

Research Article

Direct Trocar Entry in Laparoscopic Surgeries: A Retrospective Study

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Abstract

Background: Laparoscopy is still in its budding state especially in the rural areas of Gujarat state of India. It's a very skillful procedure which reduces not only the operating time but also the overall stay of patients & enables faster recovery. There are various modes of entry into the abdomen while operating Laparoscopically.

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.

Objective: The aim of this paper is to focus on the evolution of blind non – visual direct trocar method of entry into the peritoneal cavity in laparoscopic surgery.

Methods: A retrospective review was performed in all Surgical cases operated at Trimurti hospitals from 2006 - 2016 by retrieval from Medical record department.

Study also focused on age, gender, BMI, co-morbid conditions, whether the surgery was Emergency or planned, socio-economic status, general built, previous Surgical history, females who earlier underwent any Lap TL, patients who were posted for adhesionolysis & type of technique (open/closed).

Results: We studied in 10250 patients operated Laparoscopically, out of which in 25 cases open technique was used Rest – direct trocar entry (trocar used: standard metallic Karl Storz, 5mm in paediatric). Age Group: under 10 yrs -920 cases, 9180 – in 18- 65 age group, 125 cases – in age 65 yrs & above. Gender: Males: 44.5% Female 55.5%. Analysis was performed using the Microsoft Excel and Graphical representation of the values in form of bar diagram & pie diagram. (Figure 1,2)

Body Mass Index

21-25: 20%, 26-30: 30%, 31-35: 30%, > 35:10% (Figure 1-3) In Patients with BMI > 35, direct trocar entry was difficult to negotiate. It required experience hand & good skill for this, since abdominal fat in higher BMI people made the direct entry difficult. Lesser the belly fat, it was easier to negotiate the trocar.

Emergency or Planned Surgery

Figure 4 There was no correlation in the ease of trocar entry & type of operation, but in cases of Emergency Surgeries in which *acute peritonitis, haemoperitoneum* occurred, was associated with *dilated bowel loops*, care should be taken while insertion not to injure them, which again requires great skill & Surgical expertise.

Co- Morbid Conditions: Diabetes Mellitus & Hypertension did not directly affect the method of entry but they were found to be associated with higher BMI

Socio-Economic Status: We considered the socio-economic status of the patient & their activity levels.

We found that lower socio economic class of people belonged to the group doing more of labor work, esp. males and they were found to have good abdominal muscle strength & tone (which actually hinders direct trocar entry) but at the same time low belly fat content made it easy to maneuver. But in the females of this class, due to repeated child births & lax abdominal wall it was easier to negotiate trocar.

Whereas, in people with higher socio economic class, they were found to be doing sedentary work, & thus higher BMI.

Figure 5

Previous Surgical History: Previous history of midline laparotomies

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were the most difficult cases for direct trocar entry due to midline adhesions.

Similarly, other surgeries like previous Lap TL, Appendicectomies, LSCS, Hysterectomy, other miscellaneous surgeries contributed towards difficult direct trocar entry if Adhesions were present at the midline. they contributed to 10 % of the cohort.

In patients of previous h/o peritonitis + haemoperitoneum, and also seeing the location of previous scar, we presumed that they might be having dense adhesions, hence open technique was performed in such patients, number : 25 – HASSEN'S TECHNIQUE

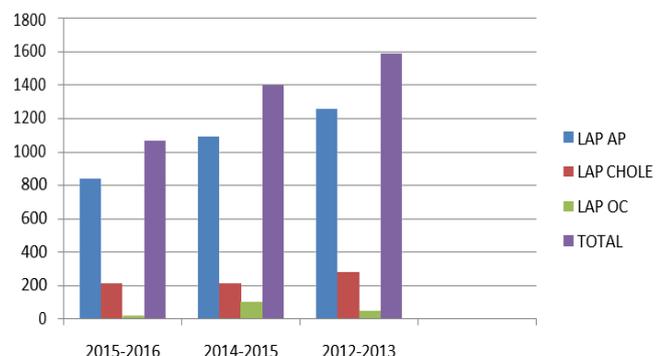


Figure 1: Laparoscopy Surgeries From 01/01/2012 – 31/03/2016.

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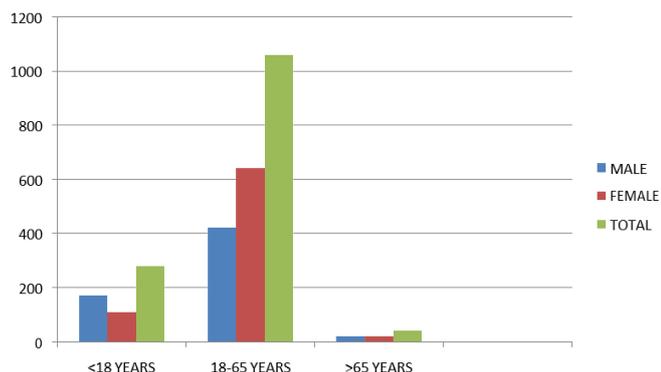
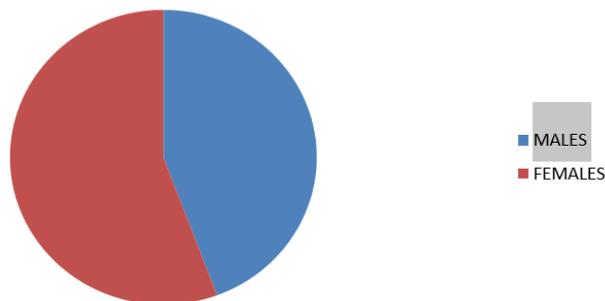


Figure 2: Gender – Age Distribution in Laparoscopy Surgeries in Year 2014- 2015.

LAPAROSCOPY SURGERIES: GENDER



BODY MASS INDEX

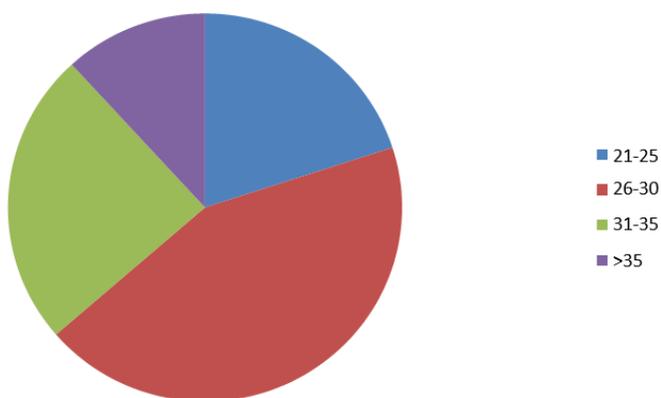


Figure 3

TYPYR OF OPERATION



Figure 4

SOCIO ECONOMIC CLASS



Figure 5

Theory: fat in normal amount helps to hold the abdominal wall, whereas excessive fat in people with higher BMI makes direct trocar entry difficult.

Some major omental adhesions were found but they were away from the trocar entry point, so in other such cases closed non-visual blind direct trocar entry was used.

LAP. TL was found in 153 of these patients with previous surgeries which amounts to 15 % of the total cohort.

Figure 6

Site of Entry:

- Supraumbilical
- Intraumbilical
- Infraumbilical Pfenential

PREVIOUS ABDOMINAL SURGERIES

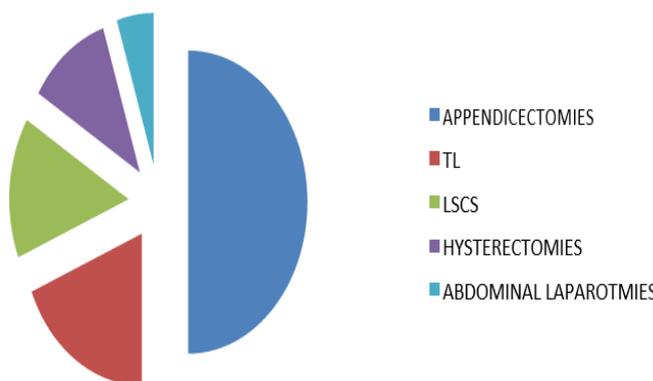


Figure 6

Technique:

- Initially we were using 11 no. Knife, open the skin & subcut upto the sheath (so that trocar entry would be easie)
- Lift the abdomen & insert the trocar with cork screw movement

Complications:

- No significant injury to blood vessel or mesentery
- Only one case of enteral injury in patient of koch's abdomen as small bowel were adherent to ant abdominal wall in cuckoon abdomen
- While creating skin incision with 11 no. Knife, injured small

mesenteric vessel, repaired laparoscopically with suturing of small bowel

- Then we started using 15 no. knife, with that no complaints till date

Discussion

Introduction

LAPAROSCOPY (GR: LAPARO- ABDOMEN, SCOPEIN-TO EXAMINE) is the art of examining abdominal cavity & its contents [1]. It requires insertion of cannula through the abdominal wall, distention of abdominal cavity with gas (pneumoperitoneum), visualization & examination of abdomen contents with an illuminated telescope [2-8]. With the advent of videocameras & other ancillary instruments, laparoscopy rapidly advanced from being a diagnostic procedure to one used in fallopian tubal occlusion to sterilization & eventually in performing numerous surgical procedures in all surgical disciplines for variety of indications [9-14].

Note: A MINIMALLY INVASIVE PROCEDURE IS ADVANTAGEOUS TO THE PATIENT & THE HEALTH CARE FACILITY IN MANY WAYS. THE OVERALL RISK OF ANY COMPLICATION WITH LAPAROSCOPY IS 8.9% COMPARED TO 15.2 % WITH LAPAROTOMY.

Access into the abdomen is the one challenge of laparoscopy that is particular to the insertion of surgical instruments through small incisions. Laparoscopy is currently widely used in the practice of medicine, for both diagnostic and therapeutic purposes [15]. The minimally invasive approach has become the method of choice for treating most benign abdominal diseases that require surgery. However, it is obvious that laparoscopic procedures are not risk free. Laparoscopic entry is a blind procedure, and it represents a problem for all the related complications [16-21].

Complications arising from laparoscopic surgery are rare and commonly occur when attempting to gain access to the peritoneal cavity [22]. Creation of the pneumoperitoneum is the first and most critical step of a laparoscopic procedure because that access is associated with injuries to the gastrointestinal tract and major blood vessels and at least 50% of these major complications occurs prior to commencement of the intended surgery.

History

History of Laparoscopic Access Techniques

Georg Kelling (1866-1945): – German surgeon – The first person to create the pneumoperitoneum – He performed this procedure on dogs

Jacobeus – Sweden – Performed the first laparoscopy in a human

Janos Veres (1903-1979): – Hungarian – Who has been primarily used the needle for the creation of a pneumothorax

History of Laparoscopic Access Techniques

Raol Palmer (1904-1945):

French gynecologist

- Introduced the most popular method of the closed laparoscopic entry in 1947
- Use of the Verres needle to induce CO₂ pneumoperitoneum for laparoscopy
- Published on its safety in the first 250 patients

Harrith M. Hasson:

- An American who described the open access laparoscopy in 1970

Dingfelder:

- Who developed the direct laparoscopic trocar insertion technique in 1978

Laparoscopy Entry Systems

CLOSED TECHNIQUE

1. Blind Non-Visual Entry

Insufflated –

- Closed conventional trocar entry
- Radially expanding trocar entry

Non-insufflated –

- Direct sharp trocar entry

2. Visual entry –

Optical trocar (Optiview, Visiport)

Open Technique –

- Hassan trocar entry

Note: *The First Laparoscopy in Human Was Performed by Jacobeus of Sweden in 1910.*

Finding a safe entry technique is a priority not only for the life of the patients but also for the increasing rate.

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 as an optimal method of entry into the peritoneal cavity.

Patients with previous abdominal surgery are more prone to visceral injury caused by the Verres needle [23-27]. This is due to peritoneal adhesions, which typically grow where the incision of the parietal peritoneum was made.

Note: *Autopsy studies have found adhesions in 74% to 95% of patients with previous abdominal surgery.*

Midline incisions greatly increase the risk of adhesions in the umbilical region. Even incisions made away from the umbilicus may lead to adhesion formation in the periumbilical region. On the other hand, insertion of the Verres needle into the left hypochondrium has been reported as safe, with reduced risk of iatrogenic injury [28-33]. The stomach is immediately below the anterior abdominal wall at the site where the left hypochondrium puncture is made. If the stomach is accidentally perforated, its contents will not necessarily leak [34-36]. This is due to the protection provided by the three layers of gastric muscle, which tend to close the puncture.

Note: A stomach perforation is easy to diagnose upon initial inspection of the peritoneal cavity and can be repaired by laparoscopic suture.

Specific measures for the correct insertion and for the reduction of the risk of injury of obese and thin patients have to be improved [37]. The Verres needle insertion at 45° from the umbilicus means that needle has to traverse a distance of 12–16 cm, which increases the risk of extraperitoneal insufflation.

Note: Major vascular injuries caused by the insertion of the Verres needle into the abdominal midline occur even in the hands of experienced surgeons.

Schäfer et al. [35] analyzed 26 major vascular injuries and reported that only four of them (15%) had been caused by inexperienced surgeons (surgeons who had performed fewer than 50 laparoscopic procedures) [38]. The other 22 injuries (85%) had been caused either

by experienced surgeons (those who had performed between 51 and 100 procedures) or very experienced surgeons (over 100 procedures performed).

OPEN TECHNIQUE – Hassan trocar entry

Open laparoscopy is a technique which allows placement of a laparoscopic camera port, in a controlled manner, by sharply opening the layers of the abdominal wall.

History of Procedure

Open laparoscopy was first developed by Dr. Harrith Hasson of Chicago, IL, who published the description of this technique in the *American Journal of Obstetrics and Gynecology* in 1971 [5]. In the past 38 years, this technique of open laparoscopy has become widely accepted and is constantly being modified to improve its practice. A survey published in 1998 [13] revealed that approximately 30% of surgeons use Hasson open entry technique to perform laparoscopy, 40% perform closed laparoscopy with Veress needle insufflation, and the remaining 30% utilize direct trocar insertion without prior insufflation. Dr. Hasson, in 2000, [29] published 29 years of his personal experiences in the use and development of open laparoscopy (4). During that time, he performed 5,284 procedures and found this entry technique to be safe, effective, and reproducible. There were only 27 complications in this group of patients, the majority being wound infections and hematomas [39-42]. There was only one case of bowel perforation as a consequence of port entry.

Direct Trocar Entry

Laparoscopic entry is initiated with only one blind step (trocar) instead of three (veress needle, insufflation, trocar). The direct entry method is faster than any other method of entry.

The technique begins with infra umbilical skin incision wide enough to accommodate the diameter of sharp trocar/cannula system. The anterior abdominal wall must be adequately elevated by hand, and the trocar is directly inserted into the cavity, aiming towards the pelvic hollow. Alternatively, the abdomen is elevated by pulling onto the towel clips placed 3cms on either side of umbilicus, & the trocar is inserted at a 90-degree angle. On removal of sharp trocar, the laparoscope is inserted to confirm the presence of omentum or bowel in the visual field.

Figure 7

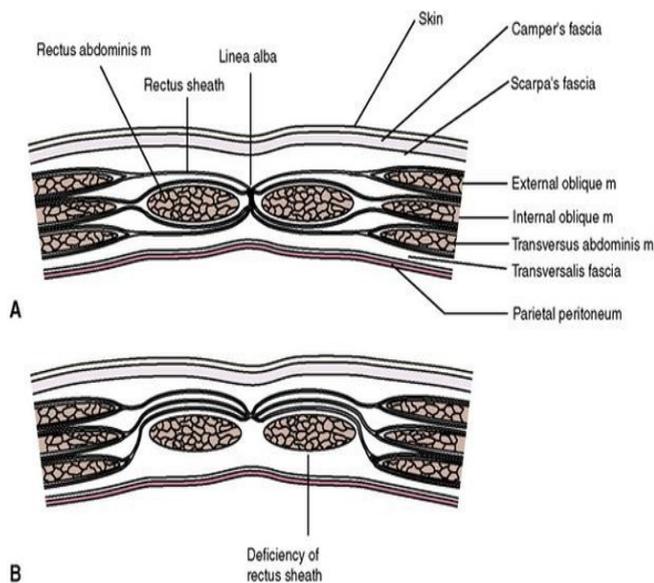


Figure 7

Changes in Cardiovascular Status Due to Rapid Insufflation of Co2 Gas

In addition, analysis of intraperitoneal pressure and volume of gas insufflated at different time points during insufflation is essential to prevent gas insufflation into sites other than the peritoneal cavity. It has been established that intraperitoneal pressure levels and the total volume of gas insufflated into the peritoneal cavity at given time points can be predicted, provided that the tip of the Verres needle is in fact in the peritoneal cavity during insufflations.

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. 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.

Note: No clinical complications have been shown to arise from transitory elevation of intraperitoneal pressure on rapid gas insufflations.

However, it is known that extremely high levels of intraperitoneal pressure for longer periods of time can cause physiological and structural changes, directly related to the tension levels caused by the high pressure. Therefore, most authors have proposed that intraperitoneal pressure remains at 12 mmHg and never above 15 mmHg during laparoscopic procedures.

Conclusion

Veress needle insertion, direct trocar insertion and open technique are different methods of establishing pneumoperitoneum to perform a successful laparoscopic procedure.

- From this retrospective study, we conducted we infer that
- direct trocar insertion is a safe method to create pneumoperitoneum.
- 10250 Laparoscopic operations were evaluated.
- In this study, we have seen that the complication rate while performing pneumoperitoneum by direct trocar entrance was negligible (only one case out of 10250).
- Direct trocar entrance also reduces the operation time. In laparoscopic surgeries, the direct trocar entrance method is a more reliable and less time consuming method.

Note: Trocar and needle injuries are rare complications of laparoscopy.

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