SAFETY OF DIRECT TROCAR INSERTION THROUGH UMBILICAL PORT IN LAPAROSCOPIC SURGERY AT KHYBER TEACHING HOSPITAL, PESHAWAR

Usba Jameel[1], Faryal Eid[1], Tahir Saeed[2], Munir Ahmad[1]

ABSTRACT

Objectives: To determine the safety of direct trocar insertion through an umbilical port in laparoscopic surgery with regards to potential complications.

Methods: This descriptive cross-sectional study was carried out at the surgical department of Khyber Teaching Hospital, Peshawar, from 1st July 2019 to 30th June 2020. The study included 213 patients of both genders fulfilling the inclusion and exclusion criteria. They were enrolled and booked for laparoscopic surgery. Under general anesthesia, a 10mm trocar was inserted through the umbilicus after an incision through the skin. Intra-operative and post-operative complications were noted and data was collected in pre-printed proforma documents. The final data was analyzed through SPSS 22.

Results: Out of the 213 patients, 77(36%) were male and 136(63%) were female. The mean age was 37.97 ±5.30 years while BMI was 25.37±4.18 kg/m^2. Pneumoperitoneum was safely and successfully created via direct trocar insertion in 182 patients (85.4%). There was no statistically significant effect of age, gender, BMI, and type of surgery on the safety of direct trocar insertion in the creation of pneumoperitoneum for laparoscopic surgeries as the P- value was more than 0.05.

Conclusion: Based on our study, it is concluded that the technique of direct trocar insertion is safe for the creation of pneumoperitoneum in laparoscopic surgeries.

Keywords: Laparoscopic Surgeries, Direct Trocar Insertion, Pneumoperitoneum, Safety, Complications.

INTRODUCTION

The creation of pneumoperitoneum is the basic requirement for laparoscopic surgeries. The method used for creation of pneumoperitoneum is not reliant on the procedure for which it is proposed[1]. The use of operative laparoscopy has increased rapidly in the last decade and most surgeons are using this technique. More than half of the all complications take place during the initial entry into the abdomen. To avoid complications, a successful pneumoperitoneum establishment is required for abdominal surgeries[2].

1. Khyber Teaching Hospital/ Khyber Medical College, Peshawar, Pakistan.
2. THQH Banda Daud Shah, Karak, Pakistan

Address for Correspondence:
Dr. Munir Ahmad
Assistant Professor, Department of Surgery, Khyber Teaching Hospital/ Khyber Medical College, Peshawar, Pakistan.
drmunir29@gmail.com
00923339493884

The underlying principle for a sufficient pneumoperitoneum is that it provides cushion between the trocar insertion site and abdomino-pelvic viscera. Over the past 50 years, a large number of techniques and technologies have been introduced to decrease complications associated with laparoscopic surgeries[3].

There are various methods used for the creation of pneumoperitoneum i,e. Veress needle insertion technique, Hasson method, optical trocar insertion and direct trocar insertion as well as other variations of these techniques[4].

A large number of complications have been noted with laparoscopy recently which are associated with veress needle insufflations. The complications include failed pneumoperitoneum, subcutaneous emphysema, gas embolism and visceral insufflations. In 1977, open access technique was described by Hasson and it minimized the risk of vascular injuries but did not minimize gut injuries. There is also instability and gas leak in open access method[5].

In 1978, the direct trocar insertion method was first reported by Ding Felder.[6] Later, it was further described by Copeland et al in 1983.

Copeland et al described the key to a successful direct trocar insertion which are adequate wall relaxation, use of a sharp trocar, and a proper skin incision[7].

A study by Imran M et al has shown that the frequency of gas leak was 16.6%, port site hematoma 6.6% and port site infection was 10% after direct trocar insertion through the umbilical port in laparoscopic surgery[8].

The rationale for direct trocar insertion without pneumoperitoneum is based on the fact that significant complications reported are directly associated with veress needle during laparoscopic procedures. There is a small body of data published in this subject in our population which can't be extrapolated to the general population. To obtain further local evidence, we intended to determine the safety of direct trocar insertion through the umbilicus in laparoscopic surgeries. This study will provide more confidence regarding the use of direct trocar insertion method for pneumoperitoneum as routine practice.

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted at the Department of Surgery, Khyber Teaching Hospital, Peshawar from 1st July 2019 to 30th June 2020. The study was conducted after obtaining permission from the ethical committee and the research department. Informed consent was taken after explaining the objectives of the study to all the participants. The inclusions criteria for the study were as follows: Age between 18 and 60 years, all genders, and undergoing any intra-abdominal laparoscopic surgery at the department. Patients fulfilling the inclusion criteria were admitted through non-probability consecutive sampling technique. Patients with intestinal obstruction, chronic liver disease, pregnancy, COPD, ischemic heart disease, end stage renal disease and previous laparatomies were excluded.

The sample size of 213 patients was calculated by using 83.4% safety (using prevalence of port site hematoma of 16.6%[8]), 5% margin of error and 95% confidence interval under WHO formula for sample size determination in health studies.

Basic demographics (age, gender, body weight, and type of laparoscopic surgery) were recorded. General anaesthesia with adequate abdominal relaxation was adopted. A 10 mm permanent re-useable sharp metallic trocar was inserted through umbilical scar after lifting the abdominal wall using towel clamps. The trocar was advanced into the cavity using gentle twisting movements. Entry was confirmed by inserting a camera and visualization of abdominal cavity, after which insufflation was initiated. The respective laparoscopic surgery (Lap cholecystectomy/Lap inguinal hernia repair/Lap appendectomies) was then performed. Follow-up was conducted on the 5th, 10th, and 15th day of operation. Patients who were lost to follow-up were contacted and reminded regarding their follow-up visit. Port site bleeding, omental injury, gas leak, port site hematoma and port site infection was noted on especially designed and pre-printed pro forma.

Data was analyzed with statistical analysis program (IBM-SPSS version 22). Frequency and percentage was computed for qualitative variables like gender, type of laparoscopic surgery, port site bleeding, omental injury, gas leak, port site hematoma and port site infection. Mean ± standard deviation(SD) was presented for quantitative variables like age and weight. Stratification was done with regard to age, gender, weight and type of laparoscopic surgery to see the effect of these variables on safety. Post stratification chi square test was applied. P value ≤0.05 was considered statistically significant.

RESULTS

Among the 213 patients, 77 (36.2%) were male and 136 (63.8%) were female. The mean age was 37.97±5.30 and the mean BMI was 25.37±4.18 kg/m^2.

Complications of direct trocar insertion technique are summarized in Table 1.

The safety of direct trocar insertion in the creation of pneumoperitoneum was 85.4% (182 patients).

The safety of direct trocar insertion technique stratified by gender, age, BMI and the type of procedure is shown in Table 2.

We also compared complications of port site infection, port site bleeding, port site hematoma, gas leaks and omental injury against age, gender, BMI and type of laparoscopic surgery. In all cases, there were no significant differences among them (p value >0.05) except omental injury with age group which was significantly more common in age group > 40 years 6 (2.82%) compared to 3 (1.41%) of those with age ≤ 40 years; p value <0.05 is shown in Table 1.

Table: 1 COMPLICATIONS OF DIRECT TROCAR INSERTION TECHNIQUE

Complications	Yes/ No	Frequency	P-value			
			Age	Gender	BMI	Type of procedure
Port site bleeding	Yes	10(4.7%)	0.486	0.794	0.328	0.149
	No	203(95.3%)				
Omental injuries	Yes	09(4.2%)	0.031	0.226	0.755	0.209
	No	204(95.8%)				
Gas Leak	Yes	27(12.7%)	0.741	0.918	0.421	0.682
	No	186(87.3%)				
Port site Hematoma	Yes	26(12.2%)	0.606	0.117	0.599	0.567
	No	187(87.8%)				
Port site infection	Yes	30(14.1%)	0.906	0.949	0.292	0.405
	No	183(85.9%)				

Table: 2. SAFETY AMONG GENDER, AGE, BMI AND TYPE OF PROCEDURE.

		Frequency	Safety		P-Value
			Yes	No	
Gender	Male	77(36.2%)	63(81.8%)	14(18.2%)	0.264
	Female	136(63.8%)	119(87.5%)	17(12.5%)	
Age (years)	≤ 40	144(67.6%)	125(86.8%)	1913.2(%)	0.422
	> 40	69(32.4%)	57(82.6%)	17(12.5%)	
BMI(Kg/m^2)	< 18.5	10(4.7%)	9(90%)	1(10%)	0.486
	18.5 - 24	74(34.7%)	63(85.1%)	11(14.9%)	
	24.01 - 27	56(26.3%)	45(80.4%)	11(19.6%)	
	> 27	73(34.3%)	6589.0(%)	8(11.0%)	
Procedure	Lap, chole	136(63.8%)	116(85.3%)	20(14.7%)	0.701
	Lap. appendix	31(14.6%)	26(83.8%)	5(16.1%)	
	Lap. inguinal hernia	46(21.6%)	40(87.0%)	6(13.0%)	

DISCUSSION

Creation of pneumoperitoneum is a basic requirement for a successful laparoscopic surgery. This reduces the risk of complications. More than half of all complications arise at the time of trocar insertion in a significant number of patients[9-11]. Any new surgical technique in the sequence of steps in a surgery must be demonstrably easier, feasible, and reproducible with a good safety profile and a minimal chance of

complications. If the morbidity and mortality are shown to be low, and the cost versus benefit analysis is deemed favourable, then the technique can be adopted and considered acceptable. The first direct trocar insertion method for laparoscopy was introduced by Ding Felder more than 32 years ago. Ding Felder described it without establishing pneumoperitoneum. This method was then used by gynecologists[6,12-18]..

Our study showed that our technique was safe in 85.4% of the patients, with port site bleeding present in only 10 (4.7%) patients, omental injury present in 9 (4.2%), gas leaks present in 27 (12.7%), port site hematoma present in 26 (12.2%), and port site infection present in 30 (14.1%) of all patients. However, there is little literature available on this subject. Upon review of the literature, we found that some studies have shown mixed results regarding safety of this technique.

According to Choudhury et al, the frequency of port site bleeding was 0.6% and omental injury was 1.1% with direct trocar Insertion through an umbilical port in laparoscopic surgery[19]. In another study conducted by Imran et al, the frequency of gas leak was 16.6%, port site hematoma 6.6% and port site infection was 10% after direct trocar Insertion through umbilical port in laparoscopic surgery[8].

A study by Agresta et al showed that there were no injuries, either minor or major. Peritoneal access and the creation of a laparoscopic workplace were obtained quickly and efficiently by direct trocar insertion[20].

Our study shows no significant association between the safety of direct port site insertions and gender, age, BMI, or the type of laparoscopic surgery. Agresta et al also showed no effect with BMI and they recommended this direct technique in patients with very low BMIs as well[19-21].
We found a significant association between omental injury and age > 40 years, however this may be an incidental finding or due to selection or operator bias, as no other study has reproduced the same association.

Limitations of our study include a small sample size, this being a single centre study, and using only a few types of laparoscopic surgeries.

CONCLUSION

Based on our study, we have concluded that the technique of direct trocar insertion is generally safe in the creation of pneumoperitoneum in laparoscopic surgeries. The safety of the direct trocar Insertion in the umbilical region is the same in all age groups, BMI groups, both genders, and in all type of laparoscopic surgeries used in this study.

DECLARATION

Authors contributions:

1. Dr. Usba Jameel Conception and design, and final approval of the version to be published. She also edited the final manuscript.

2. Dr. Faryal Eid helped in data collection and references, final approval for publication.

3. Dr. Tahir Saeed helped in data analysis, discussion writing and final approval for publication.

4.Dr. Munir Ahmad helped with drafting the manuscript, critical revision, references.

Conflicts of Interests: None

Funding: Nil

REFERENCES

1. Jain N, Sareen S, Kanawa S, Jain V, Gupta S, Mann S. Jain point: A new safe portal for laparoscopic entry in previous surgery cases. J Hum Reprod Sci. 2016;9(1):9.

2. Kindel T, Latchana N, Swaroop M, Chaudhry UI, Noria SF, Choron RL, et al. Laparoscopy in trauma: An overview of complications and related topics. Int J Crit Illn Inj Sci. 2015;5(3):196.

3. Alkatout I. Complications of laparoscopy in connection with entry techniques. J Gynecol Surg. 2017;33(3):81-91.

4. Alkatout I, Mettler L, Maass N, Noé G-K, Elessawy M. Abdominal anatomy in the context of port placement and trocars. J Turkish German Gynecol Ass. 2015;16(4):241.

5. Sotelo R, Nunez Bragayrac LA, Machuca V, Garza Cortes R, Azhar RA. Avoiding and managing vascular injury during robotic-assisted radical prostatectomy. Ther Adv Urol. 2015;7(1):41-8.

6. Dingfelder JR. Direct laparoscope trocar insertion without prior

pneumoperitoneum. The Journal of reproductive medicine. 1978;21(1):45-7.
7.. Agresta F, Mazzarolo G, Bedin N. Direct trocar insertion for laparoscopy. JSLS. 2012;16(2):255.
8.. Imran M, Chohan MZ, Mehmood Z, Mehmood K, Asif K. Comparison of Veress needle and direct trocar insertion in establishing pneumoperitoneum for laparoscopic cholecystectomy. Pak J Med Health Sci. 2014;8:652-4.
10. Ahmad G, Duffy JM, Phillips K, Watson A. Laparoscopic entry techniques. Cochrane Database Syst Rev. 2008(2):Cd006583.
11. Merlin TL, Hiller JE, Maddern GJ, Jamieson GG, Brown AR, Kolbe A. Systematic review of the safety and effectiveness of methods used to establish pneumoperitoneum in laparoscopic surgery. Br J Surg. 2003;90(6):668-79.
12,. Molloy D, Kaloo PD, Cooper M, Nguyen TV. Laparoscopic entry: a literature review and analysis of techniques and complications of primary port entry. Aust N Z J Obstet Gynaecol. 2002;42(3):246-54.
13. Abreu ALdC, Chopra S, Berger AK, Leslie S, Desai MM, Gill IS, et al. Management of large median and lateral intravesical lobes during robot-assisted radical prostatectomy. J Endourol. 2013;27(11):1389-92.
14. Zakherah MS. Direct trocar versus veress needle entry for laparoscopy: a randomized clinical trial. Gynecol Obstet Invest. 2010;69(4):260-3.
15. Altun H, Banli O, Kavlakoglu B, Kücükkayikci B, Kelesoglu C, Erez N. Comparison between direct trocar and Veress needle insertion in laparoscopic cholecystectomy. Journal of Laparoendoscopic & Advanced Surgical Techniques. 2007;17(6):709-12.
16. Catarci M, Carlini M, Gentileschi P. Major and minor injuries during the creation of pneumoperitoneum. Surg Endosc. 2001;15(6):566-9.
17. Günenç MZ, Yesildaglar N, Bingöl B, Önalan G, Tabak S, Gökmen B. The safety and efficacy of direct trocar insertion with elevation of the rectus sheath instead of the skin for pneumoperitoneum. Surgical Laparoscopy Endoscopy & Percutaneous Techniques. 2005;15(2):80-1.
18. Inan A, Sen M, Dener C, Bozer M. Comparison of direct trocar and veress needle insertion in the performance of pneumoperitoneum in laparoscopic cholecystectomy. Acta Chir Belg. 2005;105(5):515-8.
19. Choudhury DK KA. Direct trocar entry technique: a safe method of primary trocar entry in laparoscopic surgery. IOSR J Dent Med Sci. 2017;16(12):38-40.
20. Agresta F, De Simone P, Ciardo LF, Bedin N. Direct trocar insertion vs Veress needle in nonobese patients undergoing laparoscopic procedures: a randomized prospective single-center study. Surg Endosc. 2004;18(12):1778-81.
21. Ahmad G, Duffy JMN, Phillips K, Watson A. Laparoscopic entry techniques (protocol). Cochrane Database Syst Rev. 2007;3:CD006583.
22. Bonjer HJ, Hazebroek EJ, Kazemier G, Giuffrida MC, Meijer WS, Lance JF. Open versus closed establishment of pneumoperitoneum in laparoscopic surgery. Br J Surg. 1997;84(5):599-602.