoscopic entry. Proper evaluation of the patient, supported by good surgical skills and reasonably good knowledge of the technology of the instruments remain to be the cornerstone for safe access and success of minimal access surgery.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Agarwal P, Yadav R, Agarwal A. Risks and benefits of two different entry techniques for laparoscopic gynecological surgeries. Int J Reprod Contracept Obstet Gynecol 2017;6:3932-6.