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Comparative study of the open versus closed method of penumoperitoneum creation in laproscopic surgery

Dr Tejas Patel
Assistant Professor, Department of General Surgery, Parul Institute of Medical Sciences and Research, Waghodia, Vadodara, Gujarat, India

Dr Hitesh Tadvi
Assistant Professor, Department of General Surgery, GMERS Medical College, Gotri, Vadodara, India

Dr Chirag Parikh
Associate Professor, Department of General Surgery, Parul Institute of Medical Sciences and Research, Waghodia, Vadodara, Gujarat, India

Dr Himmatlal Nisarata*
Assistant Professor, Department of General Surgery, Baroda Medical College, Vadodara, Gujarat, India
*Corresponding Author

***Abstract*---**Background and Aim: In last few decades laparoscopy has gained more importance than conventional laparotomy procedure in day to day surgical practices. The different types of trocars, different sites and different positions adopted for safe entry means that the controversy is yet to be resolved. This study was conducted to compare peritoneal access with open vs closed technique in laparoscopic surgeries in terms of outcomes and complications. Materials and Methods: The total cases were divided in two groups with 50 cases were treated with open laparoscopy and 50 cases were treated with closed laparoscopy. The present prospective study involved the patients that presented with acute or chronic abdominal conditions like calculus cholecystitis, cholelithiasis, acute or subacute or chronic appendicitis, carcinoma rectum etc at medical college & hospital. Results: In the open group, gas leak occurred in 8 cases, port-site bleeding in 7 cases, port-site hematoma occurred in 3 case while port site wound infection occurred in 3 cases. In the closed group, gas leak occurred in 5 cases, port-site bleeding in 2 cases, port-site hematoma occurred in 1 case while port site wound infection occurred in 4 cases. There was one complication of extra peritoneal

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insufflations in closed method group. Laparoscopic converted to open surgeries were reported in both study groups. Conclusion: Both the closed (Veress needle) and the open (Hasson cannula) method for gaining access into the peritoneal cavity are safe. The open technique had a time advantage over the closed method. However, there were more complications associated with it. Further studies are needed in multiple centres and on larger samples for conclusive evidence.

***Keywords*---**laproscopy, veress needle, hasson cannula, peritoneum.

Introduction

The word laparoscopy originated fromthe Greek word (Laparo-abdomen, scopion-to examine). Laparoscopy is the art of examining the abdominal cavity and its contents. Initially laparoscopic surgery was termed a minimally invasive surgery, but this term was changed to minimal access surgery as laparoscopic surgery is an invasive procedure associated with similar risks of major complications as compared with the conventional open surgery.[1, 2]

Creating pneumoperitoneum is the first step in carrying out laparoscopic surgery for diagnostic and therapeuticpurposes. The establishment of pneumoperitoneum requires the introduction of a sharp insufflating needle or trocar. Peritoneal access and creation of pneumoperitoneum are key initial steps of laparoscopic surgery.[3] Methods available for creating pneumoperitoneum and inserting the laparoscope at the beginning of laparoscopic procedure can be divided into open or closed entry technique. One of the challenges of laparoscopic surgery is the insertion of surgical instruments through small incisions.[4, 5]

Over 50% of the complications arise during this time and a great majority of these occure during the insertion of the primary umblical trocar. The risk of such injuries, especially those during trocar entry, is increased in patients who have low body mass index or have a history of prior abdominal surgery.[6] Although the complications of operative laparoscopy are low, they can be severe and life threatening. The mortality rate associated with laparoscopy-induced bowel injury is 3.6%. The life-threatening complications include injury to the bowel, bladder, major abdominal vessels and anterior abdominal wall vessels.[7, 8]

If there is delay in diagnosis of visceral injuries or delay in reporting, the morbidity will increase and may lead to mortality. Less serious complications that can occur are post-operative infection, subcutaneous emphysema and extra-peritoneal insufflation. In a recent literature review, the risk of primary access complications in advanced laparoscopic tertiary center was 0.1 %. This indicates that in spite of the improvement in the technology and experience, primary access complications were decreased but not completely eliminated.[9, 10]

In last few decades laparoscopy has gained more importance than conventional laparotomy procedure in day to day surgical practices. In common surgical and gynaecological procedures laparoscopy results in smaller surgical scar, faster recovery, lesser pain and earlier return of bowel function.[11] The different types of

trocars, different sites and different positions adopted for safe entry means that the controversy is yet to be resolved. This study was conducted to compare peritoneal access with open vs closed technique in laparoscopic surgeries in terms of outcomes and complications.

Materials & Method

The present comparative study was done for the period of 8 months. A total of 100 patients were included in the study. The total cases were divided in two groups with 50 cases were treated with open laparoscopy and 50 cases were treated with closed laparoscopy. The present prospective study involved the patients that presented with acute or chronic abdominal conditions like calculus cholecystitis, cholelithiasis, acute or subacute or chronic appendicitis, carcinoma rectum etc at medical college & hospital.

Inclusion Criteria: Age more than 18 years in both sexes presenting with acute or chronic abdominal surgical conditions, without co-morbidity, Consented for inclusion Exclusion criteria consisted of conditions not allowing induction of general anaesthesia, presence of anterior abdominal wall infection, presence adhesions from previous surgeries, mechanical bowel obstruction, liver cirrhosis or portal hypertension, and patients not giving a consent for laparoscopic surgery. Informed consent was taken from the patients. Single blinding was done as the patients were not aware of the group to which they belonged. The patient population consisted of 43 males and 57 females study population was randomized to two groups: Open method – 50 patients Closed method – 50 patients The patients were diagnosed on the basis of clinical symptoms, physical examination and haematological, as well as radiological investigations available in our hospital.

Patients were kept nil-by-mouth till bowel sounds were heard. Their dressing was done on alternate days and sutures were removed on the 12th post-operative day. Post-operative local examination done to check for signs of infection by looking for tenderness over suture line, colour change and discharge while the presence of haematoma was checked by the presence of swelling over suture line. A detailed systemic examination to assess the abdomen, respiratory, cardiovascular, and central nervous systems was carried out. Patients were assessed in the immediate postoperative period and followed after one week, two months, 6 months and one year of discharge to assess for complications. Postoperative complications like wound hematoma, wound infection, gas embolism, port site hernia noted in follow up. The study was approved by the institutional authorities. Confidentiality was strictly maintained. Patients were managed as routine cases in the ward. A structured proforma was used to collect relevant information for each individual patient selected. Data was entered in the master chart for the analysis. Data is analysed by using unpaired‘t’ test and ‘chi square test’.

Results

A total of 100 cases were included in the present study. Of the total 100; 50 patients were included in the closed technique procedure while the remaining 50 patients were enrolled in the open technique procedure. Majority of the patients

were of middle-aged (mean age 42±7 years). There were 59 males and 41 females in the study. More number of men corresponded to hernia repair and appendectomy being the most commonly performed laparoscopies (54%) at our set up during the study period followed by laparoscopic cholecystectomy (46%).

In our study, the distribution of surgery was 20% laparoscopic appendectomy, 20% laparoscopic inguinal hernia repair, 46% laparoscopic cholecystectomy, 6% laparoscopic incisional hernia repair, and 8% diagnostic laparoscopy. Demographic analysis of both the groups did not show any statistical significant changes. The time to establish pneumoperitoneum was less in open technique (3.80 ± 1.25 mins) as compared to the closed technique (5.10 ± 0.2 mins). Pneumoperitoneum was achieved in all 100 cases.

In the open group, gas leak occurred in 8 cases, port-site bleeding in 7 cases, port-site hematoma occurred in 3 case while port site wound infection occurred in 3 cases. In the closed group, gas leak occurred in 5 cases, port-site bleeding in 2 cases, port-site hematoma occurred in 1 case while port site wound infection occurred in 4 cases. There was one complication of extra peritoneal insufflations in closed method group. Laparoscopic converted to open surgeries were reported in both study groups. They were because of surgical difficulties and were not related to the complications of peritoneal access.

Table 1: Complications faced in open and closed method groups

Type of complication	Open method (n = 50)	Closed method (n = 50)
Port site bleeding	7	2
Gas leaking	8	5
Port site haematoma	3	1
Port site wound infection	3	4
Extra insufflations	0	1
Need for conversion	3	2
Mortality	0	0

Discussion

Laparoscopy is the type of surgical procedure that allows a surgeon to access the inside of the abdomen and pelvis without having to make a large incision on the skin, hence is known as key-hole surgery. Technique of primary trocar entry in laparoscopy is still a debatable topic. No single method is suitable for all cases. Entry technique may be individualized in each case depending on proper preoperative evaluation and surgical skill.[12] The different methods under evolution, to reduce complications need multi-centric studies for their safety and routine practical applicability. Our study was an effort to compare the complications in both the techniques and we feel more studies with bigger sample are required to compare both and their uses in different cases.[13]

There are different techniques along with the blind veress technique such as open laproscopy, use of disposable shielded trocars, optical trocars and radially expanding trocars. The major advantage of the open technique is that under

direct vision there is access to the peritoneal cavity. This helps in prevention of the major severe injuries. Many of these injuries are related to the blind placement of the veress needle or sharp primary trocar into the abdomen when performing a technique referred as closed laparoscopy.[6, 14]

It is necessary to create the pneumoperitonium prior to the insertion of the trocar. As per many surgeons the classic blind veress needle is considered safe for the approach. The present study showed the better safety approach is the closed method over the open method. In the closed method there were fewer complications, which make it difficult to give conclusive evidence about the superiority between the two techniques. Using the veress needle (closed) method to establish pneumoperitoneum was as effective as the open method (direct trocar insertion) and may even be safer. [15]

In the patients with open method was performed there were complications like gas leaks at port insertion site, multiple attempts for port insertion, there was more port site bleeding as compared to close method. There were three cases of port site infection in open method group and four cases in closed method group, however they did resolved with antibiotics. The more number of complications can be attributed to larger incision done in the open method as compared to close method with needle puncture.

None of the groups reported any major complications like gas embolism or any type of vascular injury. Schafer et al. while comparing the complications of both techniques concluded that the open access method failed to show any superiority over the closed technique. However, Bonjer et al.[16] in their comparison between open and closed techniques found that the rates of visceral and vascular injury were respectively 0.08% and 0.07% after closed laparoscopy, and 0.05% and 0% after open laparoscopy (p=0.002). There was no significant difference in the mortality rates. In the present study also there was o mortality rate.

The small sample size of this study is its main limitation and a larger sample size is required to study the parameters more comprehensively. This is a single-centre study and hence, its results cannot be generalised. Also, the operative procedures taken into account for this study are performed by multiple doctors with varied abilities due to which it is difficult to control the confounding variables.

Conclusions

There was difference in frequency of complications in both groups with Open method being safer and rate of complication was less as compared to the close method.

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