

Original Research Article

Intraperitoneal access by closed method (veress needle) versus open (Hasson's) method in laparoscopic surgery to create pneumoperitoneum

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ABSTRACT

Background: Access into the abdomen is the one challenge of laparoscopy that is particular to the insertion of surgical instruments through small incisions. In the last three decades, rapid advances in laparoscopic surgery have made it an invaluable part of general surgery, but there remains no clear consensus as to an optimal method of entry into the peritoneal cavity. The objective of this study was to study the comparison and efficacy between closed (veress needle) and open method (Hasson's) of intraperitoneal access to create pneumoperitoneum in laparoscopic surgeries.

Methods: All patients >18 year undergoing laparoscopic procedure at Sir Sayajirao Gaekwad Hospital attached to Medical College Baroda from November 2015 to November 2016, and include 160 patients. This was Prospective study and total 160 cases of Laparoscopic surgery was taken in 1-year period. Methods used to create pneumoperitoneum were of surgeon's choice in each case. Cases were performed by one method more than other method (63 patients by veress needle and 97 by open method). Student t test (two tailed, independent) had been used to find the significance of study parameters on continuous scale between two groups. All data were entered in Microsoft Excel sheet. Data calculation was done in software - Microsoft Excel and Medcalc statistical software 16.8.4.0.

Results: The Mean operative time for access in veress needle group was 5.12 mins as compared to open method where it was 3.94 mins. Port site Gas leakage was slightly more in open method. There were no any major complications occurred in any group. There were minor complications occur in both methods at access like; omental injury, port site gas leakage, extra-peritoneal insufflations, loss of space and entry in wrong plane.

Conclusions: For intraperitoneal access in laparoscopy, both the closed and the open methods are safe and the open technique had a time advantage over the closed method.

Keywords: Hasson's method, Pneumoperitoneum, Veress needle

INTRODUCTION

Laparoscopy (Gr: Laparo - abdomen, scopein-to examine) is the art of examining the abdominal cavity and its contents. It requires insertion of a cannula through the abdominal wall, distention of the abdominal cavity with gas or air (pneumoperitoneum), and visualization and examination of the abdomen's contents with an illuminated telescope. Creation of the pneumoperitoneum

is the first and most critical step of laparoscopic procedure because that access is associated with injuries to the gastrointestinal tract and major blood vessels and at least 50% of these major complications occurs prior to commencement of the intended surgery. This complication rate has remained the same during the past 25 years.^{1,2} The number of vascular injuries in laparoscopy is 2 in 10,000 procedures and a serious complication associated with mortality occurs in 3.3 per

1,00,000.^{3,4} Rapid advances in laparoscopic surgery have made it an invaluable part of general surgery, but there remains no clear consensus as to an optimal method of entry into the peritoneal cavity.

METHODS

All patients >18 years undergoing laparoscopic procedure at Sir Sayajirao Gaekwad Hospital attached to Medical College Baroda from November 2015 to November 2016, and include 160 patients. Patients with previous abdominal and any laparoscopic / open Hernia surgeries and local skin infection were excluded. This was Prospective study and Methods used to create pneumoperitoneum were of surgeon's choice in each case. Cases were performed by one method more than other method (eg, by open method 97 cases but by closed method only 63 cases) in one-year period. A written informed consent was obtained from patients to be included in the study and data collected on printed Proforma included eg: Age, history of related complaints, history of previous abdominal surgery, obesity and concomitant diseases (diabetes, hypertension). The procedure was done under general anesthesia. The patient was catheterized and prophylactic antibiotic was given at the time of induction of anesthesia. Now next step was to create pneumoperitoneum which was done by any of two methods by veress needle (closed method) or open (Hasson's) depending on feasibility.

Veress needle puncture is in the midline of the abdomen near the umbilical scar. The length of the Veress needle that should be inserted in the abdominal cavity is not specified in any scientific report. The use of a click sound associated with the springing forward of the blunt stylet is recommended to determine when to stop advancing the needle. Unfortunately, the quality of the sound is not always reliable because it depends on many factors including ambient noise and the extent of recoil in the needle spring function. There are two important factors in the insertion of a veress needle: The insertion should be not excessive to avoid the risk of vascular injury. It should be adequate to avoid extraperitoneal insufflation. Tests can be performed before insufflation to verify whether the veress needle is correctly positioned, thus avoiding injury. Eg, An, insertion angle of 45° from horizontal in patients with a body mass index smaller than 30kg/m² to avoid a vascular injury, palpation of aorta, saline drop test, spinal needle test, imaging (CT and MRI), direct measuring of the distance.^{5,6}

In open method, a small transverse or semicircular incision approximately 1.5 cm to 2 cm is made in the inferior umbilical fold, and the skin edges are retracted with small Langen beck retractors and the fat separated from the umbilical scar.⁷⁻¹⁰ The umbilical scar is picked up by the small Allis forceps at the highest point and retracted up- to facilitate the lifting up of the abdominal wall. An incision is made in the umbilical scar in a vertical direction to incise only the fascia and rectus

sheath. The little finger is then introduced through this incision, and the preperitoneal fat and the peritoneum are perforated with the finger, which is also used to explore the area around the incision for adhesions. Alternatively, the peritoneum is gently entered with the tip of closed artery forceps, while keeping the abdominal wall elevated with Allis forceps or towel clip applied to the umbilical scar. The blunt tip cannula (Hasson's) is inserted through the incision, or in its absence, the metallic or plastic cannula without the trocar is used. The cannula is fixed to the abdominal wall with a silk thread after placing wax gauze around it and the skin edge to prevent air leakage. The creation of pneumoperitoneum is faster and uniform with the open laparoscopic technique. So, this study will show the comparison and benefits between two methods of intraperitoneal access to create pneumoperitoneum. i.e. Intraoperative time, complications, Post-operative recovery.



Figure 1: Veress needle entry.

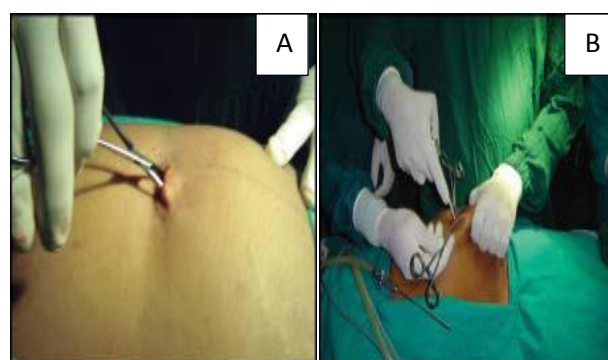


Figure 2 (A) and (B): Open access method.

RESULTS

A prospective study was carried out in the Department of General Surgery, during the period from November 2015 to November 2016 in 160 patients undergoing laparoscopic procedures in which intraperitoneal entry was made by two different methods to create

pneumoperitoneum. Descriptive statistical analysis had been carried out in the present study. Results on continuous measurements were presented on Mean \pm SD (Min-Max) and results on categorical measurements were presented in Number (%). Significance was assessed at 5 % level of significance. Student t test (two tailed, independent) had been used to find the significance of study parameters on continuous scale between two groups and Chi-square had been used to find the significance of study parameters on categorical scale between two or more groups. All data were entered in Microsoft Excel sheet. Data calculation was done in software - Microsoft Excel and Medcalc statistical software 16.8.4.0.

The age group of the patients ranged from 18 years to 70 years. The mean age of patient in verres needle group was 37.46 \pm 12.9171 years in veress needle group (Range 18-70 years). The mean age of patient in open method group was 39.80 \pm 13.9477 years (Range 18-70 years). The maximum procedures done in the age group of 21-30 years followed by 31-40 years of age.

Time of access in veress needle group is the time calculated from insertion of veress needle to insertion of first port and in open Method group it is the time Taken from skin incision to entry of trocar. Time of access significantly low in open method group as compare to veress group with t = 3.071 and P Value = 0.0025** which was statistically significant (Table 1).

Table 1: Time taken for access in both methods.

Duration (in min)	Veress needle		Open method	
	No.	%	No.	%
1-5	30	47.62%	69	71.13%
6-10	33	52.38%	28	28.87%
>10	0	0%	0	0
Total	63	100%	97	100%
Mean \pm SD	5.12 \pm 2.5172	-	3.94 \pm 2.2774	-
Inference	Time of access significantly low in open method group as compare to veress group with t = 3.071 and p value = 0.0025** which was statistically significant			

Intra-operative gas leakage present in 26 (41.27%) patients out of 63 in veress needle group and in 41 (42.27%) patients out of 97 in open method group. There was no major difference in total operative time in both methods with t = 1.346 (p = 0.1802). There were no any major complications occurred in any group.

Table 2: Comparison of complications at access.

Complication at access	Veress needle (n=63)		Open method (n=97)	
	No.	%	No.	%
Vascular injury	0	0	0	0
Bowel injury	0	0	0	0
Omental injury	2	3.17%	4	4.12%
Port site gas leakage	26	41.27%	41	42.27%
Extra-peritoneal insufflations	5	7.93%	2	2.06%
Gas embolism	0	0	0	0
Loss of Space	8	12.69%	1	1.03%
Entry in wrong plane	10	15.87%	5	5.15%

There were minor complications occur in both methods at access as mentioned in table like; omental injury, port site gas leakage, extra-peritoneal insufflations, loss of space and entry in wrong plane. Extraperitoneal insufflations during entry occurred in 5 out of 63 (7.93%) patients in

veress needle method and 2 out of 97 (2.06%) in open method. All 160 patients experienced port site local pain immediate post op period for 1-2 days. Vomiting occur post-op in 13 out of 63(20.63%) in veress needle group as compare to 25 out of 97 (25.77%) in open method. Surgical Emphysema occur in immediate post op period occurred in 1 patient in veress needle group (1.58%). Wound infection occurred at port site in 2(3.17%) patients in veress needle group and 3 (3.09%) patients in open group, which was observed at 1 week follow up period and treated with daily dressing and oral antibiotics. Entry in wrong plane occurred in 10 out of 63 (15.87%) in veress needle method group as compare to 5 out of 97 (5.15%) in open method group which was statistically significant (p = <0.0001) (Table 2, 3).

In veress needle group; 37 patients had severe, 1 patient had very severe and 24 patients had moderate pain on 1st post-operative day. 33 patients had no pain on discharge and 20 had mild pain on discharge. In open method group; 43 patients had severe, 1 patient had very severe and 53 patients had moderate pain on 1st post-operative day. 52 patients had no pain on discharge and 45 had mild pain on discharge. Post op pain is similar between two groups of patients with on day 2, and on DOD. VAS Score at 1 week follow up was >1 in 1 out of 63 patients in veress group and 3 out of 97 in open method group. VAS Score at 1 month follow up was 1 in both groups in

all patients. The mean length of post-operative hospital stay in veress needle group was 3.5 ± 1.1038 and open method group it was 3.31 ± 1.3869 with $p = 0.3616$ which was statistically not significant.

Table 3: Comparison of postoperative complications.

Post-operative complications	Veress needle (n=63)		Open method (n=97)	
	No	%	No	%
Vomiting	13	20.63%	25	25.77%
Urinary retention	5	7.93%	6	6.18%
Surgical emphysem	1	1.58%	0	0
Port site pain	63	100%	97	100%
Port site hernia	0	0	0	0

DISCUSSION

Over the last two decades, rapid advances have made laparoscopic surgery a well-established procedure. However, because laparoscopy is relatively new, it still arouses controversy, particularly with regard to the best method for the creation of the pneumoperitoneum. Traditional closed method of pneumoperitoneum involves initial blind entry into abdomen and more than half of such injuries are related to this primary blind access and occur before the start of actual anatomic dissection. To prevent these complications other methods were introduced in practice like open technique as devised by Harrih Hasson, direct trocar insertion, optical trocars, radically expanding trocars and use of disposable shielded trocars.

The open method of pneumoperitoneum was described by Harrih Hasson in 1974. The complications associated with blind entry were eliminated but method did not gain wide acceptance because it was reported to be time consuming and associated with significant gas leak.¹⁰ The method was specifically recommended for patients with history of surgery in the upper abdomen. However, such patients having previous history of abdominal surgery excluded from present study and applied the two methods randomly in homogenous patient population, making the comparison more reliable.

More time consumption in our blind technique might be due to routine performance of veress needle entry tests like aspiration test, saline test and first veress intraperitoneal pressure (VIP) test. Our extra time may also be due to some cases in which the veress needle was withdrawn and reinserted and verification tests performed again. In present study access time for creation of pneumoperitoneum and insertion of camera port was 5.12 ± 2.5172 minutes in closed method whereas it was 3.94 ± 2.774 minutes in open method. Study published in a Scandinavian journal noted that the blind Veress technique requires 214-300 seconds for abdominal cavity access, compared to other studies 240-300 seconds were open access has been used (Table 4).

Table 4: various studies shown different time in both method of access of pneumoperitoneum.

Study	Access time for closed method (minutes)	Access time for open method (minutes)
In present study	5.12 ± 2.5172	3.94 ± 2.2774
Borgotta et al ¹¹	2.2	2
Byron et al ¹²	5.9 ± 2.2	4.2 ± 1.3
Somro et al ¹³	5	8
Tariq et al ¹⁴	5 ± 1	4 ± 1
Angoli r et al ¹⁵	3.54	2.69

In present study 26 (41.27%) patients in veress needle group and 41 (42.27%) patients in open method developed gas leak. No patients had a vascular and/or visceral injuries and gas embolism in both group of patients, but 2 patients (3.17%) with veress needle technique and 4 patients (4.12%) with open method had omental injury with access. The number of entry-related complications - like Extra peritoneal insufflations, Loss of space and Entry in wrong plane were slightly more with the veress needle technique than with the open technique in this study.

In literature, various cases of injury to the great vessels caused by the Verres needle are reported. A report illustrates the difficulty in correctly diagnosing this complication, which is mainly due to the retroperitoneal position of the vessels. Meta-analysis failed to reveal any safety advantage of an open technique when compared with a closed method of entry, in terms of both visceral and major vascular injury.

CONCLUSION

For intraperitoneal access in laparoscopy, both the closed (veress needle) and the open (Hasson) method for gaining access into the peritoneal cavity are safe. The open technique had a time advantage over the closed method. Major vascular and visceral injuries did not occur in any of the groups and Overall, there were slightly more Minor complications: Omental injury, gas leak, extra peritoneal insufflations, loss of space and entry in wrong plane associated with closed method than open method. Overall, open technique is as good as closed technique and is a good alternative to closed technique for pneumoperitoneum creation in laparoscopic surgery. Further studies are needed in multiple centres and on larger samples for conclusive evidence.

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