

Comparison Between Veress Needle (Closed) Technique and Open Technique in Laparoscopic Cholecystectomy

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Abstract

Background: The aim of this study is to compare open cholecystectomy with needle (closed) technique in laparoscopic cholecystectomy in terms of outcomes and complications.

Methods : In this comparative study patients undergoing cholecystectomy were randomized to be in either of the two groups. Each containing 70 patients. Inclusion criteria was, patients with age 20 to 50 years with symptomatic gall stones disease, and without any other general contraindication for laparoscopic surgery . All patients were diagnosed by history ultrasound abdomen. All patients having contraindications to laparoscopic procedure like respiratory compromise, malignancy or any other co-morbidities were excluded from the study. Group A constituted 70 patients and all those were randomized for open technique while group B also contained the same number of patients and they were randomized for Veress needle technique. Open technique was performed through skin incision and then dissecting the fascia for gaining access to abdomen by inserting trocar while the closed technique involves direct insertion of Veress needle into abdominal cavity for pneumoperitoneum creation and then trocar placement. The parameters compared were access time , gas leak, visceral injury, vascular injury, need for conversion, umbilical port site hematoma, umbilical port site infection, umbilical port site hernia. Patients were assessed after discharge at the first post operative day, seventh day then after 2 months, 6 months, and after 1 year and last visit on 18 months for assessment of complications.

Results: Out of 140 patients, 90 were females and 50 patients were males. Age ranged from 22 to 55 years with mean age of 40 years. The mean time needed to create pneumoperitoneum was 4 ± 1 minutes in veress needle technique and 5 ± 1 in open method (p-value = 0.000) . Gas leak was observed in 15 patients in group A where as no patient had a gas

leak in group B (p-value=0.000). Pneumoperitoneum was achieved in all 150 cases. There was one case of visceral injury in which ileal mesentery was damaged while inserting trocar (p-value = 0.316). It was managed laparoscopically. No vascular injury was noted in both groups. Neither open nor closed techniques were associated with conversion to open cholecystectomy regarding access to peritoneal cavity. Two (1,3%) patients had post operative hematoma at the umbilical port site in group A whereas no one developed this complication in group B (p-value = 0.154) . Four (2.6 %) patients presented with surgical site infection at the umbilical trocar site(p-value=0.042). No complications were noted in the veress needle technique. No patient presented with umbilical port site hernia after 18 months of follow up.

Conclusion: Both the open and closed method for gaining access into peritoneal cavity are safe but the veress needle method has advantage of less time taken to enter into the abdominal cavity as compared to open method and port site complications like port site hematoma formation and infection are more in open technique.

Key Words: Pneumoperitoneum, Open method, Veress needle, Cholecystectomy

Introduction

The first laparoscopic procedure in a human which was documented in literature was performed by Jacobeus of Sweden in 1910. Creating pneumoperitoneum is the first and vital step for laparoscopic surgery. There are two methods for creating pneumoperitoneum either closed or open. Closed method is commonly used by the surgeons due to its ease. The first laparoscopic procedure in a human which was documented in literature was performed by Jacobeus of Sweden in 1910.¹ Since the advent of this new technique, laparoscopy has been in constant evolution. Over the last couple of decades there is more inclination towards laparoscopy.

Laparoscopic entry is a blind procedure and it often represents a problem for all the related complications. 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 on an optimal method of entry into the peritoneal cavity. Access into the abdominal cavity is one of the biggest challenges of laparoscopy that is particular to the insertion of surgical techniques through small incisions or direct insertions². Laparoscopy is currently widely used, not only for diagnostic but also for therapeutic purposes. The minimally invasive approach is gaining popularity day by day and is becoming the method of choice for treating most benign and malignant abdominal conditions that requires surgery like appendectomies, cholecystectomies, ovarian cysts, hysterectomy, hernioplasties (ventral and inguinal) and diagnostic laparoscopy. However, like any other technique it is obvious that laparoscopic procedure is not free of risk. Laparoscopic entry is a blind and challenging procedure. Complications during laparoscopic procedures are rare but are common while gaining access to abdominal cavity.²

The most critical step of a laparoscopic procedure is the creation of the pneumoperitoneum, this is step is associated with injuries to the abdominal viscera and major blood vessels and at least 50% of these injuries/ complications occurs prior to the start of the surgery.^{3,4} The most common and widely used laparoscopic procedure in Pakistan is laparoscopic cholecystectomy. Due to its obvious advantages now it has become the treatment of choice and gold standard for the treatment of symptomatic gallstones, acutely inflamed gallbladder (acute cholecystitis), chronic cholecystitis and empyema gallbladder as well. Laparoscopic cholecystectomy is cost effective with better outcome, shorter hospital stay, minimal complication rate and cosmetically good results. As mentioned earlier that gaining access of abdomen for creating pneumoperitoneum is the most challenging part in laparoscopic procedures^{2,5}. Complications arising from laparoscopic surgery are rare and commonly occur when attempting to gain access to the peritoneal cavity⁶ and 50% of complications arise during this time. This complication rate has remained the same during the past 25 years⁷. 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 100,000⁸. To address those complications, there are various techniques for gaining access to peritoneal cavity. Amongst the techniques used are veress needle

(closed), hasson trocar (open), direct trocar insertion and shielded trocar insertion. Numerous studies have been conducted to assess the safety and ease of various techniques for pneumoperitoneum creation and abdominal access, but consensus has been established so far and the choice of method has been left to surgeons experience and preference.

Patients and Methods

This comparative study was conducted over a period of 1.5 years from January 2013 to July 2014 in Surgical Unit II Holy Family Hospital, Rawalpindi, Pakistan. Participants were randomized to be in either of the two groups. Each containing 70 patients. All patients were selected by simple convenient sampling. Inclusion criteria was, patients with age 20 to 50 years with symptomatic gall stones disease, and without any other general contraindication for laparoscopic surgery. All patients were diagnosed by history ultrasound abdomen. Patients having contraindications to laparoscopic procedure like respiratory compromise, malignancy or any other comorbidities were excluded from the study. Informed detailed consents were taken from the patients. Group A contained 70 patients and all those were randomized for open technique while Group B contained the same number of patients and they were randomized for veress needle technique. Open technique was performed through skin incision and then dissecting the fascia for gaining access to abdomen by inserting trocar while the closed technique involves direct insertion of veress needle into abdominal cavity for pneumoperitoneum creation and then trocar placement. The parameters compared were access time, gas leak, visceral injury, vascular injury, need for conversion, umbilical port site hematoma, umbilical Port site infection, umbilical Port site hernia. Patients were assessed after discharge at the first post operative day, seventh day then after 2 months, 6 months, and after 1 year and last visit on 18 months for assessment of complications.

Results

Out of 140 patients, 90 were females and 50 patients were males. Age ranged from 22 to 55 years with mean age of 40 years. The mean time needed to create pneumoperitoneum was 4±1 minutes in veress needle technique and 5±1 in open method (p-value = 0.000) (Table 1). Gas leak was observed in 15 patients in group A where as no patient had a gas leak in group B (p-value = 0.000) (Table 2). Pneumoperitoneum was achieved in all 150 cases. There was one case of

visceral injury in which ileal mesentery was damaged while inserting trocar (p-value = 0.316) (Table 3). It was managed laparoscopically. No vascular injury was noted in both groups. Neither open nor closed techniques were associated with conversion to open cholecystectomy regarding access to peritoneal cavity. Two (1.3%) patients had post operative hematoma at the umbilical port site in group A whereas no one developed this complication in group B (p-value = 0.154) (Table 4). Four (2.6 %) patients presented with surgical site infection at the umbilical trocar site (p-value = 0.042) as shown in Table IV. No complications were noted in the veress needle technique. No patient presented with umbilical port site hernia after 18 months of follow up.

Table 1: Comparison of access time in both groups

| Variables | Open technique (group A) | Veress needle technique (group B) | p Value |
|-------------|--------------------------|-----------------------------------|---------|
| Access time | 5 ± 1 min | 4 ± 1 min | 0.000 |

Table 2: Comparison of Gas leak in both groups

| Variables | Open technique (group A) | Veress needle technique (group B) | p Value |
|-----------|--------------------------|-----------------------------------|---------|
| Gas Leak | 15 | 0 | 0.000 |

Table 3: Comparison of visceral and vascular injuries and need for open conversion

| | | | |
|---------------------|----------|-------|-------|
| Visceral injury | 1 (0.7%) | 0 (0) | 0.316 |
| Vascular injury | 0 (0) | 0 (0) | - |
| Need for conversion | 0 (0) | 0 (0) | - |

Table 4: Comparison of port site complications in both groups

| Variables | Open technique (Group A) | Veress needle technique (Group B) | p Value |
|----------------------------|--------------------------|-----------------------------------|---------|
| Port site hematoma | 2 (1.3%) | 0 | 0.154 |
| Port site infection | 4 (2.6%) | 0 (0) | 0.042 |
| Umbilical Port site hernia | 0 (0) | 0 (0) | - |

Discussion

Over the last two decades, rapid advances have made laparoscopic surgery a well established procedure. However, is relatively new, it still arouses controversy, particularly with regard to the best method for the creation of the pneumoperitoneum. There are two well recognized methods for creating pneumoperitoneum.

It can either be done by open method i.e insertion of laparoscopic trocar or Hassan trocar. Alternatively, verres needle may be inserted blindly through the abdominal midline. The latter method is most frequently used technique.

In our study access time for creation of pneumoperitoneum and insertion of camera port was 5 ± 1 min in group A whereas it was 4 ± 1 min in group B. This time for access of peritoneum is comparable to international literature. Study published in a Scandinavian journal noted that the blind Veress technique requires 214-300 seconds for abdominal cavity access⁹, compared to other studies (240-300 seconds) where open access has been used.⁹⁻¹¹ Borgotta reported 130 sec time for closed pneumoperitoneum.¹² Byron et al also reported significantly longer time insertion in VN group (5.9 2.2 min).¹³ Angoli R et.al also reported longer access time with veress needle. They reported 161.7sec in open group where as 212.4 sec in VN group.²⁸ In study by Somro et al, the time used for creation of pneumoperitoneum with veress needle was 5 minutes, by open method 8 minutes.¹⁴

In Our study 15 patients in group A developed gas leak where as no gas leak was observed in group B. One patient had a visceral injury in group A whereas no patients has visceral injury in group B. Jansen et al. in clinical trials that compared closed and open entry techniques, the complication rates were 0.07% and 0.17% for the closed and open techniques, respectively. The number of entry-related complications with the open technique was significantly higher than with the closed technique. There is no evidence to support abandoning the closed entry technique in laparoscopy; however, the selection of patients for an open or alternative procedure is still recommended.^{15,16} Meta-analysis failed to reveal any safety advantage of an open technique when compared with a closed method of entry, in terms of both visceral and major vascular injury. It must be noted that the included randomised controlled trials had insufficient power to effectively demonstrate an advantage.¹⁷

In group A, 2 i.e 1.3% patients developed umbilical port site hematoma where as in group B no patient developed port site hematoma. In group A, 4 i.e 2.6% patients developed umbilical port site infection where as in group B no patient developed port site infection. Our results are comparable with many other studies. Den Hoed *et al.* found the incidence to be 5.3%, Shindholimath *et al.* 6.3% and Colizza *et al.*^{18,19} <2%.²⁰ All PSIs were superficial, involving only the skin and subcutaneous tissue. Superficial skin infection is more

common and has been reported by another study.²¹No patient developed umbilical port site hernia at the follow up of 18 months in both groups. Our results are comparable to international literature. The overall incidence of port-site hernia was 1.7% (range, 0.3% to 5.4).²⁷

No patient had vascular injury in both groups. Our result correlates with the international literature. No vascular injury was reported in a study investigating 3,041 patients submitted to blind insertion of the first trocar through a midline incision at the umbilicus under intraperitoneal pressure of 25–30 mmHg.²² This corroborates the hypothesis that elevated intraperitoneal pressure protects the intraabdominal structures from injury caused by the first trocar. No injury caused by blind insertion of the first trocar was reported in a study involving 1,150 patients submitted to laparoscopy under intraperitoneal pressure of 25 mmHg.²³ No clinical complications have been shown to arise from transitory elevation of intraperitoneal pressure.^{22,23} A study reported that complication rates during introduction of Verres needle are one attempt 0.8–16.3%, two attempts 16.31–37.5%, three attempts 44.4–64%, and more than three attempts 84.6–100%. The complications associated were extraperitoneal insufflation, omental and bowel injuries, and failed laparoscopy.²⁴ Merlin et al. reported on a systematic review that the most common of the major complications associated with access were bowel injuries.²⁵ The risk of bowel injury in nonrandomized studies was higher with the open technique than with closed technique, although bias introduced through patient selection may have been a factor. The evidence on the comparative safety and effectiveness of the different access methods was not definitive, but trends in the data merit further exploration. Chapron et al. reported on a nonrandomized comparison of open versus closed laparoscopic entry practiced by university affiliated hospital teams. The bowel and major vessel injury rates were 0.04% and 0.01% in the closed technique and 0.19% and 0% in the open technique, respectively. They concluded that open technique does not reduce the risk of major complications during laparoscopic access.²⁶

Conclusion

Both the open and closed method for gaining access into peritoneal cavity are safe but the veress needle method has advantage of less time taken to enter into the abdominal cavity as compared to open method

and port site complications like port site hematoma formation and infection are more in open technique.

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