

## Original Research

### To compare the open versus closed method of pneumoperitoneum creation in laparoscopic surgery

<sup>1</sup>Ashwani Kumar, <sup>2</sup>Rajiv Sharma

<sup>1</sup>Assistant Professor, <sup>2</sup>Senior Resident, General Surgery, Pandit Jawahar Lal Nehru Government Medical College (Pt JLNGMC), Chamba, HP, India

#### ABSTRACT:

**Aim:** To compare the open versus closed method of pneumoperitoneum creation in laparoscopic surgery. **Material and methods:** This research comprised 100 patients of either gender who had an operating procedure for laparoscopic surgery. Per operational results included the manner and length of pneumoperitoneum generation, numerous tries, incision size, extraperitoneal insufflation, port site haemorrhage, gas leak, and total gas utilised. Surgical complications such as visceral or vascular damage, port site hematoma, and conversion to open surgery were described. Patients were evaluated in the post-operative period for wound hematoma, wound infection, gas embolism, and port site incisional hernia. **Results:** All the 100 patients that participated in this study belonged to the age group of 15-63 years out of which majority were 45-55 years old which is the period of maximum physical activity. There were 65% male and 35% females in the current study. Technical difficulties like multiple attempts, gas leak at port site and port site bleeding are more in open method than in closed method, which is attributed to larger size of incision in open method. Furthermore, a significant higher incidence of such minor complications is found in case of BMI >25 ( $p < 0.05$ ) at confidence level of 95%. Duration for pneumoperitoneum creation in open method group is shorter as compared to closed method group for pneumoperitoneum creation in laparoscopic surgery;  $p$  value is 0 ( $p < 0.05$ ) at confidence level of 95%. **Conclusion:** We may infer that both the open and closed techniques for producing pneumoperitoneum during laparoscopic surgery are completely safe. Due to the larger incision size, minor problems occur more often with the open approach, although the treatment may be completed in less time. Significant vascular and visceral harm, however, did not occur in any of the study groups.

**Keywords:** laparoscopic, surgery, pneumoperitoneum

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**Corresponding author:** Rajiv Sharma, Senior Resident, General Surgery, Pandit Jawahar Lal Nehru Government Medical College (Pt JLNGMC), Chamba, HP, India

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#### INTRODUCTION

Key-hole surgery, or laparoscopy, is a form of operation in which the surgeon views the internal organs via small incisions in the skin.<sup>1</sup> The words laparo, meaning "abdomen," and skopein, meaning "to see," in Greek are the origin of the term. The benefits of laparoscopy over laparotomy include shorter hospital stays, less discomfort after surgery, quicker recovery times, better aesthetic outcomes, and fewer scars.<sup>2</sup> The abdominal cavity is enlarged with the use of a pneumoperitoneum, main and secondary ports are positioned, and a variety of port closure methods are used. There are now five main techniques to generate pneumoperitoneum: blind Veress needle insertion, direct trocar insertion, optical trocar insertion, the open approach, and the modified open method. The most prevalent method is direct Veress needle

insertion.<sup>3</sup> Trocar injuries during insertion into the abdominal cavity, port site complications like infection, oedema, haematoma, and pain, and an increased risk of hypothermia and peritoneal trauma due to increased exposure to cold and dry gases during insufflation are the most serious risks associated with laparoscopy.<sup>4</sup> Patients with a low body mass index or a history of past abdominal surgery are at a higher risk of such injuries, particularly during trocar entrance.<sup>5,6</sup> In spite of this, laparoscopic surgery still has a lower complication rate than open surgery does. In patients with low body mass index, scars from prior surgery, abdominal TB, and pelvic inflammatory disease, past studies have shown that the open approach is superior than the closed method in terms of time of the operation and frequency and severity of complications.<sup>7</sup>

## MATERIAL AND METHODS

After receiving clearance from the protocol review committee and the institutional ethics committee, this comparative research was carried out at the Department of Surgery. This research comprised 100 patients of either gender who had had an operating procedure for laparoscopic surgery. Per operational results included the manner and length of pneumoperitoneum generation, numerous tries, incision size, extraperitoneal insufflation, port site haemorrhage, gas leak, and total gas utilised. Surgical complications such as visceral or vascular damage, port site hematoma, and conversion to open surgery were described. Patients were evaluated in the post-operative period for wound hematoma, wound infection, gas embolism, and port site incisional

hernia. All patients undergoing elective laparoscopic surgery and hemodynamically stable patients are eligible, while patients undergoing emergency laparoscopic surgery, a history of abdominal tuberculosis or puerperal sepsis, cases of machinery failure for pneumoperitoneum establishment, and patients with intestinal obstruction are not. Chi square tests are used to determine statistical significance.

## RESULTS

All the 100 patients that participated in this study belonged to the age group of 15-63 years out of which majority were 45-55 years old which is the period of maximum physical activity (Table 1). There were 65% male and 35% females in the current study.

**Table 1: Gender and age distribution**

Gender	Number	%
Male	65	65
Female	35	35
Age		
below 25	12	12
25-35	22	22
35-45	15	15
45-55	41	41
above 55	10	10

Technical difficulties like multiple attempts, gas leak at port site and port site bleeding are more in open method than in closed method, which is attributed to larger size of incision in open method, Furthermore, a significant higher incidence of such minor complications is found in case of BMI >25 ( $p < 0.05$ ) at confidence level of 95% (Table 2)

**Table 2: Size of incision in both methods**

	Open methods	Closed methods
<b>AVG size of incision (mm)</b>	13.5	13
Maximum size of incision mm	15	14
Minimum size of incision mm	13	13

Duration for pneumoperitoneum creation in open method group is shorter as compared to closed method group for pneumoperitoneum creation in laparoscopic surgery; pvalue is 0 ( $p < 0.05$ ) at confidence level of 95% (Table 3.)

**Table 3: Duration of pneumoperitonium creation in both methods**

	Open methods	Closed methods
Avg duration of Pneumoperitonium creation (sec)	114	141
Maximum duration of pneumoperitonium creation (sec)	209	181
Minimum duration of pneumoperitonium creation (sec)	79	79

Mild technical issues, such as several tries ( $p = 0.041$ ), gas leaks at the port site ( $p = 0.041$ ), and minor consequences, such as port site bleeding, are more common with the open approach. In the case of the closed technique, one incidence of pre-peritoneal insufflation is documented. In most circumstances,  $p < 0.05$  is used. As a result, it is statistically significant. There was no report of visceral/vascular damage or port site hematoma in our research. Wound infection (clear discharge) occurred in three instances, one in the open technique group and two in the closed method group, and was effectively treated with

antibiotics and dressing. No instances of port site hernia have been documented during the follow-up period, however a longer duration of follow-up is required. Previous surgery, particularly laparoscopic surgery and surgery near the umbilicus and its scar, may induce adhesions between the viscera and the scar, increasing the risk of damage during pneumoperitoneum. As a result, in these individuals, the open approach of producing pneumoperitoneum is preferable. In our research, the kind of laparoscopic operation had no effect since there were no particular selection criteria for the type of laparoscopic surgery.

## DISCUSSION

The open approach has the benefit of gaining peritoneal cavity access under direct observation, which prevents the most serious damage. Intra-abdominal structural injury is a possible preventable consequence of laparoscopy. Many of these injuries are the result of the blind insertion of the veress needle or sharp main trocar into the abdomen during closed laparoscopy. Most laparoscopists still believe that using a typical blind veress needle entrance to induce pneumoperitoneum first before inserting the trocar as a standard laparoscopic method is safer. This research found that minor problems, such as several tries, gas leak at the port site, and port site bleeding, are somewhat more common with the open approach of pneumoperitoneum generation than with the closed method. In the case of the closed technique, there are two cases of pre-peritoneal insufflation. Three instances of port site infection in the open approach and two cases in the closed method were treated with antibiotics and dressing. Both techniques were free of serious difficulties. The open approach takes less time to create a pneumoperitoneum and uses less gas than the closed method, making it difficult to provide clear data concerning the superiority of the two procedures. The increased incision size linked with the open approach contributed to the difficulties. As opposed to the needle puncture the closed approach, the incision is a tiny laparotomy. The findings are consistent with previous research. While evaluating the complexities of both strategies, Schafer et al determined that the open access method did not outperform the closed strategy.<sup>8</sup> In their comparison of open and closed procedures, Bonjer et al showed that the rates of visceral and vascular damage were 0.08% and 0.07% after closed laparoscopy, respectively, and 0.05% and 0% after open laparoscopy ( $p=0.002$ ).

There was no statistically significant change in fatality rates.<sup>9</sup> There was no fatality in either of the two study arms in this investigation. Chapron et al, on the other hand, observed that the rates of bowel and major vascular damage in the closed approach ( $n=8324$ ) were 0.04% and 0.01%, respectively, and 0.19% and 0% with the open technique ( $n=1562$ ). They came to the conclusion that open laparoscopy did not lower the likelihood of serious problems during laparoscopic access.<sup>9</sup> Chandler et al. discovered that the open approach had no safety benefit over the closed technique.<sup>10</sup> In this research, neither group had a severe problem. According to the European Association for Endoscopic Surgery, randomised controlled studies comparing closed vs open approaches have insufficient sample size to detect a difference in significant consequences.<sup>11,12</sup> There were fewer problems in the closed group in major outcome studies, but randomised controlled trials revealed the open technique to be quicker and linked with a reduced frequency of minor complications. The panellists did not prefer one strategy over the other. We discovered that the open method was quicker than

the closed strategy in this investigation. This is also consistent with earlier research. Petigen et al discovered that the open approach needed half the time of the closed technique and advised its adoption since it was more cost effective.<sup>13</sup>

The European Association for Endoscopic Surgery likewise decided that the open procedure is quicker than the veress needle method for inserting the initial trocar. Sigman et al. discovered that the open technique needed less time and recommended for its usage on that basis.<sup>14</sup> In their research, Zakherah et al determined that the open method is a safer option to the closed entrance strategy for creating pneumoperitoneum.<sup>15</sup> Other benefits of this method include lower costs and equipment, as well as faster pneumoperitoneum formation. In his research, no significant injuries were observed, but mild problems were more common with the open method, which is consistent to our findings. In his research, Moberg A et al reported no serious injuries while employing the open approach.<sup>16</sup> He also noted a lower occurrence of minor issues such as gas leaks. However, the time required for access was much longer in the case of patients with BMI more than 25 using the open approach. In our research, individuals with BMIs greater than 25 required longer time to get entry. In his research, Shailesh Kumar et al found that veress needle (closed approach) is equal, if not better, than open technique in terms of access-related issues.<sup>17</sup> Although minimal difficulties occurred, Ilias et colleagues determined that the open approach was quicker.<sup>18</sup> This is analogous to our research. In this investigation, the open technique was quicker, but we found a 'gas leak' issue in one out of every 10 situations. The problem was remedied by tightening and anchoring the sliced fascia to the trocar. This takes time and creates disruption in the midst of the operation.

## CONCLUSION

We may infer that both the open and closed techniques for producing pneumoperitoneum during laparoscopic surgery are completely safe. Due to the larger incision size, minor problems occur more often with the open approach, although the treatment may be completed in less time. Significant vascular and visceral harm, however, did not occur in any of the study groups. Pneumoperitoneum may be created in laparoscopic surgery using either the open or closed approach; hence, both are equally effective.

## REFERENCES

1. NHS Choices. NHS. Available at: <https://www.nhs.uk/conditions/laparoscopy/#>. Accessed on 15 July 2019.
2. Agha R, Muir G. Does laparoscopic surgery spell the end of the open surgeon? *Journal of the Royal Society of Medicine*. J R Soc Med. 200;96(11):544–6.
3. Chotai NR, Choksi BB, Damor S, Bhedi A. Intraperitoneal access by closed method (veress needle) versus open (Hasson's) method in laparoscopic surgery

- to create pneumoperitoneum. *Int Surg J*. 2017;4(8):2786-90.
4. Perugini RA. Complications of laparoscopic surgery [Internet]. *Surgical Treatment: Evidence-Based and Problem-Oriented*. Holzheimer RG, Mannick JA, editors. Munich: Zuckschwerdt; 2001.
  5. Kwak HD, Ju JK, Kang DW, Baek S-J, Kwak JM, Kim J, et al. Outcomes according to body mass index following laparoscopic surgery in patients with colorectal cancer [Internet]. *J Min Access Surg*. 2018;14:134-9.
  6. Lécure F, Leonard F, Philippe Jais J, Rizk E, Robin F, Taurelle R. Laparoscopy in patients with prior surgery: results of the blind approach Internet. *JLS*. 2001;5(1):13-6.
  7. Bathla V, Thekdi PI, Koradia P, Jhala D, Gadhvi U. Comparative study of modified open technique and closed technique for primary trocar insertion in laparoscopic surgery. *Int J Res Med Sci*. 2016;4(1):160-4
  8. Schafer M, Krahenbuhl L. Trocar and Veress needle injuries during laparoscopy. *SurgEndosc*. 2001;15:275-80.
  9. Bonjer HJ, Hazebroek EJ, Kazemier G, Giuffrida MC, Meijer WS, Lange JF. Open versus closed establishment of pneumoperitoneum in laparoscopic surgery. *Br J Surg*. 1997;84:599-602.
  10. Chapron C, Cravello L, Chopin N, Kreiker G, Blanc B, Dubuisson JB. Complications during set-up procedures for laparoscopy in gynaecology: open laparoscopy does not reduce the risk of major complications. *ActaObstetGynecol Scand*. 2003;82: 1125-9.
  11. Chandler JG, Corson SL, Way LW. Three spectra of laparoscopic entry access injuries. *J Am Coll Surg*. 2001;192:478-90.
  12. Neudecker J, Sauerland S, Neugebauer E, Bergamaschi R, Bonjer HJ, Cuschieri A. et al. The European association for endoscopic surgery clinical practice guideline on the pneumoperitoneum for laparoscopic surgery. *SurgEndosc*. 2002;16:1121-43.
  13. Peitgen K, Nimtz K, Hellinger A, Walz MK. Open approach or Veress needle in laparoscopic interventions? Results of a prospective randomized controlled study. *Chirurg*. 1997;68:910-3.
  14. Sigman HH, Fried GM, Garzon J, Hinchey EJ, Wexler MJ, Meakins JL, et al. Risks of blind versus open approach to celiotomy for laparoscopic surgery. *SurgLaparoscEndosc*. 1993;3:296-9.
  15. Zakherah M. Direct trocar versus veress needle entry for laparoscopy: a randomized clinical trial. *GynecolObstet Invest*. 2010;69:260-3.
  16. Moberg A.C, Petersson U. Direct trocar versus veress needle entry for laparoscopy: a randomized clinical trial. *Scand J Surg*. 2012;96:297-300.
  17. Shailesh K, Shubhendu B. Veress needle: a safe technique in modern laparoscopic era. *World J Laparoscop Surg*. 2013;6(1):1-5.
  18. Ilias J, Jatin B, Bhavesh V. Open vs. closed method of establishing pneumoperitoneum for laparoscopic surgery. *Int J Res Med Sci*. 2016;5(1):13-7.