

Comparison between Simple and Classical Techniques to Create Closed Pneumoperitoneum

Gharti BB, Shrestha PM, Shrestha A, Basnet RB, Shah C, Adhikari B

Department of Urology,
National Academy of Medical Sciences, Bir Hospital,
Kathmandu, Nepal.

Corresponding Author

Binod Babu Gharti
Department of Urology,
National Academy of Medical Sciences, Bir Hospital,
Kathmandu, Nepal.
E-mail: binodbabubob@gmail.com

Citation

Gharti BB, Shrestha PM, Shrestha A, Basnet RB, Shah C, Adhikari B. Comparison between Simple and Classical Techniques to Create Closed Pneumoperitoneum. *Kathmandu Univ Med J.* 2021;75(3):309-13.

ABSTRACT

Background

Closed method of pneumoperitoneum using Veress needle is an established technique. Classical closed technique is popular. Simple technique is a modified closed technique.

Objective

To compare the classical and simple techniques of closed pneumoperitoneum.

Method

This study was conducted in the department of urology, Bir hospital from August 1st 2019 to March 30th 2021. Total 114 patients were randomized into simple and classical technique of creating closed pneumoperitoneum. Time taken for creation of pneumoperitoneum, complications and failure of creating pneumoperitoneum in each group noted and analyzed. Chi square test, Fischer exact test and student t test were used and $p < 0.05$ considered significant.

Result

Among 114 patients, 61 in simple and 53 in classical technique allocated. In simple technique, mean age was 42.98 ± 18.21 years, BMI was 21.84 ± 2.57 kg/m², mean time for pneumoperitoneum creation was 108.07 ± 21.14 seconds. In classical technique, mean age was 40.15 ± 17.58 years, BMI was 21.94 ± 2.54 (kg/m²), mean time for pneumoperitoneum creation was 189.70 ± 32.21 seconds. Mean time was less in simple technique than classical technique ($p < 0.001$). Complication rate observed was 6% in each technique ($p=0.797$) with cumulative rate of 10%. Omental injury was seen in 3.2% in simple technique and 5.6% in classical technique ($p=0.662$). Retroperitoneal insufflation was seen in 6.5% in simple technique and 5.6% in classical technique ($p=0.842$). No failed pneumoperitoneum was observed in both groups.

Conclusion

Simple technique is as effective, reproducible and safe method as classical technique of creating closed pneumoperitoneum.

KEY WORDS

Classical technique, Pneumoperitoneum, Veress needle

INTRODUCTION

In laparoscopy, access into the abdomen is the initial most challenging step and is a blind procedure with majority of complications occurring in this step.¹ At least 50% of these major complications occurs prior to commencement of the intended surgery.² Pneumoperitoneum creation techniques are of two types: open and closed.³ Incidence of bowel injury was 0.7% compared to 0.5% and that of vascular injury 0.44% compared to 0% in closed and open technique respectively making both techniques equally popular.⁴⁻⁶

Veress needle is used to create closed pneumoperitoneum. This technique is particularly important because it minimizes gas escape during the procedure.⁷ In closed classical technique, intraperitoneal location of Veress needle tip can be confirmed by these tests: Hiss test, aspiration of air into a partially filled syringe followed by free instillation of saline through the needle, on inability to reaspirate instilled saline.⁸ Simple technique is a modified technique where, intraperitoneal location of needle tip is identified by free flow of normal saline from syringe which is connected to needle hub during its gradual descent in the abdominal wall. It is claimed to be a simple, safe and effective technique.⁹

We have conducted a pilot study on simple technique of creating closed pneumoperitoneum. The preliminary results were comparable to classical technique of creating closed pneumoperitoneum. Thus, this study is conducted with the objective to compare simple technique and classical technique of creating closed pneumoperitoneum regarding time duration, complications and failure rate.

METHODS

This is a prospective comparative study done in Department of Urology, Bir Hospital for duration of 20 months (1st August 2019 to 30th March 2021) after receiving approval from institutional review board, Bir hospital. Convenient sampling technique was used to calculate sample size based on the last fiscal year audit of urologic laparoscopic surgery which was 120. Even after extending the duration of study to 20 months (initially proposed duration was 12 months) only 116 patients could be enrolled in the study due to the ongoing COVID pandemics.

Patients undergoing laparoscopic urological surgery were included for the study while patient below 14 years of age and laparoscopic surgeries with initial open technique of creating pneumoperitoneum were excluded in the study. Pre-operatively, patients were assessed on OPD basis in the department of Urology, Bir Hospital. Demographic parameters of the patients, history, and physical examination were recorded. The patients were undergone routine preoperative investigations and a pre anesthetic checkup. All patients had sterile urine before the procedure. Patients

were counseled about the study and a written informed consent was taken. Admitted before surgery and detailed history was taken according to proforma. With the help of computer-generated randomization (Microsoft excel 2016) Patient were allocated to in each group. Procedure was performed by a single consultant urologist.

Patient was administered General Anesthesia and put in lateral or supine position. Painting and draping were done followed by preparation of the laparoscopic instruments: scope and operating instruments. In simple technique, a small skin stab (3 mm) was given at Right iliac fossa (RIF)/ Left iliac fossa (LIF)/Paraumbilical with 11 number blade and 5 ml syringe without plunger filled with normal saline (NS) connected to Veress needle hub and needle was locked (fig. 1). Veress needle inserted up to muscle layer then Veress needle lock is opened then the needle further advanced (fig. 2). When the free flow of saline is notice from 5 ml syringe the tip of Veress needle is assumed to be just inside the peritoneal cavity (fig. 3). Then carbon dioxide tubing was connected to Verres hub to create pneumoperitoneum. First port was placed and scope was inserted (fig. 4).



Figure 1. 5 ml syringe filled with NS without plunger connected to needle hub in needle locked status inserted up to muscle layer



Figure 2. Veress needle Lock opened and gradually advanced further



Figure 3. Free flow of Saline when the tip is just inside the peritoneal cavity

In classical techniques, a small skin stab (3 mm) with 11 number blade at Right iliac fossa/Left iliac fossa/Paraumbilical was given and Verres needle insertion was

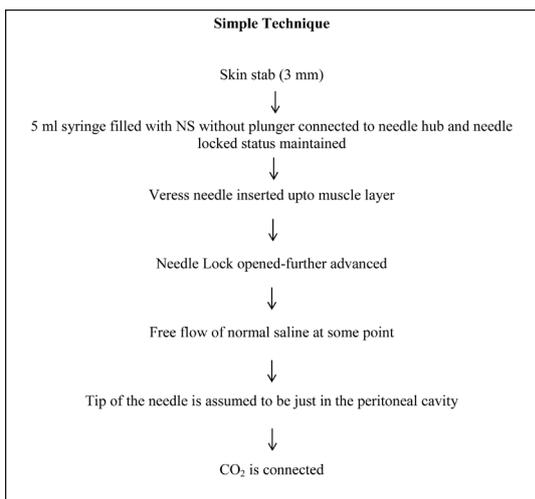


Figure 4. Simple technique of closed pneumoperitoneum

done. Resistance loss on penetrating peritoneal layer. Ten ml syringe filled with normal saline was connected to verres needle hub. Aspiration was done once no undesired aspirate material eg fluid, pus, fecal matter except than air then NS was pushed freely into peritoneal cavity. Reaspiration of NS was done. Free flow of NS after removal of the plunger confirming the position of needle tip then carbon dioxide was connected to create pneumoperitoneum. First port was placed and scope was inserted.

In both techniques once the carbon dioxide tubing was connected to Veress needle hub, the flow rate was kept constant at 2 liters/minute initially at pressure of 10 mmHg. Once there is 1 liter pneumoperitoneum was created the flow rate was increased to 5 liters/min and pressure is raised to 15 to 20 mmHg. Once enough pneumoperitoneum was created (3 to 3.5 liters) first port was placed and the pressure was reduced to 12 mmHg for whole duration of procedure. Other port insertion will be proceeded and surgery commenced.

Time of pneumoperitoneum creation was taken from the point the veress needle is inserted in the skin incision to first port placement. Confirmation of successful pneumoperitoneum was done by visualization of peritoneal cavity by laparoscopic telescope through the first port. This was measured in seconds.

Complications undertaken for this study were: Preperitoneal insufflation, Bowel perforations, Mesenteric injury, Omental injury, Retroperitoneal insufflation, Major vessel injury. Any of the above-mentioned complications were noted if present.

Failure of pneumoperitoneum creation was assumed when the closed technique fails to create pneumoperitoneum which needed either converted to open technique (Hasson method) or to open surgery.

Data analysis was done using the statistical package for social sciences, SPSS. A p-value less than 0.05 was considered statistically significant. Patients were divided into 2 Groups ie Simple technique and Classical technique.

Baseline characteristics were compared between Simple technique and Classical technique using the chi-square test/fisher’s exact test for categorical variables and the Student t-test for continuous data.

RESULTS

Total 114 patients were enrolled (fig. 5). Mean age of patient in years is 42.98 ± 18.21 in simple technique and 40.15 ± 17.58 in classical technique and p value is 0.401. BMI in simple technique is 21.84 ± 2.57 and in classical technique is 21.94 ± 2.54 and p value is 0.823. Previous abdominal surgery done in 12 patients in simple technique and 8 patients in classical technique with p value of 0.522 (Table 1).

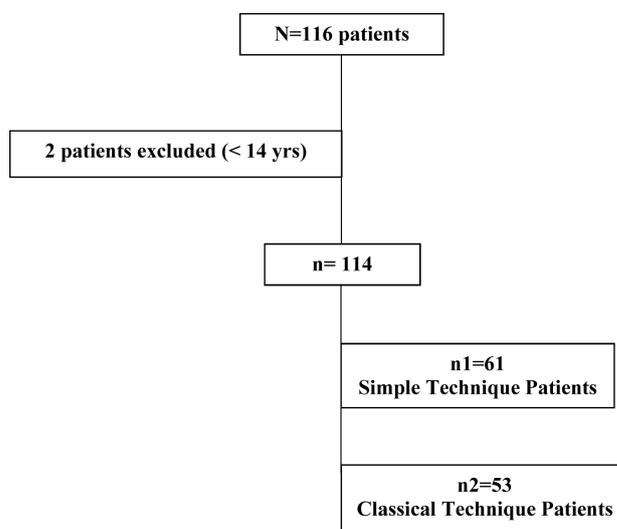


Figure 5. Enrolled samples in the study

Table 1. Basic characteristics of Patients

Basic Characters	Simple technique n(% or SD)	Classical technique n(% or SD)	P-value
Total Patients	61 (53.5)	53 (46.5)	
Gender			0.189
Male	34 (59.6)	23 (40.4)	
Female	27 (47.4)	30 (52.6)	
Mean age (years)	42.98±18.21	40.15± 17.58	0.401
Mean BMI Kg/m²	21.84±2.57	21.94±2.54	0.823
Previous abdominal surgery			0.522
Yes	12 (20.0)	8 (15.0)	
No	49 (80.0)	45 (85.0)	
Patient Position			0.896
Left Lateral	30 (49.1)	26 (46.0)	
Right Lateral	27 (44.2)	25 (47.1)	
Supine	4 (6.5)	2 (3.7)	

Eighty six (71%) of the laparoscopic surgeries were nephrectomies in which 43 (38%) right nephrectomy and 38 (33%) left nephrectomy. Reconstructive surgery in the form of Anderson-Hynes (A-H) pyeloplasty accounts for

24 (20%) of surgeries in which 12 (10%) on right and 12 (10%) on left). Laparoscopic pelvic surgeries accounted for 7 (6%) in which Radical cystectomy 3 (3%), Boari flap 2 (%), VVF repair 1 (1%). Only 2 (2%) of patient underwent laparoscopic adrenalectomy 1 each on right and left side (fig. 6).

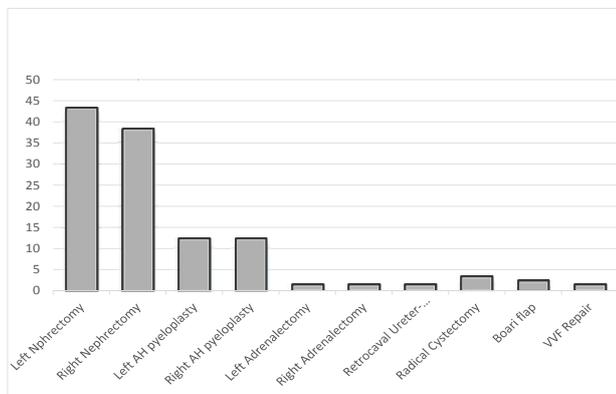


Figure 6. Indications for laparoscopic urological procedures

Mean time for pneumoperitoneum creation in seconds is 108.07 ± 21.14 in simple technique and 189.70 ± 32.21 in classical technique with significant p value < 0.001 . No major complications like bowel injury, visceral organ injury and major vascular injury were observed in both the technique. Only minor complications were encountered. The cumulative complication rate for closed pneumoperitoneum when both techniques were combined was 10%. The overall complication rate observed was 6% in each technique ($p=0.797$). Among the various complications, Omental injury and Retroperitoneal insufflation were seen in both the groups. Omental injury was 2 (3.2%) in simple technique and 3 (5.6%) in classical technique with p value 0.662 whereas Retroperitoneal insufflation was 4 (6.5%) in simple technique and 3 (5.6%) in classical technique with p value 0.842. These were not statistically significant (Table 2). No failure rate was observed in both the groups.

Table 2. Comparison of two techniques for Mean time, Complication and Failure

Variables	Simple technique	Classical technique	P-value
Mean time (sec) for pneumoperitoneum creation	108.07 ± 21.14	189.70 ± 32.21	<0.001
Complications			0.797 ^a
Preperitoneal insufflation	0	0	
Bowel perforations	0	0	
Mesenteric injury	0	0	
Omental injury	2(3.2%)	3(5.6%)	
Retroperitoneal insufflation	4(6.5%)	3(5.6%)	
Major vessel injury	0	0	0.662 ^b
Failure rates (Conversion to open method)	0	0	0.842 ^b

^aChi square test, ^bFisher exact test

DISCUSSION

One hundred and sixteen patients were taken in the study. Two patients excluded as they were under the age of 14 years. Thus, total of 114 patient were taken in the study in the duration of 20 months. Statistically significant lower mean time of pneumoperitoneum creation was observed in simple technique (108 secs vs 189 secs). There was no significant difference observed in both techniques of pneumoperitoneum creation regarding the complication rates and the failure rate. Only few minor complications were observed in both the techniques which were not significant. Hence the simple technique was found to be as effective and safe method as the classical technique with lower mean time of pneumoperitoneum creation.

Roy et al. were the ones who introduced the simple technique of pneumoperitoneum creation.⁹ They successfully created pneumoperitoneum without any difficulty, complications and failure in 25 consecutive patients and proposed this technique as an easier method of closed pneumoperitoneum. Since there was no head to head comparison between the simple and classical technique of creating pneumoperitoneum, in this study, we have attempted to compare these methods. In our study, we also had 61 patients with this technique with seemingly very low minor complication rate without any failure. Fifty three patients in classical techniques were also had few complications rate only without any failure although the mean access time was longer.

Jansen et al. in a review article helped to stablish the closed method of pneumoperitoneum comparing the complication rates with open technique.¹⁰ In this study the complication rates were comparable and statistically not significant in closed and open method. The complication encountered were visceral (0.3 to 1.7%) and vascular (0.1-4.7%) in this review article. In our study visceral injury in the form of omental injury (3.2-5.6%) and retroperitoneal insufflation (6.5% and 5.6%) were seen but no bowel injury and or major vascular injury observed. Less vascular injury may be because of placement of veress needle mostly on RIF/LIF to create pneumoperitoneum.

Access time in simple technique in a study by Akhtar et al. was 2.83 minutes which was comparable to our finding of mean access time 1.8 minutes.¹¹ They did not encounter any major visceral and vascular injuries which we did not too. In 2% case they observed extraperitoneal insufflation which was similar to our study.

The mean access time in classical closed technique was 3.94 minutes in a study by Mushtaq et al. which is similar to our study where in closed technique the mean time was 3.8 minutes.¹² In this research, Preperitoneal insufflation was 5.19% and omental injury was 3.97%. Similar is the finding in our study regarding Preperitoneal insufflation (4.3%) and omental injury (6.1%).

Strength of this research is it is a prospective randomized study conducted in single center and performed by a single surgeon. This leads to less biased sample selection in each group and also negates the role of confounders as it was done by single surgeon.

Limitation of study is small sample size and single center study. Simple technique in reality is simply the better technique which can be practiced in routine laparoscopic surgeries. Thus, especially for novice surgeons it will be an easy to learn step to start with closed pneumoperitoneum with less access time and low minor complications without failure.

CONCLUSION

Simple technique is as effective, reproducible and safe method as classical technique of creating closed pneumoperitoneum. Moreover, the simple technique is easier and faster method. This technique in reality is the better option which can be practiced in routine laparoscopic surgeries. Thus, especially for novice surgeons, it will be an easy to learn step to start with closed pneumoperitoneum with less access time and low minor complications without failure.

REFERENCES

1. Varma R, Gupta JK. Laparoscopic entry techniques: clinical guideline, national survey, and medicolegal ramifications. *Surg Endosc.* 2008;22(12):2686-97.
2. Krishnakumar S, Tambe P. Entry complications in laparoscopic surgery. *J Gynecol Endosc Surg.* 2009; 1(1): 4-11.
3. Schafer M, Lauper M, Krahenbahl L. Trocar and Veress needle injuries during laparoscopy. *Surg Endosc.* 2001;15
4. Taye MK, Fazal SA, Pegu D, Saikia D. Open versus closed laparoscopy: yet an unresolved controversy. *J Clin Diagn Res.* 2016;10(2):QC04-QC07
5. Larobina M, Nottle P. Complete evidence regarding major vascular injuries during laparoscopic access. *Surgical Laparoscopy Endoscopy & Percutaneous Techniques.* 2005;15(3):119-23.
6. Toro A, Mannino M, Cappello G, Di Stefano A, Di Carlo I. Comparison of two entry methods for laparoscopic port entry: technical point of view. *Diagnostic and therapeutic endoscopy.* 2012;2012:1-6
7. Abd Ellatif ME, Ghnam WM, Abbas A, Basheer M, Dawoud I, Ellaithy R. Latif's point: A new point for Veress needle insertion for pneumoperitoneum in difficult laparoscopy. *Asian J Endosc Surg.* 2018;11(2):133-7.
8. Palanivelu C. Laparoscopic space access. *Art of laparoscopic surgery, textbook and atlas.* 1. 1st ed: Jaypee Brothers; 2007. p. 59-68.
9. Roy AN, Ghatak S. A simple and safe technique of creating closed pneumoperitoneum. *Indian J Surg.* 2013;75(4):262.
10. Jansen FW, Kolkman W, Bakkum EA, de Kroon CD, Trimbo-Kemper TC, Trimbo JB. Complications of laparoscopy: an inquiry about closed-versus open-entry technique. *Am J Obstet Gynecol.* 2004;190(3):634-8.
11. Akhtar N, Nomani A, Salim B, Baig SJ. A simple and safe technique of creating closed pneumoperitoneum. *International Journal of Medical and Health Research.* 2016;2(12):87-9
12. Mushtaq U, Naikoo GM, Gilkar IA, Peer JA, Dar WA, Wani YH. Classical Closed Technique by Veress Needle Insertion Versus Direct Trocar Insertion in the Creation of Pneumoperitoneum in Various Laparoscopic Surgeries. *Journal of Contemporary Medical Research.* 2019;6(7):G9-13.