

Comparative Analysis of Palmer's and Sub-Umbilical Point for Veress Insertion to Create Pneumoperitoneum in Laparoscopic CholecystectomySanthosh Kumar Elaveree E¹, Himani Sandhu², Rakshit Agnihotri³, Rohit Singh⁴¹JR-3, Department of General Surgery, Hind Institute of Medical Sciences, Mau Ataria, U.P.²JR-3, Department of General Surgery, Hind Institute of Medical Sciences, Mau Ataria, U.P.³JR-2, Department of General Surgery, Hind Institute of Medical Sciences, Mau Ataria, U.P.⁴Assistant Professor, Department of General Surgery, Hind Institute of Medical Sciences, Mau Ataria, U.P.

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Abstract:

Introduction: Laparoscopic cholecystectomy has emerged as a gold standard technique for the treatment of gall stones. The first step of a laparoscopic procedure is to create pneumoperitoneum through veress needle insertion in a selected point. The Palmer and sub-umbilical points are debated insertion sites. Compare the insertion sites of creating pneumoperitoneum for doing laparoscopic cholecystectomy in terms of safety, time taken and complications are the aim and objectives of the study.

Materials and Methods: A randomized controlled trial enrolled 50 patients undergoing laparoscopic cholecystectomy. Palmer Point Group (n=25) and Sub-umbilical Point Group (n=25) were formed. Veress needle insertion points were compared in terms of procedural time, complications, and conversion procedure.

Results: The baseline characteristics, including age, gender, and body mass index (BMI), were comparable between the two groups, ensuring a balanced distribution of demographic factors. In this study the Mean age was 41.73±7.61 years in group A and 40.8±9.08 years in group B; maximum number of females were presented i.e. 76% in Gr.-A and 80% in Gr. B; Mean weight was 65.20±6.66kg in group A and 64.82±7.34kg in group B; patients in group A, 11 (44%) were having calculus cholecystitis and 14 (56%) were presented with cholelithiasis, whereas, 13 (52%) were having calculus cholecystitis and 12 (48%) were presented with cholelithiasis; BMI was presented with 25-29.9 (9), 36% in Gr.A and 25-29.9 (8)32% in Gr.B. In the present study minimum assess time taken was 5.5 min and maximum was 8.5min. Mean procedure time was 70.3±2.19 min in group A and 72.15±1.56 min in group B. It was also observed the Palmer Point Group showed lower complications compared to Sub-umbilical Point Group (p=0.022). Whereas conversion procedure, hospital stay lengths, etc., did not show any significant difference.

Conclusion: This study supports the Palmer point technique's superiority for veress needle insertion than the sub umbilical point in patients undergoing laparoscopic cholecystectomy.

Keywords: Laparoscopic cholecystectomy, veress needle insertion, Pneumoperitoneum creation, Palmer point technique, Sub-umbilical point technique.

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Introduction

Access into the abdomen is the one challenge of laparoscopy that is particular to the insertion of surgical instruments through small incisions. Laparoscopy is currently widely used in the practice of medicine, for both diagnostic and therapeutic purposes. The minimally invasive approach has become the method of choice for treating most benign abdominal diseases that require surgery. However, it is obvious that laparoscopic procedures are not risk free. Laparoscopic entry is a blind procedure, and it represents a problem for all the related complications. Complications arising from laparoscopic surgery are rare and commonly occur

when attempting to gain access to the peritoneal cavity [1]. Creating a pneumoperitoneum is the most important step of laparoscopic surgery procedure (LS) 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 [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 100.000. Finding a safe entry technique is a priority not only for the life of the patients but also for the increasing

rate. 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 an optimal method of entry into the peritoneal cavity [3].

To decrease the complications of laparoscopic insertion, the abdominal wall (AW) must be separated from visceral organs as much as possible during entry in procedures other than open surgery. Many entry techniques have been described since human laparoscopy was first reported in 1910 by Jacobaeus, these include the veress-capno peritoneum trocar, the open (Hasson) technique and so on. The Veress needle insertion is the most frequently used technique [4].

Verres Needle: The Verres needle is the oldest method, developed by Dr. Verres in 1938. The users of this technique describe this entry as easy and quick. Commercially available Verres needles vary from 12 to 15 cm in length, with an external diameter of 2 mm. A bezel shaped tip enables the needle to pierce the tissues of the abdominal wall. Upon entering the peritoneal cavity, the resistance generated from the abdominal wall is overcome, which permits the exposure of the interior needle with its blunt atraumatic mandril.

This system affords a degree of safety and efficacy, making the puncture of the peritoneal cavity with a Verres needles an easy, fast, and effective technique. Once the peritoneal cavity is inflated by this technique, the first trocar can be inserted without problems, minimizing intraoperative gas leakage and saving surgical time. The classic location of the Verres needle puncture is the midline of the abdomen near the umbilical scar [5].

There are two important factors in the insertion of a Verres needle. First the insertion should be not excessive to avoid the risk of vascular injury. Second it should be adequate to avoid extra peritoneal insufflation, because this will lead to failure of the pneumoperitoneum with an associated operative difficulty due to inappropriate distension of the anterior abdominal wall and postoperative pain [6].

It has also been reported that the patients with previous abdominal surgery are more prone to visceral injury caused by the Verres needle at umbilical point. This is due to peritoneal adhesions, which typically grow where the incision of the parietal peritoneum was made [7].

Autopsy studies have found adhesions in 74% to 95% of patients with previous abdominal surgery. Midline incisions greatly increase the risk of adhesions in the umbilical region and even incisions made away from the umbilicus may lead to adhesion formation in the paraumbilical region [8]. On the other hand, insertion of the Verres

needle into the left hypochondrium has been reported as safe, with reduced risk of iatrogenic injury. [9]

Hence, a new technique which consists in a transverse supra- or sub umbilical incision showing the umbilical cicatrix pillar and the junction of the pillar with the linea alba. After the incision (1 cm) at the junction of the umbilical cicatrix pillar with the linea alba was possible to have the peritoneal cavity opened [10]. This technique was safe, effective, easy to learn, and quick to perform. The method clearly displayed the point on the abdominal wall where the peritoneum was tightly fused and allows direct entry to the peritoneal cavity in the majority of the cases, while the abdominal wall was kept tented and away from the underlying viscera at all times [10]. It has also been documented that the safest initial entry site in high-risk patients was the left upper quadrant, better known as Palmer's point. This site (3 cm below the left costal margin in the midclavicular line) was rarely affected by adhesions, and with splenomegaly and stomach distension being excluded it has been shown to be safe [11].

Therefore, the choice of Initial trocar entry site is very important which is based on surgeon's preference and comfort, patient's surgical history, and patient anatomy. The Common entry points are sub-umbilical, left upper quadrant or Palmer's point, right upper quadrant, mid-abdomen (Lee Huang point), vaginal or uterine fundus, and Jain's point [12,13].

Sub-umbilical point: Pneumoperitoneum may be created by placing the Veress needle at the sub-umbilical point, below the lower edge of the umbilicus.

Palmer's point: Where a patient has had multiple previous operations, risk of per umbilical adhesions a pneumoperitoneum may be created by placing the Veress needle in the right or left upper quadrant (Palmer's point, 3 cm below the left costal margin in the mid-clavicular line).

The choice between the Palmer and sub-umbilical points for veress needle insertion in laparoscopic cholecystectomy remains a topic of debate within the surgical community. While the Palmer point offers potential advantages in terms of safety and accuracy, the sub-umbilical point technique continues to be favoured for its familiarity and ease of use [14]. The existing literature provides insights into the benefits and limitations of each technique [15,16],

A comparative analytical study in between Palmer's point and Jain point has been reported and it was documented that the Jain point was a feasible entry option with low complication rates in situations where other ports have limitations.

The port was safe for all types of previous scars in the upper, middle, and lower abdomen and could be used in all ranges of BMI. As per surgical need it could be used as a mirror image from the right side. Located in the mid-abdomen, it doubles up as the main ergonomic working port. It has no known contraindications. The Jain point could be used as an entry port for all practitioners of laparoscopy in previous surgery cases of patients in whom Palmer's point was contraindicated [17]. A comparative study in between DTI and Veress needle technique has also been concluded that both the techniques i.e.; DTI and Veress needle technique were equally effective, safe and feasible for creation of pneumoperitoneum during laparoscopic procedure, but further research was needed to establish clear guidelines for veress needle insertion point selection based on patient characteristics and surgical outcomes [18]. In view of above facts this study was carried out to compare the outcomes of the Palmer's point and sub-umbilical point for veress needle insertion in creating pneumoperitoneum during laparoscopic cholecystectomy with the comprehensive analysis

of relevant parameters, such as procedural complications, surgical time etc to provide valuable insights into the preferred technique for optimal patient outcomes and surgeon satisfaction. This study also focused on surgical practice and the overall quality of laparoscopic cholecystectomy procedures through rigorous research and analysis, subsequently, strived to shed light on the on-going debate surrounding the optimal veress needle insertion points (Palmer's point and sub-umbilical point) and its impact on the laparoscopic cholecystectomy procedure.

Material and Methods:

Study site: Department of Surgery, Hind Institute of Medical Science, Mau Ataria, Sitapur

Study Design: Comparative Analytical study

Study duration: 18 months after obtaining HIMS IHEC'S Approval.

Sample size: 50 (In each group), Group A= Palmer's point and Group B = Sub-umbilical point.

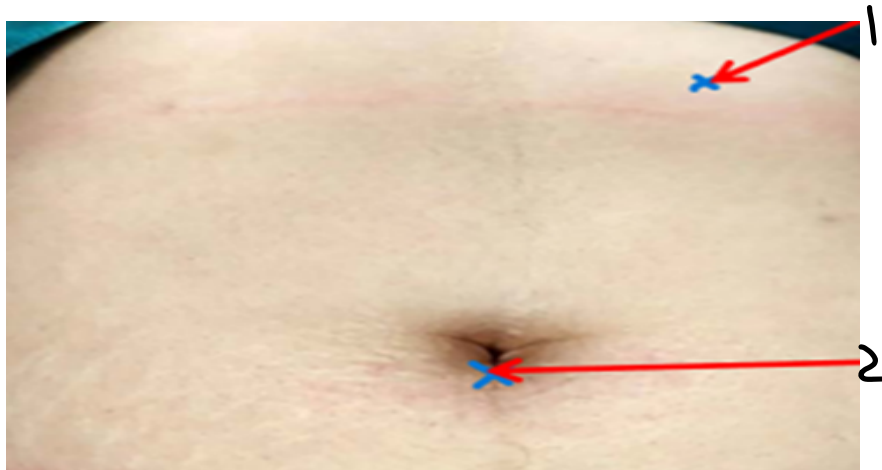


Figure 1: Palmer's point¹ and Subumbilical point² [i] Palmer's point [ii] Subumbilical point

Study Subject:

A total of 50 patients (25 in each group; Group A= Palmer's point and Group B = Sub-umbilical point) who were planned for an elective laparoscopic cholecystectomy surgery between April 2022 to August 2023 in a Tertiary health care center in North India were enrolled in the study.

Patients were accepted only when they met the following criteria: diagnosed with symptomatic cholelithiasis, aged 18 to 70 years, and provided informed consent.

Patients who are a known case of previous abdominal surgery, significant cardiopulmonary comorbidities, or when contraindicated for laparoscopic surgery were removed and not included in the study.

Methods:

This randomised comparative study was conducted on patients who attended the outpatient department of Surgery at Hind Institute of Medical Sciences, Mau, Ataria, UP

During the period that extended from April 2022-August 2023. All patients undergoing elective laparoscopic surgeries in department of surgery and meeting the inclusion criteria during the study period were included in the study. The patients belonging to age group of 18 to 70 years were enrolled for the study.

Patients who have undergone previous midline laparotomy, BMI more than or equal to 35, Pregnant women were not included in the study. Patients with uncorrected coagulopathy, peritonitis

and those not consenting to participate were also excluded.

Veress needle technique: Veress needle technique was performed as per standard guidelines in present study. Patient was placed in Trendelenburg position and 3 mm incision was given. An angle of 45° towards pelvis was maintained and Veress needle was introduced into the abdomen carefully. While inserting the needle, 2 sounds were ensured i.e.; one while entering fascia and second while entering into peritoneum. The needle was then then aspirated and the position was verified with the saline drop test before initiating insufflation. Following this, the gas tube was connected to the Verres needle and peritoneum was insufflated with CO₂ and then the trocar was inserted. Throughout the intraoperative period, vital parameters were recorded in both the groups. Time from incision to creation of pneumoperitoneum was noted. Number of failed attempts, ability to create pneumoperitoneum, conversion of closed method to open method was noted.

Also, the incidence of intraoperative as well as post-operative complications such as subcutaneous emphysema, port site bleeding, injuries to bowel, bladder or major abdominal vessels, omental injury, gas leak etc. were noted and compared between two groups [16].

Randomization: The enrolled patients were placed at a random into two groups using computer-generated random numbers: the Palmer Point Group (n = 25) and the Sub-umbilical Point Group (n = 25). Randomization was conducted by an independent research coordinator who did not have any role in the surgical procedures.

Surgical Procedure: All laparoscopic cholecystectomies were performed by a single experienced surgeon using a standard four-port technique. Pneumoperitoneum was established

using either the Palmer point or sub-umbilical point technique based on group allocation. Trocar placement and surgical steps were consistent for both groups.

Statistical analysis

Data was compiled using MS excel and IBM SPSS software version 20 was used for data analysis. Descriptive and inferential statistics was applied. Data was grouped and expressed as frequency and percentage whereas numerical data was expressed as mean and standard deviation. Chi square test was applied to assess the difference in proportions between two groups whereas t test was applied to assess the difference in mean values of two groups. P value<0.05 was considered significant whereas p<0.01 was considered highly significant.

Results:

A total of 50 patients were included in the study, with 25 patients allocated to the Palmer's Point Group-A and 25 patients to the Sub-umbilical Point Group-B. The baseline characteristics, including age, gender, and body mass index (BMI), were comparable between the two groups, ensuring a balanced distribution of demographic factors. In the present study Mean age were 41.73±7.61 years in group A and 40.8±9.08 years in group B. Minimum and maximum age of patient is 15 years & 68 years. In the present study maximum number of females is presented i.e. 76% in Gr.-A and 80%.in Gr. B. In this study minimum weight of the patient is 49 kg and maximum weight is 81kg. Mean weight was 65.20±6.66kg in group A and 64.82±7.34kg in group B. Out of 25 patients in group A, 11 (44%) were having calculus cholecystitis and 14 (56%) were presented with cholelithiasis. Among group B, out of 25 participants, 13 (52%) were having calculus cholecystitis and 12 (48%) were presented with cholelithiasis. (Table 1)

Table 1: Distribution of demographic factors in two groups (A=Palmer's point; B= Sub umbilical point)

Variables	Palmer's, point (n=25)		Sub umbilical point (n=25)	
	Number	Percentage (5)	Number	Percentage (%)
Gender				
Male	6	24%	5	20%
Female	19	76%	20	80%
Age(Y)				
<20	1	4%	1	4%
21-40	6	24%	9	36%
41-60	14	56%	13	52%
61-70	4	16%	2	8%
Mean Age (Y)±SD	41.73±7.61		40.8±9.08	
Mean Weight(Kg)±SD	65.20±6.66		64.82±7.34	
Calculus cholecystitis	11(44%)		13(52%)	
Cholelithiasis	14(56%)		12(48%)	
BMI				
18.5-24.9	5	20%	4	16%
25-29.9	9	36%	8	32%

30-34.9	4	16%	7	28%
35-39.9	4	16%	5	20%
≥40	3	12%	1	4%

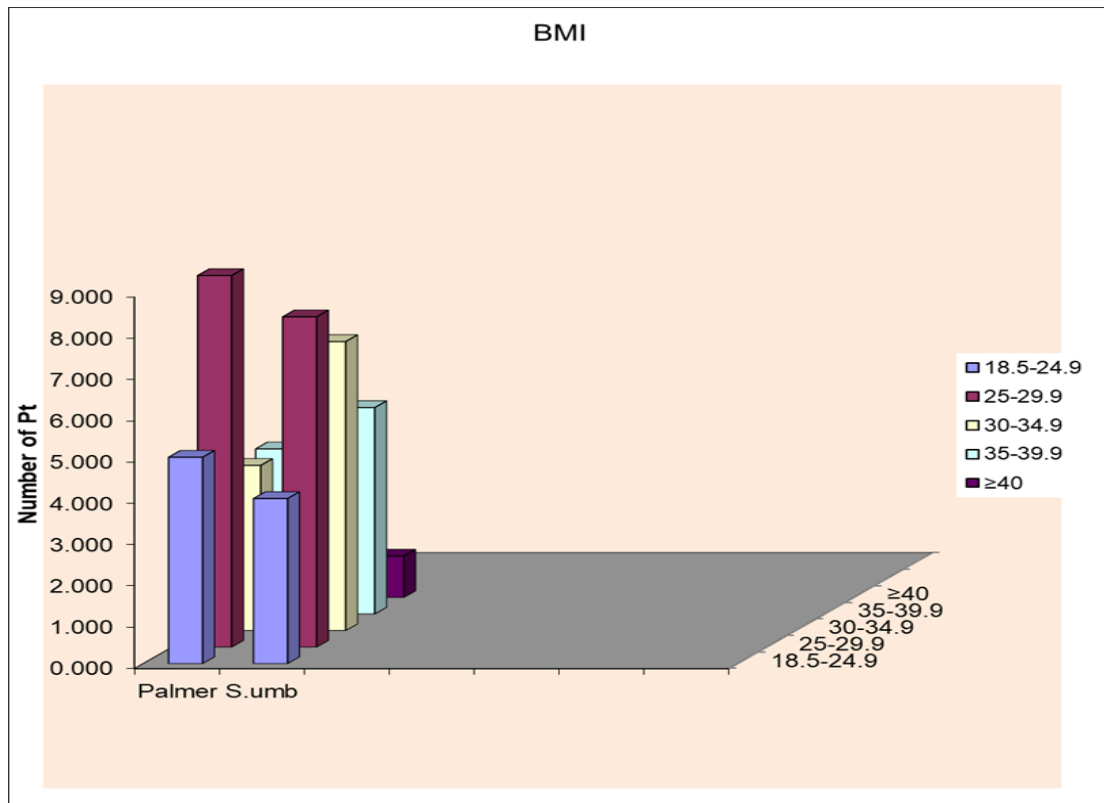


Figure 2: Comparative distribution of BMI (kg/m²) in two groups (A=Palmer's point; B= Subumbilical point)

BMI (kg/m²) -range-25-29.9 with 36% in Group A, where as 32% in group B (p=≤0.005)

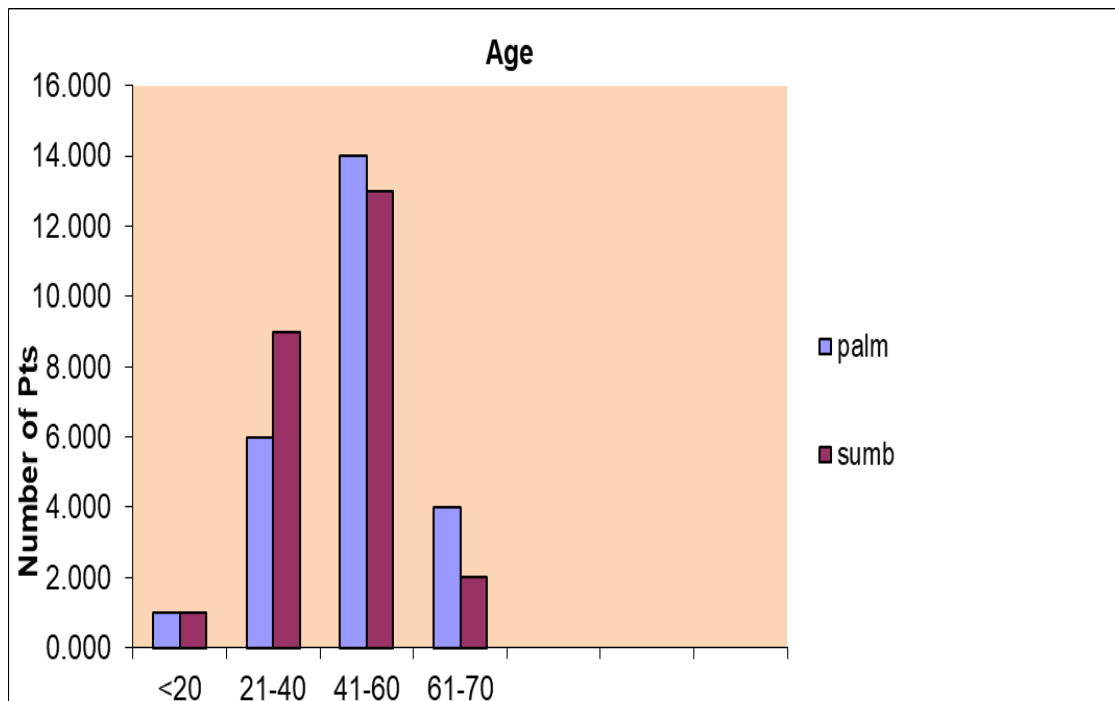


Figure 3: Comparative distribution of Age (Y) in two groups (A=Palmer's point; B= Sub umbilical point)

Age-range-41-60 with 56% in Group A, where as 52% in group B ($p \leq 0.005$). In The Present Study Minimum Assess Time Taken Was 5.5 Min and Maximum Was 8.5min. Mean Procedure Time Was 70.3 ± 2.19 Min In Group A And 72.15 ± 1.56 Min In Group B. (Table-2 & Figure 4)

Table 2: Intraoperative/ Postoperative Parameters in two groups (A=Palmer’s point; B= Subumbilical point)

Variables	Palmer’s, point (n=25)	Subumbilical point (n=25)	P Value
Mean Procedure Time (Minute)	70.3mins±2.19 (55-85)	72. 15±1.56mins (60-84)	0.368
Intraoperative time(min)			
<45	4	3	0.026
45-60	19(76%)	17(68%)	
>60	2	5	
Assess time(Min)			
1-5	3	1	0.027
6-10	20(80%)	22(88%)	
>10	2	2	
Number of attempts (average)	1	1.12	0.063
Complications	3	5	0.022
Conversion	0	0	
Mean length of stay in hospital (days)	4 1.5 (SD)	5 1.5(SD)	
Vomiting	16.1	26.6	0.005
Urinary Retention	10.3	34.5	0.005
Port Site Hematoma	0	0	
Port Site Infection	0	0	

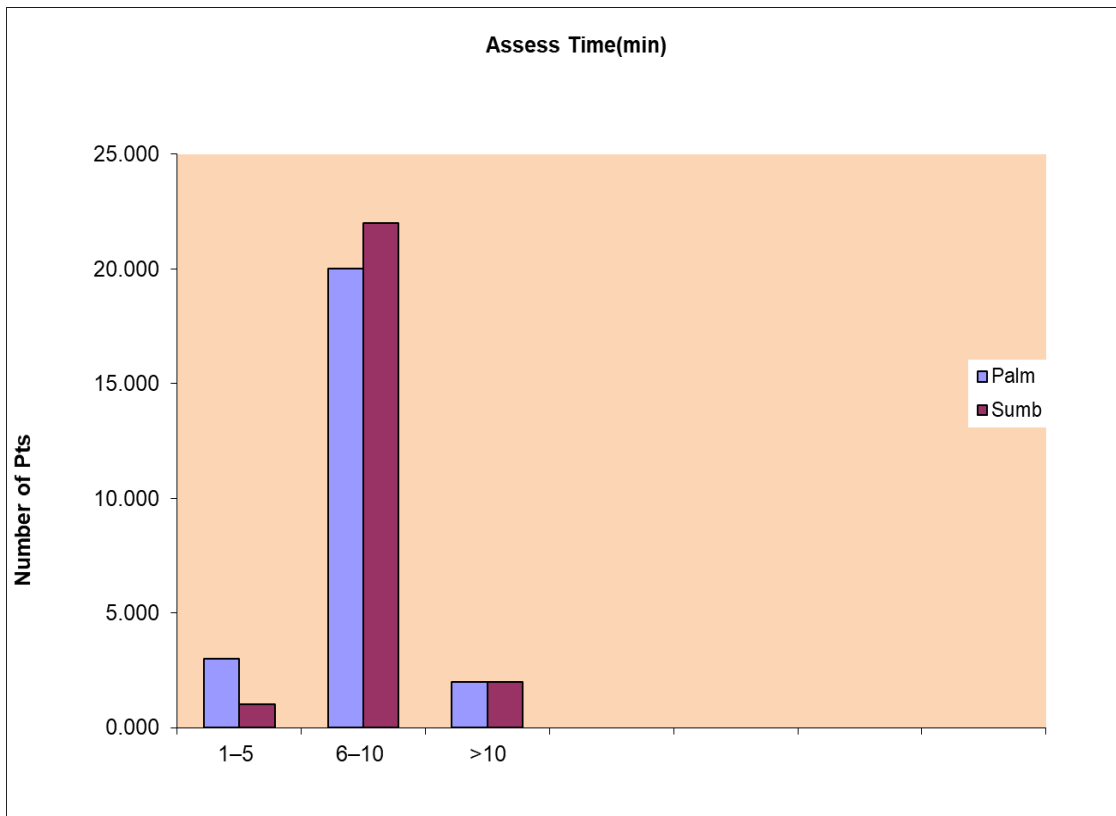


Figure 4: Access time analysis in both groups

Assess Time (Min) Range- 6-10 (mins) with 80% in Group A, where as 88% in group B ($p \leq 0.027$)

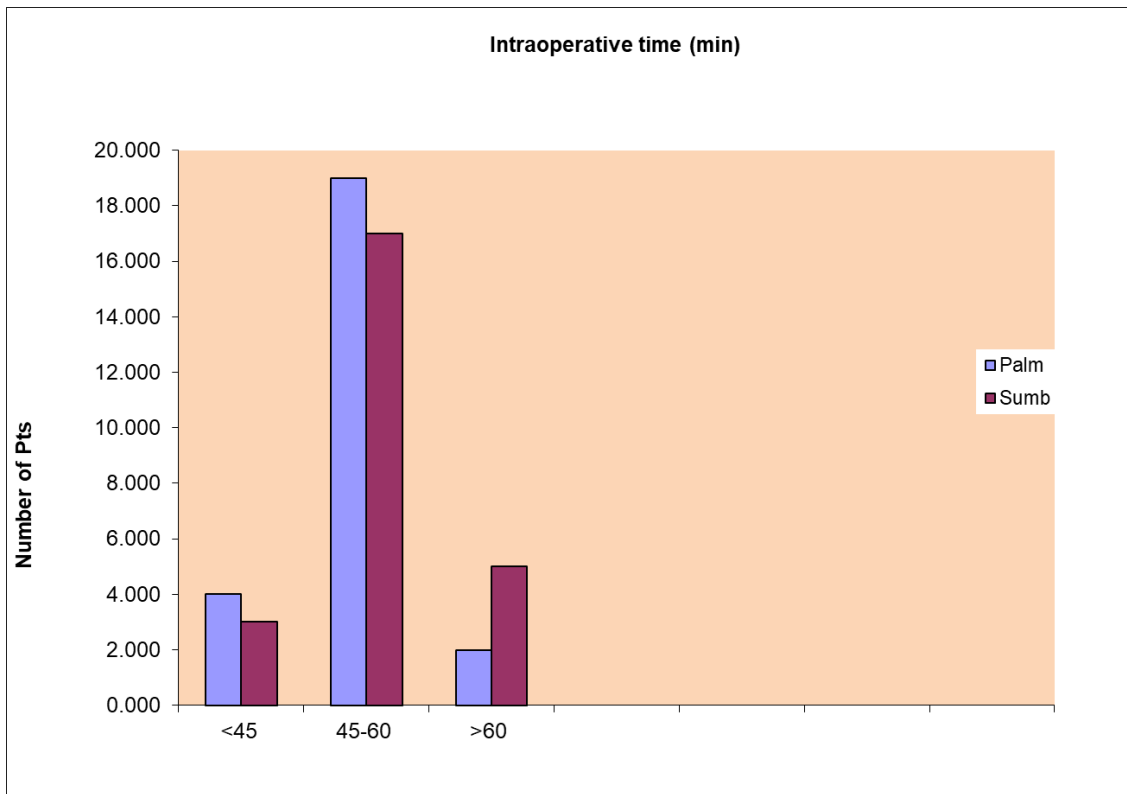


Figure 5: Intraoperative time analysis in two groups

Intraoperative Time (Min) Range- 45-60 (mins) with 76 % in Group A, where as 68% in group B ($p \leq 0.026$)

Intraoperative Parameters:

The intraoperative parameters assessed included procedural time, complications related to veress needle insertion, and the need for conversion surgery. Notably, complications related to veress needle insertion such as extra peritoneal gas insufflation, puncture of viscera, vascular injury were markedly reduced in the Palmer Point Group as opposed to the Sub-umbilical Point Group with a p-value of 0.022 which was statistically significant

($p < 0.05$). Additionally, the Palmer Point Group exhibited an insignificant difference in mean procedural time, number of attempts and conversion to open procedure ($p > 0.05$) compared to the Sub-umbilical Point Group.

Postoperative Outcomes:

Length of stay in hospital was evaluated as postoperative outcome. The length of stay in hospital was almost similar between the two groups, ie. 4 days for Gr.-A, and 5 days for Gr.B. It was indicated that the choice of veress needle insertion point did not significantly affect recovery time in the present study (Table-2).

Table 3: Postoperative pain after 12 hr, 24 hr, 48 hr in group A and group B

visual analogue scale	Palmer's, point (n=25)	Subumbilical point (n=25)
12 hr.		
0-3	2	3
4-7	20	19
8-10	3	3
24 hr		
0-3	4	1
4-7	18	19
8-10	3	5
48hr		
0-3	14	15
4-7	9	6
8-10	2	4

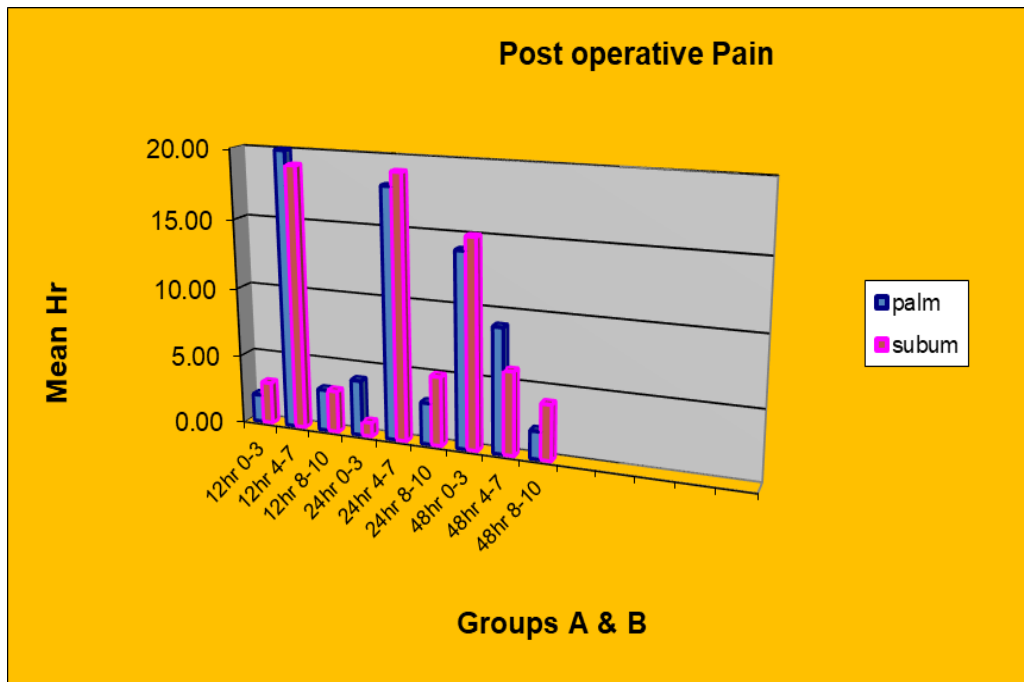


Figure 6: Postoperative pain after 12 hr, 24 hr, 48 hr in group A and group B.

Postoperative pain (hr.) Score-4-7 in 12hr & 24 hr; in 48 hr- Score-03 in both groups.

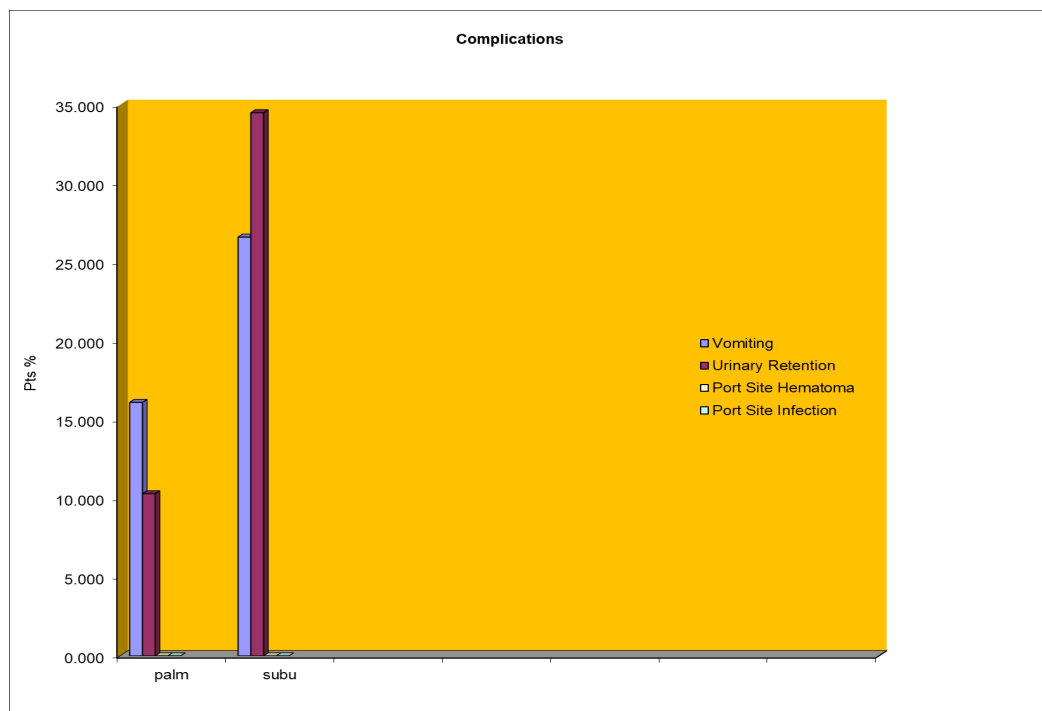


Figure 7: Complications in between two groups (A=Palmer’s point; B= Sub umbilical int)

Vomiting and Urinary Retention was found significantly ($p \leq 0.005$) more in Gr.B.

So, Table-2,3 & figures- 3-4, have revealed that there was significant less pain in group A patients than in group B patients, subsequently there was no significant difference in intraoperative time, assess time, wound infection and port site hernia in group A and group B patients.

Discussion

Complications associated with Veress needle entry during laparoscopic surgery, such as gastrointestinal or vascular injury, are fortunately rare [19]. Safely inserting a Veress needle and creating pneumoperitoneum is thought to be both the most important and the most difficult step in laparoscopy. Some authors reported that about 50%

of all laparoscopic surgery complications occur during Veress needle entry [20,21]

The traditional site of Veress needle entry for peritoneal insufflation is at the base of the umbilicus because it is the thinnest site of the abdominal wall. However, this site is not appropriate for some patients because of previous laparotomy, ventral hernia, suspected intraperitoneal adhesions, or failure of access after three attempts. In these patients, there are other sites for entry, with Palmer's point being the most commonly recommended site [22] as compare to subumbilical point.

Using subumbilical point has some disadvantages. In a randomized study, it has been found that Veress entry via subumbilical point and intraumbilical entry had similar failure rates [23]. But the fascial layers of abdominal wall at Palmer's point do not come together, which may be why the correct placement of the Veress needle at this point was difficult as compare to subumbilical point but safely, accuracy were more [23]. Hence, the left upper quadrant access i.e. Palmer's technique for closed Veress entry, could be a safe alternative for accessing the peritoneal cavity and creation of pneumoperitoneum, especially for patients with prior abdominal operations and intraperitoneal adhesions to minimize entrance related injuries. As with our study results, the published data was also reciprocated with the safety of palmer's technique for creation of pneumoperitoneum. There was no complication during the access of abdomen through this technique. In 96.8% of patients access was obtained through single attempt and mean pneumoperitoneum establishing time was 7.2 minutes. A study reported that the left sub costal approach was successful in 342 of 344 attempts (99%), in 2 patients the method failed because the Veress needle could not be placed in the peritoneal cavity and an open insertion method was used. There were no major complications and a hematoma in the greater omentum in one patient was the only complication, which was self-limiting hematoma and did not require treatment subsequently in all patients, a pneumoperitoneum was successfully created [24]. Similarly, a previous study did not encounter any major entrance injury in 38 patients with prior abdominal operations using palmer's point for creation of pneumoperitoneum for laparoscopic radical prostatectomy [25].

It has also been documented that the open (Hasson) technique and palmer's technique for pneumoperitoneum in the obese patient and those with suspected Peri-umbilical adhesion could be used as alternative [26]. A study described the use of Palmer's point for establishing pneumoperitoneum has several advantages. First, because the peritoneum is xed and braced

anteriorly by the arch rib, inserting the Veress needle requires less effort; thus, abdominal traction (e.g., using two towel clips) is unnecessary. Second, there is less subcutaneous fat at Palmer's point, even in obese patients. Thus, inserting the needle is easy and is unaffected by the shape of the patient. Third, with the aid of gravity, the viscera fall away from Palmer's point. There are no major vessels at this site. Inserting the Veress needle in this area is theoretically safe [27]. Although the length of the Veress needle is usually 12 cm, the risk of aortic injury approaches zero. Third, adhesion is rare in these areas, even in patients with prior surgeries [28].

In our study, it was observed that there was no significant difference in intraoperative time, surgical site infection and port site hernia between two groups. But there was reduce postoperative pain in group A than group B, as we have used visual scale that may be varied, subsequently total hospital stay was slightly more in group B. One patient who sustained injuries during primary access was retained for one more day and account for this extra stay. Our findings were in consistence with many workers [29,30].

Conclusion

Although the most commonly used entry technique is classical closed technique via a Veress needle at the umbilical/subumbilical site, in patients with history of previous abdominal operations who are at a higher than average risk for entry complication due to increased incidence for intraperitoneal adhesions, an alternative entry site or entry method has to be considered. We conrmed the safety of primary left upper quadrant (Palmer's point) access for laparoscopic cholecystectomy in patients with previous history of abdominal operations and recommend the same. Our study was not without limitations. Hence, we recommend that more randomized controlled trials be conducted.

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