ANALYSIS OF THE EFFICACY OF OPEN (HASSON) AND CLOSED (VERESS NEEDLE) METHODS OF PNEUMOPERITONEUM CREATION IN LAPAROSCOPIC UROLOGICAL SURGERIES

Farooque Ahmed[1*], Ayesha Khan[2*], Arif Ali[3*], Naresh Kumar[4*], Shahzad Ali[5*], Hassan Siddiqui[6*]

*Department of Urology, Jinnah Postgraduate Medical Center Karachi, Pakistan.

ABSTRACT:

BACKGROUND

There are several different approaches to laparoscopic surgery nowadays. The two most popular laparoscopic access techniques are open (Hasson) and closed (veress needle) technique. There is no indication that using an open or closed laparoscopic entrance is more secure or quicker at first. Consequently, the purpose of the current study is to compare two techniques for inserting laparoscopic trocars (the Hasson and Veress Needle) during urologic operations.

OBJECTIVE: To determine the efficacy of successful techniques of pneumoperitoneum creation between open (Hasson) versus closed (veress needle) methods among patients undergoing laparoscopic urological surgeries at JPMC Karachi.

METHODS: A prospective comparative study was conducted at the department of urology. A total of 37 patients who fulfilled the inclusion criteria were included in the study. Informed consent was taken after explaining the procedure, risks and benefits of the study. The patients were randomly divided into two groups. Patient's in group A were managed by open (Hasson) method, while in group B by closed(Veress needle). All the collected data were entered into the proforma attached at the end and used for research purpose.

RESULTS: A total of 37 patients, 25 in open (Hasson) group versus 12 in closed (Veress needle) group were included to compare the successful pneumoperitoneum creation in patients undergoing urologic laparoscopic surgeries. Mean ± SD of age in open group was 47.2± 10.3 while in close group was 45.3± 9.4, 17 (68%) males and 8 (32%) females were enrolled in open group, while 9 (75%) males and 3 (25%) females were included in closed group. Successful creation of pneumoperitoneum was noted in 25 (100%) in open group while 11(91.6%) in closed group.

CONCLUSION: Many techniques have been developed for laparoscopic access to the abdominal cavity, among which Hasson and veress needle are most commonly employed. Several researches have compared their effectiveness and results, showing similar outcomes. Our

study has shown that both of them are safe and effective in the formation of pneumoperitoneum, therefore either one may be used in laparoscopic urological procedures.

KEYWORDS: Pneumoperitoneum Creation, Open (Hasson) Method, Closed (Veress Needle) Method, Laparoscopic Surgeries

.

INTRODUCTION:

Laparoscopy, a surgical technique that allows a surgeon to access the inside of the abdomen or pelvis has now become one of the standard approaches for most of the urological procedures. In both diagnostic and reconstructive procedures, urological laparoscopy can be employed. The risks and hazards of laparoscopic surgery are diverse. Nonetheless, the incidence of these complications is rather low. Approximately half of these events occur when a port is placed in the abdominal cavity. The first port placement for the pneumoperitoneum is responsible for about 20% of this problems.[1]

The first essential step in laparoscopic surgery is gaining peritoneal access and establishing pneumoperitoneum. Pneumoperitoneum must be established by either placing a trocar using an open technique or inserting a sharp insufflating veress needle using a closed procedure.[2] Closed approaches involve blind veress needle (VN) insertion and insufflation, followed by blind trocar insertion into the peritoneal cavity. The open (Hasson) approach begins with a peritoneal incision that allows direct view of the insertion of a blunt trocar, followed by gas insufflation and the insertion of a laparoscope.[3]

Research comparing the risks for open and closed access approaches for establishing pneumoperitoneum has shown varying outcomes. One research found that the rates of visceral and vascular damage were 0.083 and 0.075% after closed access method and 0.048% and zero after open access approach, respectively.[4]

Patients receiving closed v/s open laproscopic methods were reported to have higher rates of bruises, gas leakage, and failure to form pneumoperitoneum, respectively (1.07% vs 0.21%, 0.8% vs 1.8%, and 0.67% vs 0.13%)[5]. According to a research, failure to form pneumoperitoneum occurred in the open and closed methods, respectively, at rates of 0.72 and 2.9%[6]. Whereas a different research revealed that the open vs. closed method failure rate was 0% vs. 8.57%[7]. Mortality rates after closed and open laparoscopy were 0.003% and 0 % respectively.[4]. Therefore it seems that open laparoscopy (OL) is less hazardous than veress needle technique. However, few studies have come to the conclusion that there is no primary access technique that is safer than another in terms of concerns associated to primary access.[8] Close primary access is just as safe as the open option.

Laparoscopic surgical complications are uncommon but frequently happen while attempting to access the peritoneal cavity[9]. It is crucial to detect and reduce the risks connected to inducing a pneumoperitoneum, since laparoscopy is increasingly being used for various urological operations. In order to create pneumoperitoneum with the least number of attempts, this study will compare the open (Hasson) and closed (Veress needle) techniques. This is because more attempts tend to result in complications, which diminish procedure safety. This study aims to offer a practical and effective surgical approach with statistical support for surgical decision-making to lessen complications. So, using a procedure that has a greater success rate on the first attempt can assist to lower the incidence of complications in patients having laparoscopic surgery.

MATERIAL & METHODS:

A prospective comparative study was undertaken at the department of Urology in Jinnah Postgraduate Medical Center (JPMC), Karachi from 4th November 2020 till

13th May 2021. After receiving approval from the Institute of Ethics Committee and acquiring informed written consent from research participants, the data was collected using the standardized proforma. A total of 37 patients, age between 15-60 years who had never under-went previous abdominal surgery, undergoing elective laparoscopic surgery were included in our study. Individuals having para-umbilical/umbilical hernia, prior abdominal surgical history, peritoneal adhesions, bleeding disorders, vascular aneurysms, and BMI greater than 35 g/m^2 were excluded from the research.

The participants were allocated randomly into two groups, and the study was carried out in a single blind fashion. Patient's in-group A was managed by open (Hasson) method, while in group B by closed (Veress needle). General anesthesia was used for the surgery, and an antibiotic as a preventative measure was administered at the time of anesthetic induction. In the open procedure, the skin margins were retracted with Langen Beck retractors after a 1.5 to 2 cm transverse incision was made at the required side of umbilical area. In order to ease the abdominal wall lifting, the umbilical scar was elevated. Only the fascia and rectus sheath were incised by making a vertical incision in the umbilical scar. The abdominal wall was elevated with Allis forceps while the pre-peritoneum fat and peritoneum were invaded with the tip of artery forceps. The blunt tip cannula (Hasson's) was inserted through the incision. The cannula was then secured to the abdominal wall with a silk thread to stop air leakage after pneumoperitoneum had been established. In Veress needle group a stab incision was made at the umbilical level. The veress needle was inserted through incision and gently rotated and advanced into peritoneal cavity. Tests were performed before insufflation to verify correctly positioned veress needle after which gas was insufflated through needle.

Mean + SD was calculated for age and procedure duration. For each, gender and successfully formed pneumoperitoneum, frequency and percentage were

determined. The effective formation of pneumoperitoneum using the close vs. open approach was compared using the appropriate Chi-Square/Exact Fisher's test at the 5% level of significance. Age, gender, and procedure length differences between the two groups were compared. To determine the effect of this on the result, stratification using the appropriate Chi-Square or Fisher's exact test was used. P≤ 0.05 is considered significant.

RESULT:

In this randomized control trial, a total of 37 patients, 25 in open (Hasson) group versus 12 in closed (Veress needle) group were included to compare the successful pneumoperitoneum creation in patients undergoing urologic laparoscopic surgeries at JPMC Karachi and results were analyzed. Mean ± SD of age & gender are given **Table 1.**

GROUP(N)	MALE	FEMALE	MINIMUM AGE	MAXIMUM AGE	MEAN AGE± S.D
Open (25)	17 (68%)	08 (32%)	15	60	47.2± 10.3
Closed (12)	09 (75%)	03 (25%)	15	60	45.3± 9.4

TABLE 1: Descriptive Statistics Of Age And Gender

Mean ± SD of duration of procedure in open and closed group was 4.9±1.2 and 5.8±1.7 with Confidence interval (CI) (4.64-5.15) and (5.43-6.16) minutes, respectively as shown in **Table 2**

GROUP(N)	MINIMUM DURATION(Minutes)	MAXIMUM DURATION(Minutes)	MEAN± S.D
Open (25)	5	15	4.9±1.2
Closed (12)	5	15	5.8±1.7

TABLE 2: Duration Of Procedure (Minutes) For Creation Of Pneumoperitoneum (N=37)

Successful creation of pneumoperitoneum was noted in 25 (100%) in open group while 11 (91.6%) in closed groups and P-value found to be significant i.e. (P=0.029) **Table 3** & **Figure 1**

GROUP(N)	SUCCESSFUL CREATION		P-VALUE*
	YES	NO	
Open (25)	100% (25)	0%	0.029
Closed (12)	91.6 % (11)	8.3% (1)	

TABLE 3: Comparison For Successful Creation Of Pneumoperitoneum Between Groups

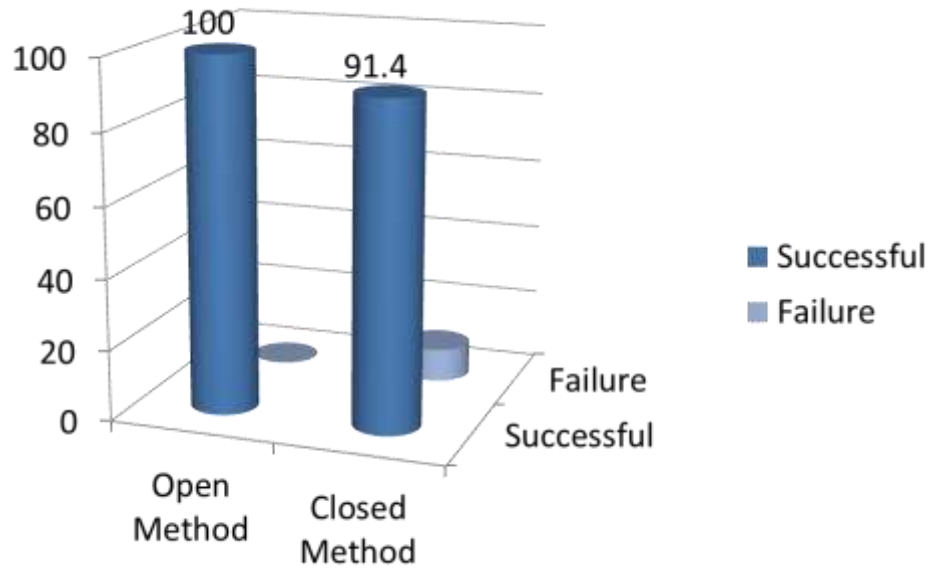

FIGURE 1: Comparison For Successful Creation Of Pneumoperitoneum Between Groups

Stratification of gender and age was done with successful creation of pneumoperitoneum to assess the significant difference between both groups from (**Table 4-5**).

TABLE: 4 Stratification For Age Group With Successful Creation Of Pneumoperitoneum

GROUP	**AGE**	**SUCCESSFUL CREATION**		**P-VALUE***
		YES	**NO**	
Open	15-39 year	19 (51.3%)	0	0.313
Closed		07 (18.9%)	1 (2.77 %)	
Open	40-60 year	6 (16.23%)	0	0.045
Closed		4 (10.8%)	0	

***Applied Fischer's Exact Test**

TABLE 5: Stratification For Gender With Successful Creation Of Pneumoperitoneum

GROUP	GENDER	SUCCESSFUL CREATION		P-value
		YES	NO	
Open	Male	17 (45.9%)	0	0.199
Closed		8 (21.6%)	1 (2.8%)	
Open	Female	8 (21.6%)	0	0.969
Closed		3 (8.1%)	0	

DISCUSSION:

Induction of pneumoperitoneum, which can have a variety of hemodynamic and respiratory implications, is one of the essential step in laparoscopic procedures[10,11]. However the surgeon still has to deal with iatrogenic injuries during laparoscopic surgery[12]. More than half of these injuries are attributable to the first blind entrance into the abdomen used in the traditional closed approach of pneumoperitoneum[13]. Laparoscopic surgery previously received condemnation from the surgical community[14] as a result of these difficulties. Other approaches, such as the Harrith Hasson open procedure, optical trocars, direct trocar insertion, expanding trocars, and use of disposable shielded trocars, have been put into use to avoid these issues[15-18]. The two most popular techniques employed today, however, are the Hasson's approach and the Veress needle technique with their various variations[19]. Although the difficulties with blind access were overcome, the

approach was not widely adopted since it was perceived to be time consuming and linked with considerable gas leaks. Patients who had previously undergone surgery on their upper abdomen were advised for open technique[19].

Although the close procedure is regarded to be the faster of the two ways to create pneumoperitoneum, it has gained greater popularity and is more frequently utilized by surgeons. According to several studies, using a Veress needle can lead to a variety of potentially fatal side effects, including as damage to the intestines, bladder, and major intra-abdominal arteries. As a result, surgeons strongly favored the open technique because they felt it was safer[20]. In our investigation, the open technique needed less time between the first incision and the introduction of the laparoscope. Due to our unique modification of the umbilical stalk procedure, less time was needed for the open method in our study. The anterior abdominal wall's anatomy at the umbilicus is used in this technique. Open method may become the gold standard by implementing this new way[18]. Moreover, small leaks can be fixed by the new insufflators with CO^2 flows of 20 liters or more per minute. The fact that we execute veress needle entry tests like the aspiration test, saline test, and initial veress intra-peritoneal pressure (VIP) test on a regular basis may account for the longer time required for our blind technique. It may have taken longer than expected in certain instances since the verification tests were repeated after the veress needle was removed and reinserted. The key benefit of using an open method is the absence of problems with primary access. With this approach, we had no problems getting access. Some serious side effects of the closed method, such as major vascular damage or intestinal laceration, have been documented by several writers[21]. We did not discover any such difficulty with our blind entry method. This might be as a result of the usual abdominal wall raising and veress needle test.

The mean age in our study was 47.2±10.3 for the open group and 45.3±9.4 for the closed group. The average age was reported to be 42 years by Akbar M. et al[7]. In our research, the mean duration of procedure was 4.9±1.2 and 5.8±1.7 minutes in the open and closed groups, respectively. The average time was 8.11 minutes in the open group and 9.17 minutes in the closed group, according to Akbar M. et al[7.] In terms of gender distribution per group, there were 17 (68%) men and 8 (32%) women enrolled in the open group, whereas there were 9 (75%) men and 3 (25%) women in the closed group. In the research by Ali Al, et al., the closed group (veress) contained 57 men (20.7%) and 218 females (79.3%), whereas the open group (Hasson) included 80 (29.1%) males and 195 (70.9%) females[6]. In the current study, 25 participants in the open group (100%) and 11 participants in the closed group (91.6%) successfully created pneumoperitoneum, with a P value of 0.029 being considered significant. In addition, Ali Al et al[6] reported that 273 (99.27%) patients in the open group (Hasson) had successfully created pneumoperitoneum, whereas 267 (97.09%) patients in the closed group (veress) had done so.

In current study, stratification of confounders/effect modifiers with respect to successful creation of pneumoperitoneum, insignificant difference was noted in age group (15-39 year as P=0.313), gender (male and female as P=0.199 & P=0.069), and duration (1-5 minutes P=0.059 and >5 minutes P= 0.298) respectively, whereas significant difference was recorded in age group (40-60 year as P=0.045).

CONCLUSION:

Many techniques have been developed for laparoscopic access to the abdominal cavity, among which Hasson and veress needle are most commonly

employed. Numerous studies have compared their efficacy and safety, demonstrating comparable results. Our study has proven both of them to be safe and efficacious in the development of pneumoperitoneum, therefore either of them can be utilized in laparoscopic urological surgeries.

Conflict of interest:

The authors declare no conflict of interest.

Source of Funding:

The authors received no financial support for the research.

REFERENCES:

1. Mishra R. Textbook of practical laparoscopic surgery. 3rd ed. New Delhi: Jaypee Brothers; 2009.
2. Bathla V, Thekdi PI, Koradia P, Jhala D, Gadhvi U. Comparative study of modified open technique and closed technique for primary trocar insertion in laparoscopic surgery. Int J Res Med Sci 2016;4(1):160-64.
3. Hamayun M, Saba N, Bilal M, Mehsud N. Comparison of open versus closed pneumoperitoneum in laparoscopic surgery. Gomal J Med Sci 2015;13:115-7.
4. Bonjer H, Hazebroek E, Kazemier G, Giuffrida M, Meijer W, Lange J. Open versus closed establishment of pneumo peritoneum in laparoscopic surgery. Br J Surg 1997;84(5):599- 602.
5. Taye MK, Fazal SA, Pegu D, Saikia D. Open versus closed laparoscopy: yet an unresolved controversy. J Clin Diagn Res. 2016;10(2):QC04-7.
6. Ali Al, Abbasi S, Hussain SM. Comparison of open (hasson) and closed (veress needle) methods of creating pneumoperitoneum in laparoscopic surgeries. Pak Armed Forces Med J. 2019;69(2):255-61
7. Akbar M, Khan IA, Naveed D, Khattak I, Zafar A, Wazir MS. Comparison of closed and open methods of pneumoperitonium in laparoscopic cholecystectomy. J Ayub Med Coll Abbottabad. 2008;20(2):85-9.

8. Sajid M, Latif A, Misbah J, Rehman S. Veress needle related complications in laparoscopic surgery: our experience. Ann Punjab Med Coll. 2010;4(1):72-6.
9. Bathla V, Thekdi PI, Koradia P, Jhala D, Gadhvi U. Comparative study of modified open technique and closed technique for primary trocar insertion in laparoscopic surgery. Int J Res Med Sci 2016;4(1):160-4
10. Schulze S, Lyng KM, Bugge K, Perner A, Bendtsen A, Thorup J, et al.Cardiovascular and Respiratory Changes and Convalescence in Laparoscopic Colonic Surgery Comparison Between Carbon Dioxide Pneumoperitoneum and Gasless Laparoscopy. Arch Surg. 1999; 134(10):1112–8.
11. Safran DM, Orlando R. Physiologic effects of pneumoperitoneum. Am J Surg.1994;167: 281–6.
12. Catarci M, Carlini M, Santioro E. Major and minor injuries during creation ofpneumopertoneum, A multicentre study of 12919 cases. Surg Endosc 2001;15:566–9
13. Jansen FW, Kapiteyn K, TrimposT, Herman J. Complication of laparoscopy: a prospective multicentre observational study. Br J Obstet Gynaecol 1997;104:595–600.
14. Yuzpe AA. pneumoperitonium needle and trocar injuries in laparoscopy: a survey on possible contributing factors and prevention. J Reprod Med 1990;35:485–90.
15. Molly D, Kalloo PD, Cooper M. Laparoscopy entry: a literature review and analysis of techniques and complications of primary port entry. Aust NZ J Obstet Gynaecol 2002;14: 365–74.
16. Yerdel MA, Karayalcin K, Koyuncu A, Akin B, Koksoy C, Turkcapar AG, et al. Direct trocar insertion versus Veress needle insertion in laparoscopic cholecystectomy. Am J Surg. 1999;177(3):247–9.
17. Vilos GA,Ternamian A, Dempster J, Labergy PY. Laparoscopic entery; A review of techniques, technologies and complications. J Obstet Gynaecol Can 2007;29(5):433–65.
18. Ahmad G, Daffy JM, Philips K, Watson A. Laparoscopic entry techniques. Cochrane Database Syst Rev 2008;16(2):CD006583.
19. Vilos GA, Vilos AG. Safe laparoscopic entry guided by verres needle CO2-insufflation pressure. J Am Assoc Gynaecol Laparosc. 2003;10(3):415–20

20. Vindal A, Lal P. The Veress needle causes most laparoscopic injuries and should be abandoned: FOR: the open technique is safer and saves time. BJOG 2015;122(1):141
21. Ballem RV, Rudomanski J. Techniques of pneumoperitonium.Surg Laparosc Endosc 1993; 3(1):42–3

AUTHORS

First Author: Dr Farooque Ahmed, MBBS, FCPS Urol., Senior Registrar at Urology department, JPMC, Karachi.

Second Author: Dr Ayesha Khan, MBBS, FCPS urol., Senior Registrar at Urology department JPMC, Karachi.

Third Author: Dr Arif Ali, MBBS, FCPS Urol., Assistant Professor at Urology department, JPMC. , Karachi.

Fourth Author: Dr Naresh Kumar. MBBS, FCPS Urol., FRCS Glas., Associate professor at Urology department, JPMC, Karachi.

Fifth Author: Dr Shahzad Ali. MBBS, FCPS Urol., FACS, FRCS Glas., Professor at Urology department JPMC, Karachi.

Sixth Author: Dr Hassan Siddiqui. MBBS, FCPS Urol.

Correspondence Author – Dr Farooque Ahmed