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Original Article

Pneumoperitoneum by Veress Needle versus Hasson Technique in Laparoscopic Surgeries – A Prospective Interventional Study

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Abstract

Background: Laparoscopy faces challenges in accessing the abdominal cavity, with high complications, and techniques include the Veress needle, Hasson procedure, and incisions over the abdominal wall. The study aims to compare the peritoneal access with the Veress needle and Hasson technique in laparoscopic surgeries regarding complications and outcomes.

Materials and Methods: This prospective interventional study was conducted in the Department of General Surgery of SRM Medical College Hospital and Research Center for 18 months–January 2021–July 2022. One hundred patients, 50 undergoing laparoscopic surgery for the abovementioned disease, received open-access procedures, and 50 underwent closed procedures. Access time – 3–6 min; pain, duration, Gas leak, extraperitoneal insufflations, visceral injury, vascular injury, and port site infection were noted.

Results: Most patients were reported as male in both groups (V: 58%; B: 56%), and most patients belonged to the age group of 31–40 years (V: 38%; H: 42%). No significant difference in gender, age group, diagnosis, procedure, complications, or pain at discharge between groups. (V) group patients showed a higher mean time for primary trocar (6.82 min), and (H) group patients were observed with a mean time of 4.22 min with a significant effect ($P < 0.0001$). The average access time was found to be higher in the (V) group of patients (5.98 min) than (H) group patients (4.34 min), with a significant effect ($P < 0.0001$).

Conclusion: Compared to the Hasson technique, the Veress needle method creates pneumoperitoneum faster, while the Hasson technique had higher gas leakage.

Key words: Abdominal incision, Hasson, Laparoscopy, Pneumoperitoneum, Surgery, Veress

INTRODUCTION

Laparoscopy is a technique used to examine the organs and tissues inside the abdominal cavity.[1] The abdominal cavity (pneumoperitoneum) is sufficiently distended, and the abdominal contents are seen using a lighted telescope. Laparoscopic surgery was once referred to as minimally invasive surgery. Still, the phrase was switched to minimum access surgery since it is an invasive treatment with the same risks of significant problems as traditional open surgery.[2] Because the abdominal incision is replaced with extremely tiny incisions just large enough to insert a trocar (5–10 mm in diameter), Let's assume that this procedure causes the patient the smallest possible stress. That means less time spent resting and recovering from surgery, less time spent in pain management, and a quicker time to full activity and work capacity. It offers several benefits for individuals, the healthcare system, and society. Primary abdominal access is the most challenging aspect of laparoscopic surgery since it is often performed blindly and is linked with vascular and visceral damage.[3]

The first incision into the abdominal cavity is a common injury site during laparoscopy.[4] Because most laparoscopic injuries occur during verses and trocar insertion, laparoscopic

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surgeons are mainly concerned with minimising first-entry complications. Although laparoscopy complications are uncommon, they may be severe and life-threatening. A 3.6% mortality incidence is related to laparoscopy-induced intestinal damage.[5] Injuries to the intestines, main abdominal vessels, bladder, and anterior abdominal wall vessels are life-threatening. If there is a delay in diagnosing or reporting visceral injuries, the morbidity will grow and may lead to death. Post-operative infection, subcutaneous emphysema, and extraperitoneal insufflation are less significant problems that may develop.[5]

A recent literature assessment found the likelihood of immediate access problems at advanced laparoscopic tertiary centers to be 0.1%. It implies that, despite technological and clinical advancements, main access difficulties were reduced but were not eradicated. Open laparoscopy, in which the trocar connected to a gas inlet is inserted through the incision into the abdomen cavity and then inflated (the "secure approach") (Hasson technique, direct trocar insertion), and pneumoperitoneum can be created during laparoscopy using a variety of various methods. The Veress (closed) needle technique is the prevalent technique. However, complications might arise when a needle is blindly inserted. This method has the potential to cause visceral and vascular damage. Avoiding the risks of blindly inserting a trocar and verses needle, Hasson created the idea of open laparoscopy in 1971.[6] The entrance consists mainly of mini-laparotomy. The incision is sufficiently long to provide dissection, incise of the fascia, and direct access to the peritoneal cavity.[6]

There is no apparent agreement about the preferred route of peritoneal cavity entrance. Some experts think that the Hasson open approach is preferable to the traditional closed entrance technique, arguing that it is less dangerous, prevents gas embolisms, and substantially minimizes the risk of vascular and intestinal damage associated with immediate access. However, various research has shown contradictory results, and no consensus exists.[7] As a result, the purpose of the study is to compare two approaches for accessing the abdominal cavity and "creating a pneumoperitoneum during laparoscopy." The study aims to compare the peritoneal access with the Veress needle and Hasson technique in laparoscopic surgeries regarding complications and outcomes.

MATERIALS AND METHODS

This prospective interventional study was conducted in the Department of General Surgery of SRM Medical College Hospital and Research Center for 18 months–January 2021–July 2022.

Inclusion Criteria

Adults of both sexes, aged 18 and older, with acute or chronic abdominal disorders such as cholelithiasis, calculus cholecystitis, appendicitis, and umbilical hernia conditions requiring biopsies and without comorbidities were included in the study.

Exclusion Criteria

Persons younger than 18 and patients who underwent previous abdominal surgeries, suspected adhesions, and situations requiring converting to open procedures were excluded from the study.

One hundred patients, 50 undergoing laparoscopic surgery for the abovementioned disease, received open-access procedures, and 50 underwent closed procedures.

Comparison of data collected from the Veress needle and Hasson technique under the following variables: Access time – 3–6 min, pain, duration, Gas leak, extraperitoneal insufflations, visceral injury, vascular injury, and port site infection were noted [Figures 1 and 2]. A structured proforma was used to collect relevant information for each selected patient.

Statistical Analysis

The data's average, standard deviation, frequency, and percentage were all shown. The *t*-test for independent samples was used to make comparisons between continuous variables. In addition, we compared categorical variables using the Pearson Chi-square test. $P < 0.05$ was judged statistically significant for a two-tailed test. The study was conducted with IBM's Statistical Package for the Social Sciences version 21.0. (IBM-SPSS Science Inc., Chicago, IL).

RESULTS

Most patients were reported as male in both groups (V: 58%; B: 56%), whereas females were reported as 42% in group (V) and 44% in a group (H). Most patients belonged to the age group of 31–40 years in both groups (V: 38%; H: 42%), followed by the age group of 41–50 years (V: 28%; (H): 28%). However, a minimum of patients were observed in the age group of more than 61 years in both groups (V: 6%; (H): 2%) [Table 1].

Of all patients in the (V) group, the majority of patients underwent Paraumbilical hernia 14 (28%), followed by cholelithiasis 10 (20%). In contrast, in the (H) group, most of the patients were found with cholelithiasis 13 (26%), followed by Paraumbilical hernia 11 (26%) of all patients [Table 1].

The procedure followed for surgery in both groups of patients was also recorded during the study. In the (V)

group, LAP appendicectomy was performed on most patients, 19 (38%), followed by LAP cholecystectomy and LAP IPOM in 14 (28%). In the (H) group, LAP appendicectomy was performed on most patients [Table 2].

Of 50 patients in the CL group, bowel injury was observed in a maximum of patients 5 (10%), followed by loss of space 3 (4%), whereas, in the (H) group, port site leakage was observed in the majority of patients 5 (10%).

The extent of pain experienced 24 h after the surgery was also noted during the study asking the patient severity that they are experiencing orally. Severe pain was observed by the majority of patients in (V) group 26 (52%), whereas, in the (H) group, majority of patients experienced moderate pain 28 (56%). Most group (V) patients, 29 (58%), experienced mild pain during discharge, whereas the majority of (H) group patients, 28 (56%) found with no pain [Table 2].

(V) group patients showed a higher mean time for primary trocar (6.82), whereas (H) group patients observed a mean time of 4.22. The average access time was found to be higher in the (V) group of patients (5.98) than in the (H) group of patients (4.34). There was no significant difference in the average duration of stay in both groups of patients (V: 4.66; (H): 4.76) [Table 3].

Table 1: Comparison of gender, age, and diagnosis between groups

Variables	Veress (V) group (%)	Hasson (H) group (%)	*P*-value
Gender			
Female	21 (42)	22 (44)	0.84
Male	29 (58)	28 (56)	
Age group			
<30	8 (16)	10 (20)	0.787
31–40	19 (38)	21 (42)	
41–50	14 (28)	14 (28)	
51–60	6 (12)	4 (8)	
>61	3 (6)	1 (2)	
Diagnosis			
Acute appendicitis	7 (14)	9 (18)	0.919
Acute chronic appendicitis	3 (6)	2 (4)	
Calculus cholecystitis	4 (8)	2 (4)	
Cholelithiasis	10 (20)	13 (26)	
Paraumbilical hernia	14 (28)	11 (22)	
Sub acute appendicitis	9 (18)	9 (18)	
TB abdomen	3 (6)	4 (8)	

Table 2: Comparison of procedures, complications, and pain between groups

Variables	Group		*P*-value
	Veress (%)	Hasson (%)	
Procedure			
D lap with biopsy	3 (6)	4 (8)	0.905
Lap appendicectomy	19 (38)	20 (40)	
Lap cholecystectomy	14 (28)	15 (30)	
Lap IPOM	14 (28)	11 (22)	
Complication			
Bowel injury	5 (10)	1 (2)	0.062
Entry on the wrong plane	2 (4)	0	
Extraperitoneal insufflation	2 (4)	0	
Loss of space	3 (6)	1 (2)	
Omental injury	2 (4)	0	
Port site leakage	2 (4)	5 (10)	
Nil	34 (68)	43 (86)	
Pain			
Moderate	21 (42)	28 (56)	0.371
Severe	26 (52)	20 (40)	
Very severe	3 (6)	2 (4)	
Pain at discharge			
Mild pain	29 (58)	22 (44)	0.161
No pain	21 (42)	28 (56)	

DISCUSSION

Pneumoperitoneum formation and trocar entry, which account for more than half of laparoscopic operation challenges, happen before surgery. Although the incidence of visceral and vascular damage from either procedure is unknown, fewer than 1% of patients have morbidity from having a pneumoperitoneum created and the initial trocar inserted. Hence, in our study, we compared the two methods side by side to see which was better for laparoscopic surgeries.[1-4]

In the present study, most patients were reported as male in both groups (V: 58%; B: 56%), whereas females were reported as 42% in the group (V) and 44% in group (H). Furthermore, most patients belong to the age group of 31–40 years in both groups (V: 38%; (H): 42%), followed by the age group of 41–50 years (V: 28%; (H): 28%). However, a minimum of patients was observed in age groups of more than 61 years in both groups (V: 6%; (H): 2%). These findings in the present study are from earlier reported studies.[8]

In our study, in the (V) group, the maximum number of patients diagnosed with paraumbilical hernia was 14 (28%), followed by cholelithiasis 10 (20%), whereas, in the (H) group, majority of patients observed with cholelithiasis 13 (26%), followed by paraumbilical hernia 11 (26%) of all patients. In their research, Bonjer *et al.* found a similar.[9]

Table 3. Primary trocar, access time, and duration of stay between groups

Variables	Group		*P*-value
	Veress	Hasson	
Time taken for primary trocar	6.82 0.85	4.22 0.86	<0.0001
Access time	5.98 2.25	4.34 1.73	<0.0001
Duration of stay	4.66 2.17	4.76 0.96	0.767

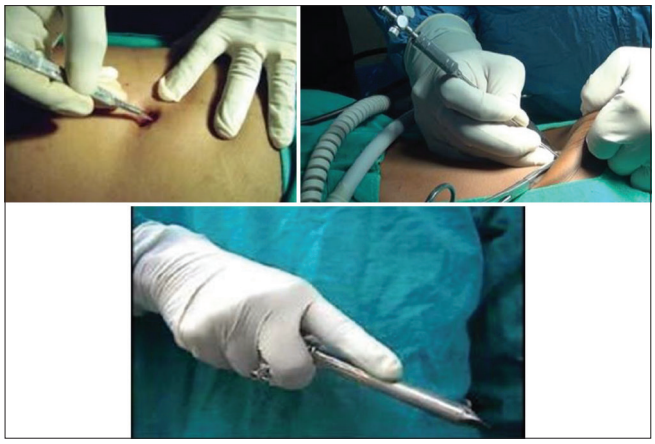

Figure 1: Veress needle technique

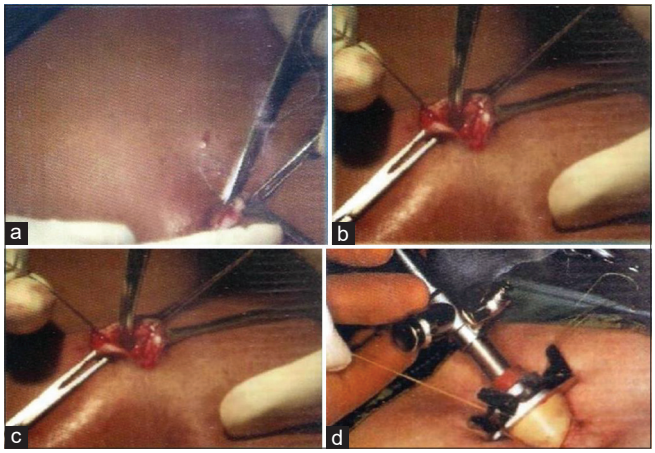

Figure 2: Hasson technique (a) a transverse incision around 2.5 cm is made supra (or) infraumbilically (or) transumbilical, (b) dissection of subcutaneous tissue is proceeded up to the rectus sheath, (c) the peritoneal breach is expanded with the artery forceps, and (d) the Hasson cannula is passed through the above incision, into the peritoneal cavity

In our study, in the (V) group, LAP appendicectomy was carried out on most patients, 19 (38%), followed by LAP cholecystectomy and LAP IPOM in 14 (28%). Whereas, in the (H) group, LAP appendicectomy was performed on most patients. Zaman *et al.* reported a laparoscopic cholecystectomy procedure in a maximum number of patients (85%) in both open and closed groups.[10]

In our study, of all patients in the (V) group, bowel injury complication was observed in a maximum of patients 5 (10%) followed by loss of space 3 (4%). In contrast, in the (H) group, port site leakage was observed in most patients 5 (10%). Juneja *et al.*, in their study, reported port site wound infection in most patients in both (V) and (H) group patients.[15] However, Taye *et al.*, in their investigation, reported difficulty in primary complications in most of the patients of the (V) group (1.73%) and leakage of gas (1.8%) in the (H) group of patients.[11]

In our study, most patients in the (V) group reported severe pain 26 (52%), whereas, in the (H) group, most patients experienced moderate pain 28 (56%) during the surgery. At the time of discharge, it was found that most of the group (V) patients, 29 (58%), experienced mild pain, whereas most of the (H) group patients, 28 (56%), had no pain. These findings in the present study are similar to earlier reported studies.[12]

In our study, (V) group patients showed a higher mean time for primary trocar (6.82 min). In contrast, (H) group patients were observed with a mean time of 4.22 min with a significant effect ($P < 0.0001$). The results of our investigation are consistent with studies by Peitgen *et al.* and Cogliandolo *et al.*, which demonstrate that the open approach is quicker than the closed technique and has a comparable frequency of problems.[13,14]

In our study, the average access time was found to be higher in the (V) group of patients (5.98 min) than (H) group patients (4.34 min), with a significant effect ($P < 0.0001$). Juneja *et al.* also reported a similar finding in their investigation, where there was a significant effect ($P < 0.03$) in access time between the V (2.83 min) and (H) (2.52 min) group of patients.[15]

In our study, duration of hospital stay after the surgery, there was no difference in the average duration of stay in both groups of patients (V: 4.66 days; (H): 4.76 days). Zaman *et al.*, in their study, also reported similar findings, where there was an insignificant difference in the average duration of stay in V (49.71 days) and (H) (45.1 days) group patients.[11]

Limitations of the study

There are some limitations of the study, such as the fact that the study data contained a small number of patients and it is a single-centered study and was collected during the covid pandemic; hence, the number of elective cases and cases opted for laparoscopy where minimal number and included in the study.

CONCLUSION

The incidence of these characteristics did not change significantly between the two approaches, making the open technique, also known as Hasson's technique, and the closed technique, also known as Veress' technique, nearly equal in terms of the degree of pain experienced during and after surgery and complications. However, compared to the Hasson approach, the "Veress needle method created pneumoperitoneum faster," and the Hasson technique had higher gas leakage. Therefore, more definitive information

is needed for multi-centric research with a systematic review, a high sample size, and meta-analyses.

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