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A study comparing open technique v/s veress technique for principal port access in laparoscopic surgery

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Abstract

Background: There is yet to be a clear consensus on the best strategy for entering the peritoneal cavity for laparoscopic surgeries. Closed and open techniques are used simultaneously with varying frequencies but none of the procedures currently used to access the abdomen in laparoscopic surgery are fully effective or free from complications.

Objectives: To study and identify the supreme technique of principal port access in Laparoscopic surgery between veress technique and open technique

Results: A total of 60 patients were enrolled. The gas leak was sub satanically low in the Veress technique as compared to the open technique ($p=0.0001$). The failed attempt observed was also quite less consisting of only 10% patients.

Conclusion: The Veress technique was found to be significantly superior to the open technique.

Keywords: Currently, found, superior, technique

Introduction

Laparoscopy is a popular surgery in several surgical and gynaecological disciplines. Complications from laparoscopy are frequently related to the first entry or placement of the first port into the abdomen. There is yet to be a clear consensus on the best strategy for entering the peritoneal cavity for laparoscopic surgeries. Despite significant recent technological breakthroughs in minimally invasive surgical procedures, pneumoperitoneum is still required for laparoscopy. The proper approach for getting access into the abdominal cavity is a bit of a conundrum, and complications related to the entry technique could prove fatal [1-3].

The initial stage in laparoscopic surgery is to create a pneumoperitoneum; the surgeon might use a variety of procedures to accomplish this. This is the most dangerous step, and the majority of complications connected to laparoscopic surgery as a generic method occur at this stage, with a fatality rate of 0.05–0.2% [4]. Many studies have been undertaken to assess the benefits and drawbacks of closed versus open approaches for creating pneumoperitoneum. However, randomised, multi center clinical trials have not been able to provide a definitive conclusion as to which of the two procedures is safest [5].

Closed and open techniques are used simultaneously with varying frequencies. Some studies have been published with slight modifications of the two basic approaches and others are in the testing phase. None of the procedures currently used to access the abdomen in laparoscopic surgery are fully effective or free from complications. Thus, different approaches and techniques have been studied. Two of these methods are the standard technique of insufflation by Veress needle insertion (VN) and direct trocar entry (DT) without prior pneumoperitoneum. Several studies have suggested that DT entry is a safe alternative to VN entry, but few were prospective and only 3 were randomized. Although TD is faster than any other entry method, it is the least performed laparoscopic technique. Complications of laparoscopic surgery appear to be primarily entry related and independent of surgical complexity. Several studies have suggested that the initial insertion of the trocar is the most dangerous step in minimally invasive surgery [6].

Extraperitoneal space insufflation occurs in roughly 0.5% of instances and is often caused

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by inappropriate placing of the Veress needle in subcutaneous tissue, the mesentery, the omentum, or the retroperitoneum [7]. This complication can arise if the Veress needle does not pierce the subcutaneous tissue deeply enough to enter the peritoneal cavity, allowing the insufflating gas to accumulate between the fascia and peritoneum. Subcutaneous emphysema can also occur if the entry site is too big or if there is leakage surrounding the cannula. Inadvertent extraperitoneal space insufflation frequently presents as difficulty in forming a pneumoperitoneum. Even though the needle tip is in the subcutaneous tissue, a defective pressure gauge and servo regulator can produce significant amounts of insufflating gas [8]. Carbon dioxide insufflation in the abdomen has two major effects on respiration, one mechanical and one chemical. Mechanically, increasing intraabdominal pressure decreases diaphragmatic excursion and end expiratory volume, both of which contribute to increased respiratory dead space and CO retention [9]. Furthermore, general anaesthesia with paralysis increases the amount of alveolar dead space and the number of high ventilation-perfusion (V/Q) zones [10]. Clinically, increasing dead space is indicated by an increase in PaCO₂ and a decrease in expired end-tidal CO₂. This CO₂ retention can be resolved with appropriate muscular relaxation and controlled mechanical ventilation, as well as the use of supplementary oxygen and positive airway pressure to promote oxygenation as needed. [11, 12] The cumulative effects of hypercapnia and acidosis decrease cardiac contractility, alter the arrhythmia threshold, and lead to tachycardia and vasoconstriction. The resorption of the insufflated gas is responsible for the chemical effect on breathing. The insufflated gases diffuse through the peritoneal surface and are carried away by the venous blood flow [13].

Methods

Study design and methods: All patient were selected from the general surgery operation theatre at LTMMC & LTMGH, Mumbai, India. Who were undergoing any laparoscopic surgery with entry of principal port being umbilicus. Patient with any laproscopic procedure with principal entry other than umbilicus, parental refusal were excluded, and diseased umbilicus or previous surgeries around the umbilicus were excluded for veress method. The duration of the study was a year. It is a prospective interventional study. Parameters such as age, time of principal port access, duration of surgery, gas used, leak of intra-pertoneal CO₂, any failed attempts and postoperative complications were observed. Port closure will be done with port closure needle with 1 no. vicryl under vision.

Veress technique

Patients after giving small supra-umbilical or infra-umbilical stab incision, veress needle will be inserted through it in the direction of anal canal going perpendicular to the skin. Entry into abdomen will be confirmed via the irrigation, suction and hanging drop method. The CO₂ insufflations of the abdomen will be done with flow rate initially 1ml/sec later with 3ml/sec till liver dullness is achieved. Then the incision is increased till 11mm and in the same direction sharp 10mm trocar is inserted & entry confirmed with a gush of air. Then the telescope is inserted via the canula to confirm the entry into peritoneum and look for potential injuries.

Open technique

Patients after giving supra-umbilical (Crying) or infra-umbilical (Smiling) incision, subcut is dissected until the rectus sheath is reached. Under vision the sheath is incised and the entry is confirmed by inserting an artery forceps and entry of the artery forceps into the abdomen without resistance. Blunt 10mm canula is inserted. Then the abdomen is insufflated with CO₂ with 3ml/min flow rate until target pressure is achieved. Then the telescope is inserted via the canula to confirm the entry into peritoneum and look for potential injuries.

Statistical Analysis

Chi square test of association & student independent t-test was performed for both the techniques. The data was analysed on SPSS ver 25.

Results

There were a total of 60 patient who qualified the criteria and who gave their voluntary consent during the study period. In which the age ranged from 17 to 70 years with mean and std. deviation of (37.98±13.7440) after which the age group was converted into two categories less than 38 years and more than 38 years respectively. Out of which 36(60%) belonged to the first group followed by 24(40%) belonging to more than 38 years. (From table 1)

Table 1: Mean & Std. deviation of variables such as Age, Total port access time and Amount of gas used.

Variables	Mean ± std. deviation
Age	37.98±13.7440
Total principle port access time	4.53±2.560
Total amount of gas used	138.37±79.1863

Time for principle port access was recorded in minutes, start time and end time was recorded and duration of the full process was recorded accordingly. The time ranged from 2 minutes to 18 minutes with mean and std. deviation as (4.53±2.5609). In majority of the patients (n = 16) the procedure was completed in 4 minutes followed by 3 minutes in 13 patients. Only one patient's procedure took 18 minutes to complete. During the procedure the amount of gas used was also recorded ranging from 55 units to 440 units, with mean of 138.36 units and std. deviation of 79.19 units. 150 unit of gas was needed by 8 patients (13.3%) during the procedure. (From table 2).

Gas leak was observed in 14(23.3%) patients and in 46(76.7%) there was no such problem found. Amongst the total of 60 patients failed attempt was only observed in 6(10%) of the patients and 54(90%) had no such issue. With respect to extra peritoneal insufflation only 9(15%) patient observed to have it and the remaining 51(85%) did not required it. Access technique used in the study were open and veress, in 31(51.7%) patient open access technique was used and in 29(48.3%) veress was used. Port side complications such as bleeding, Infectn, Seroma and Hernia were being observed, in all the 60 patients bleeding, seroma and hernia was not observed. Only 4(6.7%) patients faced infectn as port side complication and 56(93.3%) did not faced this complication. (From table 3).

Table 2: Total principle port access time (in minutes) & Total amount of gas used

Principle port access time (In Minutes)	N (Percent)	Total amount of gas used	N (Percent)
2 min	8 (13.3)	55	1 (1.7)
3 min	13 (21.7)	62	2 (3.3)
4 min	16 (26.7)	63	4 (6.7)
5 min	9 (15)	65	1 (1.7)
6 min	9 (15)	70	2 (3.3)
7 min	2 (3.3)	73	3 (5.0)
10 min	1 (1.7)	78	2 (3.3)
12 min	1 (1.7)	80	1 (1.7)
18 min	1 (1.7)	84	3 (5.0)
Total	60	85	3 (5.0)
		90	2 (3.3)
		95	1 (1.7)
		101	3 (5.0)
		102	1 (1.7)
		121	1 (1.7)
		133	1 (1.7)
		145	4 (6.7)
		150	8 (13.3)
		178	2 (3.3)
		185	1 (1.7)
		200	2 (3.3)
		202	2 (3.3)
		207	4 (6.7)
		221	2 (3.3)
		245	1 (1.7)
		250	1 (1.7)
		440	2 (3.3)
		Total	60

Table 3: Characteristics of patients, Indications, Techniques & Complications

Variables	N (Percent)
Age	
Less than 38 years	36 (60)
More than 38 years	24 (40)
Access techniques	
Open	30 (50)
Veress	30 (50)
Port side complications	
Bleeding	0
Infectn	4 (6.7)
Seroma	0
Hernia	0

Table 4: Open v/s Veress Technique

Variables	Open	Veress	p value
Principle port access time	2.74±3.054 [#]	7.31±1.9291 [#]	0.785
Gas leak			
Yes	13	1	0.0001**
No	17	30	
Failed attempt			
Yes	0	6	0.009**
No	30	24	
Extra peritoneal insufflatn			
Yes	1	6	0.329
No	29	25	
Total amount of gas used	145.44±55.6350 [#]	100.09±97.0932 [#]	0.519
Port side complications			
Bleeding			
Yes	0	0	-
No	30	30	
Infectn			

Yes	4	0	-
No	26	30	
Seroma			
Yes	0	0	-
No	30	30	
Hernia			
Yes	0	0	-
No	30	30	
Vessel Injuries			
Yes	0	0	-
No	30	30	
Duration of surgery (in Hrs)	1.44 ± 0.5823 [#]	1.10 ± 0.3748 [#]	0.558

** Chi square value < 0.01

Independent t test

Chi square test of association was performed to test the association of access techniques with other variables it was found that the access techniques were highly associated with gas leak and failed attempt with p vale of 0.0001 and 0.009 respectively. Independent t test was performed for principal port access time and amount of gas used. (From table 4).

Discussion

In the study it was observed that the majority of the subject enrolled in the study were belonging to the younger age i.e. below 38 years. The gas leak was sub satanically low meaning there was not much of a gas leak observed during the procedure. The failed attempt observed was also quite less consisting of only 10 percent. From the total study patient on one third were affected by extra peritoneal insufflatn. The common post port side complication was kept in mind and were observed during the procedures of all the study patient apart from infectn no other complications were observed. Access technique were found to be highly significant with amount of gas leak and failed attempts. Stating that there is association between the type of access technique and the amount of gas and attempt required for completing the procedure. Port access time was observed less in open technique in comparison to veress technique. Open access technique required more amount of gas. There was no major vessel injuries nor any port side complication apart from infects during open technique procedure. Open surgery technique took a bit more time in completing the procedure with respect to veress technique.

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