

Comparison of Open and Closed Entry Techniques for Creation of Pneumoperitoneum in Laparoscopic Surgery in Terms of Time Consumption, Entry-related Complications and Failure of Technique

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ABSTRACT

The modern art of examining the abdominal cavity by laparoscopy and its contents which requires insertion of a cannula through abdominal wall, creation of pneumoperitoneum and visualization of abdominal cavity to perform any surgical procedure has become a routine in many institutions. The first step in any laparoscopic procedure is creation of pneumoperitoneum for which mostly carbon dioxide is the recommended gas used. Two commonly used methods to create pneumoperitoneum are closed (veress needle) and open technique (Hasson technique). Both have their own advantages and disadvantages. The current study was designed to compare these two techniques in terms of safety of the procedure, time for induction of pneumoperitoneum, air leakage, and time required to complete the procedure.

Aim: To compare the open and closed methods of creating pneumoperitoneum for doing various laparoscopic procedures in terms of their safety, operating time and other parameters.

Settings and design: A prospective randomized double blind study.

Materials and methods: This was a randomized controlled prospective study conducted at Department of General and minimal access surgery, MMIMSR Medical College, Ambala Haryana from August 2013 to December 2015. Pneumoperitoneum was created by closed technique in group A, and by open technique in group B. Time required for successful pneumoperitoneum was calculated in each group. Failure to induce pneumoperitoneum was determined for each technique. Time

required to induce pneumoperitoneum, total operating time, air leakage and injuries sustained during induction of pneumoperitoneum were compared in both techniques.

Result: Out of the total 200 patients included in study, 100 were in group A and 100 in group B. Mean time required for successful pneumoperitoneum was 9.17 minutes in group A and 8.11 minutes in group B. Total operating time ranged from 55 minutes to 130 minutes in group A and from 45 to 110 minutes in group B. Mean of total operating time was 78.34 and 67 minutes in groups A and B respectively. Mean time needed to close the wound was 9.88 minutes in group A and 4.97 minutes in group B. Failure of technique was noted in three patients in group A while no failure was experienced in group B. Air leakage was seen in five patients in group B and none in group B. In two cases in group A minor complications during creation of pneumoperitoneum were observed while in group B no complication occurred. Port site infection and port site hernia was seen in group B and none in group A. No patient died in the study. Two patients were having preperitoneal insufflation which was presented as injury due to induction of pneumoperitoneum.

Conclusion: We concluded from this study that open technique of pneumoperitoneum was, less time consuming and safer than the closed technique.

Keywords: Hasson's technique, Laparoscopic cholecystectomy, Pneumoperitonem, Veress needle.

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INTRODUCTION

The existence of numerous methods for the induction of pneumoperitoneum at laparoscopy surgery indicates that none have been proven totally efficacious or complication free. These methods include the standard or closed technique of insufflation after insertion of the Veress needle via the umbilicus (infra or supra umbilical), open laparoscopy involving dissection through the linea alba

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and opening of the peritoneum under direct vision, and direct trocar insertion. After reviewing the two methods available and surveying the existing data concerning the rates of failure and complications, we conclude that no single technique can claim to be overwhelmingly superior, and that laparoscopic surgeons should, therefore, acquaint themselves with both of these two techniques. The umbilical port (10 mm) is also known as primary port, through which laparoscope is introduced. The majority of visceral or vessel injury is due to entry of primary umbilical port.¹

The open technique was first described by Hasson in 1970. This technique consists of creating a small umbilical incision under direct visualization to enter the abdominal cavity followed by the introduction of a blunt trocar. Pneumoperitoneum is then rapidly created. Hasson proposed its potential benefits to be the avoidance of blind insertion of the Veress needle and bladed trocar, prevention of visceral and vascular injuries, preperitoneal insufflation and gas embolism, guaranteed pneumoperitoneum, and a more anatomical repair of the abdominal wall.²

Under usual circumstances, the Veress needle is inserted in the umbilical area, in the midsagittal plane, with or without stabilizing or lifting the anterior abdominal wall. In patients known or suspected to have periumbilical adhesions, or after failure to establish pneumoperitoneum after three attempts, alternative sites for Veress needle insertion may be sought.³

Both of these techniques are associated with vascular as well as visceral injury, but extensive literature reviews have not proved the superiority of one technique to the others, largely due to the lack of large, randomized, controlled trial data. Today, some 30 years on, the debate continues as to which method is the safest to use. Various unreliable available body of facts indicates that the younger generation of General surgeons prefer the open technique.⁴⁻⁶

AIMS AND OBJECTIVES

The aim of the study is to see the difference between open and closed methods of creation of pneumoperitoneum for performing any laparoscopic procedure in terms of operating time, safety, failure of technique and time for creation of pneumoperitoneum.

MATERIALS AND METHODS

The study was carried out in the Department of General Surgery, MMIMSR Medical College and Hospital, Ambala, Haryana from August 2013 to December 2015.

INCLUSION CRITERIA

- Cholelithiasis (uncomplicated)
- Age 18 to 70 years
- No history of previous laparotomy
- Normal umbilicus.

EXCLUSION CRITERIA

- Age < 18 and > 80
- Pregnancy
- Past history of laparotomy
- Umbilical hernia or granuloma/abscess
- Severe systemic illnesses.

OBSERVATION AND RESULTS

The study was conducted at MMIMSR Medical College and Hospital, Ambala, Haryana. A total of 200 patients were studied out of which 170 underwent laparoscopic, 20 laparoscopic hernia repair and 10 laparoscopic appendectomy (Table 1). All the patients underwent laparoscopic procedures were divided into two groups A and B. In group A, pneumoperitoneum was created using closed technique and in group B it was created using open technique. The two groups had different parameters regarding time of consumption of entry technique for pneumoperitoneum, safety of viscera vessels and bladder, air leakage, port site hernia and failure of both techniques in two groups (Tables 2 and 3).

DISCUSSION

Minimal access surgery has become the method of choice for management of symptomatic and uncomplicated gallbladder stones, appendectomies and hernia repair

Table 1: Type of procedure carried out in two groups

Procedure	Group A (n = 100)	Group B (n = 100)
Laparoscopic cholecystectomy	85	85
Laparoscopic appendectomy	5	5
Laparoscopic hernia repair	10	10

Table 2: Time analysis in two groups

Variable p-value	Group A		Group B	
	Range	Mean SD	Range	Mean SD
Time required to induce pneumoperitoneum 0.044	6–17	9.17 ± 2.86	6–10	8.11 ± 1.02
Total operating time 0.005	55–130	78.34 ± 21.59	45–110	67 ± 15.11
Hospital stay 0.034	36–72	49.71 ± 8.30	36–56	45.1 ± 6.76

Table 3: Complications in two groups

Variable	Group A (100)	Group B (100)
Failure of technique	0	3 (3%)
Air leakage	5 (5%)	0
Port site infection	2 (2%)	0
Port site hernia	0	1 (1%)
Injuries (including preperitoneal insufflation)	0	2 (2%)

p value < 0.05

(TAPP and TEP). One of the key steps in this type of surgery is induction of pneumoperitoneum, which is not physiological and has adverse hemodynamic and respiratory outcomes.^{7,8} These effects can be minimized with appropriate dedicated anesthetic management.¹⁴⁻¹⁶ Iatrogenic injuries in laparoscopic surgery, however, are still a problem confronted by the surgeon.^{15,16} Traditional closed method of pneumoperitoneum involves initial blind entry into abdomen and more than half of such injuries are related to this primary blind access and occur before the start of actual anatomic dissection.⁹ It is because of these complications that laparoscopic surgery faced a lot of criticism by the surgical community in the beginning.¹⁰ To prevent these complications other methods were introduced in practice like open technique as devised by Harrith Hasson, direct trocar insertion, optical trocars, radically expanding trocars and use of disposable shielded trocars.¹¹⁻¹⁴ However, the veress needle technique and Hasson's technique with their different modifications are the two widely used methods today.¹⁵ We compared these methods in terms of time required to induce pneumoperitoneum, time needed to close the wounds, total operating time and complications associated with each method in our studies if failure of technique was more seen in case of closed technique then on other hand port site infection, and air leakage was more a problem with open technique.

CONCLUSION

From this study we can reach to a conclusion that there is no evidence to support the superiority of one technique over the other, and this view is supported by the literature. We believe that surgeons should be competent in both techniques. Either can be used without undue risk.

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