“BLADELESS OPTICAL TROCAR TECHNIQUE VERSUS MODIFIED HASSON TECHNIQUE FOR INITIAL ACCESS IN LAPAROSCOPIC SURGERIES - A COMPARATIVE STUDY”

By

Dr. BONDALAPATI SAI NIKHIL CHOWDARY, MBBS

UNDER THE GUIDANCE OF
DR.P.N.SREERAMULU
PROFESSOR
DEPARTMENT OF GENERAL SURGERY
SRI DEVARAJ URS MEDICAL COLLEGE,
TAMAKA , KOLAR, KARNATAKA

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ABSTRACT

BACKGROUND: Although Bladeless Optical trocar (BOT) insertion and Modified Hasson's technique of trocar (MHT) insertion have been more popular recently for first access in laparoscopic operations, their efficacy is still uncertain. The insertion times and problems at initial access for BOT and MHT insertions in laparoscopic surgeries were therefore compared in this research.

METHODS: This prospective comparative analytical study was done at the Department of General Surgery in RL Jalappa Hospital and research Center, Kolar among patients who underwent laproscopic surgical procedures. A total of sixty cases were included with thirty cases in each group. Group OT (Bladeless Optic Trochar) included 30 cases and Group MH (Modified Hansson's) included 30 cases. Approval of this study was granted by the Institutional Human Ethics Committee. Following the acquisition of written informed consent, participants were evaluated for demographic and clinical data by the principal investigator using a pre-structured proforma. Cases were allotted in each group based on computer generated random numbers. Apart from the demographic variables, time taken for achieving access, complications and conversion of lap to open were the key parameters assessed.

The data was entered in excel sheet and analyzed using SPSS - Version 21.

Results: In this study both optical trocar group and modified Hasson's group were similar in age, gender, BMI, ASA class and laparoscopic surgical procedures without any remarkable difference. Notably, the time taken for peritoneal access was significantly lesser in optical trocar group compared to modified Hasson's group. Additionally, the incidence of complications with the optic trocar was remarkably lesser than the incidence of complications in modified Hasson's approach. However, the rate of conversion from laparoscopic to open surgical procedure was similar in open optical trocar group and modified Hasson's group.

Conclusion: We infer that the bladeless optical trocars are safe and efficacious in terms of faster access to peritoneum with lesser complications compared to modified Hasson's approach in laparoscopic procedures.

Key words: Optical Trocar, Modified Hasson's Technique, Laparoscopic surgeries, efficacy

INTRODUCTION

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Due to the selective tissue dissection carried out under a magnification camera, lap procedures are less invasive and result in comparatively less tissue damage than open procedures. Laparoscopic surgical techniques are now the preferred method for a number of surgical operations due to advancements in technology and patient understanding. The first laparoscopic procedure on human was carried out in Sweden by Jacobeus 1910[1].

Laparoscopic procedures have been continuously evolving since then. For simple symptomatic cholelithiasis, Laparoscopic cholecystectomy has emerged as the preferred procedure globally[2,3]. From 1990s laparoscopic cholecystectomy was preferred instead of open procedure.

Laparoscopic surgery, also known as keyhole surgery, is a surgical procedure that allows access to the abdomen and pelvis without requiring a big skin incision[4].The first crucial stages in any Laparoscopic procedure are initial abdomen access and achieving pneumoperitoneum, both of which can cause known vascular and bowel injuries. Rarely observed in open surgery, they are exclusive to laparoscopic procedures[5].

Establishing a pneumoperitoneum, which involves entering peritoneum and insufflating withCO2, is the first stage in laparoscopic surgery. This allows for sufficient working and viewing area.

Over the past century, a number of methods, tools, and strategies have been developed to create pneumoperitoneum. These consist of the following: Veress needle,shielded disposable trocars,bladed or bladeless OT, direct trocar insertion without the requirement for a

previous pneumo-peritoneum, open Hasson's approach, and modified open method. Although every surgeon has a favorite technique for producing pneumoperitoneum according on his or her training and experience, the most popular approaches are the open and Veress needle procedures with their many variations and direct trocar enterance[6].

Since its introduction by Veress in 1938, the Veress needle has been the most widely used technique for creating pneumoperitoneum, particularly among gynecologists[7].

The open approach was first presented by Hasson in 1971, but it was not extensively used, possibly because it necessitated a small laparotomy, which can be challenging for obese patients[8]. In order to approach the peritoneal cavity, Pawanindra et al. reported modified Hasson procedures for open access that use a 1 cm incision at the point where the umbilical cicatrix pillar and the linea alba meet. This technique takes less time, safer with less learning curve and efficient[9-12].

Minimal access surgeons all over the world frequently employ the open access Modified Hasson method[13], which involves making a smallincision over umbilicus under visualization to enter the abdomen and then inserting a blunt trocar. However, this technique is blind and can result in complications during abdominal entry, such as vascular injury,solid organ injuryand visceral injury. Approximately half of issues arise during abdominal access for the insertion of a camera or port[14].

Dingfelder first published on direct trocar abdominal entry in 1978.The benefits of this entry method include avoiding complications associated with the Veress needle use, such as intestinal insufflation, preperitoneal insufflation, failed pneumoperitoneum, or the more serious carbon dioxide embolism; initiating lap entry with only one blind trocar rather than using Veress needle

for initial insufflation and followed by trocar placement and being quicker than any other entry method[15,16].

The layers of the abdominal wall may also be seen on the monitor thanks to the OT, which advances the medically sharp or conical cannula edge beneath the eye[17]. This reduces the chance of damaging abdominal tissues and the amount of time needed to generate pneumoperitoneum by enabling the surgeon to go through the layers to the peritoneum in a clean space[17]. Modified Hasson's method of trocar (MHT) insertion and Bladeless OT (BOT) insertion have gained popularity recently for initial access in lap procedures, however it is still unknown how effective these two approaches are. Therefore, this study compared the insertion times and complications during first access for BOT and MHT insertions in lap procedures.

OBJECTIVES

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- To evaluate Bladeless OT insertion in terms of time taken for insertion and complication during initial access in lap surgeries

- To evaluate Modified Hasson's method of trocar insertion in terms of time taken for insertion and complication during initial access in lap surgeries

- To compare Bladeless OT insertion and Modified Hasson's method of trocar insertion in terms of time taken for insertion and complication during initial access in lap surgeries

REVIEW OF LITERATURE

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In lap surgeries, setting up a workspace is the initial step. Pneumoperitoneum is often created by insufflation of CO2 into abdominal cavity. The initial access into abdominal cavity is linked with a greater risk relative to other procedural steps.Although there have been improvements in human lap operation techniques, approximately 1 in 1000 patients encounter notable difficulties during the initial entry. After this first entry, more instrument ports can be placed safely under lap visualization. Lap access is ually classified as blind (no direct visualization of abdominal cavity during entrance), closed (no surgical entry to abdomen), open (after a mini-laparotomy), or visible (with a telescope placed via the port). Furthermore, either an insufflated or non-insufflated abdomen might receive the first port[18].

Over the past few decades, a number of methods, tools, and strategies have been developed to reduce entry-related injuries in both veterinary and human surgery[19,20]. However, consistent benefits of one strategy over another have not been documented by meta-analyses or evidence-based reviews. Furthermore, the findings of these studies should be read cautiously since not all complications, especially minor onesare documented, and the outcomes are influenced by the surgeon's preferences and level of experience. Although they are seldom seen in clinical trials, entry-related injuries in veterinary medicine that happened at the time of creating pneumoperitoneum or portal insertion are extensively covered in textbooks[21,22].

The safety of several trocar placement strategies was investigated in a single large animal medicine clinical study, which also found issues with insufflation in 12 out of 40 horses[23]. Some clinical trials in small animal medicine have reported issues related to accessing the abdominal cavity.These include splenic damage, subcutaneous emphysema[24], and deadly gas embolism[25-28].

Splenic damage is commonest severe access injuries that might require conversion because of the canine spleen's increased size under general anesthesia. Because small animals and humans differ substantially in terms of abdominal architecture, size of the body, abdominal wall resistance, care must be used when utilizing human data for small animal cases. This also holds true when contrasting an 80-kg Great Dane with a 3-kg cat. Lastly, the majority of abdominal access devices on the market today are made to be used with human patients, who are known to have an intraabdominal free space. This issue should also be considered when utilizing these devices on tiny animals, where there may not always be a clear area. Given the aforementioned factors, it is imperative to outline the most widely utilized abdominal entry methods in human and veterinary surgery and go over most clinically significant elements of lap accessibility in small animal surgeries based on recent research and firsthand knowledge.

Factors to Evaluate During Lap Entry

Physics of Entry

The many facets of various lap access procedures may be categorized as follows: access location (umbilical, retrocostal, or other); access instrument (pull vs. push trocar); and manner (blind vs. open). Surgeons should assess layers of tissue to be pierced, design of instrument, and required penetration strength, regardless of the abdominal access method or

location. The majority of surgeons use their dominant hand to grip a traditional trocar and cannula while applying a large amount of linear force produced by shoulder and core muscles to the body portion they are accessing. This suggests that in order to reduce the entrance force required to transverse the various tissue layers during port insertion, the instrument design has a pointed or sharp edge[30]. Furthermore, a fast reduction of resistance is observed following transfixation of the peritoneal layer.There is a higher chance of unintentional injury when there is a more abrupt and uncontrollable decreases of resistance because it causes more trocar overshoot.

Peritoneal Tenting

Type of trocar, the way the trocar or Veress needle (VN) is handled, and the patient's local anatomy can all affect how the peritoneum shifts during abdominal entry. If trocar or VN is unintentionally inserted into a deepsubperitoneal site without entering the abdominal cavity, a phenomenon known as peritoneal tenting can result, this may lead to adverse outcomes.

Relevant Anatomic Knowledge

To minimise linear force during abdominal entry, make first access—blind or open—at a site with minimal tissue resistance. In both animal and human lap procedures, the initial incision is usually made in linea alba in periumbilical region. This site also avoids abdominal wall veins during insertion.

Even for the identical operations, there is no agreement on where to put the trocar-cannula assembly, despite the fact that port placement for different devices is thought to be crucial. Various studies' descriptions of port site are sometimes imprecise and allow for significant mistake, particularly when performed by inexperienced surgeons.This was demonstrated in a

research that evaluated 64 students in their last year of vet school on their performance using two distinct trocar implantation strategies that have been documented in the veterinary literature. Of the pupils, only 40.8% were able to locate them correctly. In contrast, 95% of the pupils were able to put the objects correctly once a mapping system was introduced. These results lend credence to the necessity of creating an accurate method for correctly locating the ports[31].

Design of Trocar and Cannula

Trocar is a tool that resembles a pen and has a sharp triangle tip on one end. The pointed end is ideally inside a hollow cannula, which creates an opening in the body for insertion.A surgical access port is provided by this procedure. For thousands of years, people have been using these gadgets. A gastight valve is typically positioned at the proximal end of the trocar to facilitate instrument insertion and removal during procedures, while effectively preventing the escape of insufflated CO2. Appearance of pointed pyramidal tip varies; its diameter ranges from 2-15 mm but may be larger, reaching several cms when intended for positioning special instruments such as tissue morcellators or staplers. The trocar can feature either a cutting (bladed) or blunt point. BOT reduce the force needed to enter the abdominal wall.

Spring loaded plastic shield that immediately covers blade when it enters the abdominal cavity is a feature of some designs for further safety. Because a veterinary patient's abdominal wall is quite close to their spleen, aorta, or other big arteries, using these spring-loaded safety barriers is often advised in veterinary medicine. Conical tips, which can be made of plastic or metal, need a small initial incision made with a scalpel. Instead of severing tissues, they extend through the abdominal wall's tissues. This results in better sleeve retention. Nevertheless, a greater linear force is needed for both blunt and conical points to penetrate the abdomen. There are three types of trocar-cannula assemblies: hybrid, reusable, and single-patient. Reusable trocars are those

with reusable parts, are often most economical choice. Nonetheless, a large number of veterinarians who conduct minimally invasive operations now sterilize and reprocess lap tools, like as trocars and cannulae, for future use[32].

OT

Both the open and Veress needle entrance procedures have relatively less chance of complications, yet they can still be disastrous. Therefore, attempts have been undertaken to further minimize them. One such technique is inserting the laparoscope straight into a sharp trocar, which enables the surgeon to see the different abdominal wall layers as the trocar advances. OT are the collective term for the specialized trocars designed for this purpose. The several layers of the abdominal wall are plainly distinguishable as the OT travels through them, according to published findings. Beyond the trocar point, a black patch appears if there are no organs stuck to the peritoneum[33]. In contrast, the presence of adhesions results in a white reflection[33]. The OT, in contrast to conventional sharp trocars, is made to push tissue away in a radial manner as opposed to cutting through it.

Figure 1. Proper assembly and handling of the 11-mm Endopath Xcel bladeless trocar and a 10-mm 0° laparoscope.

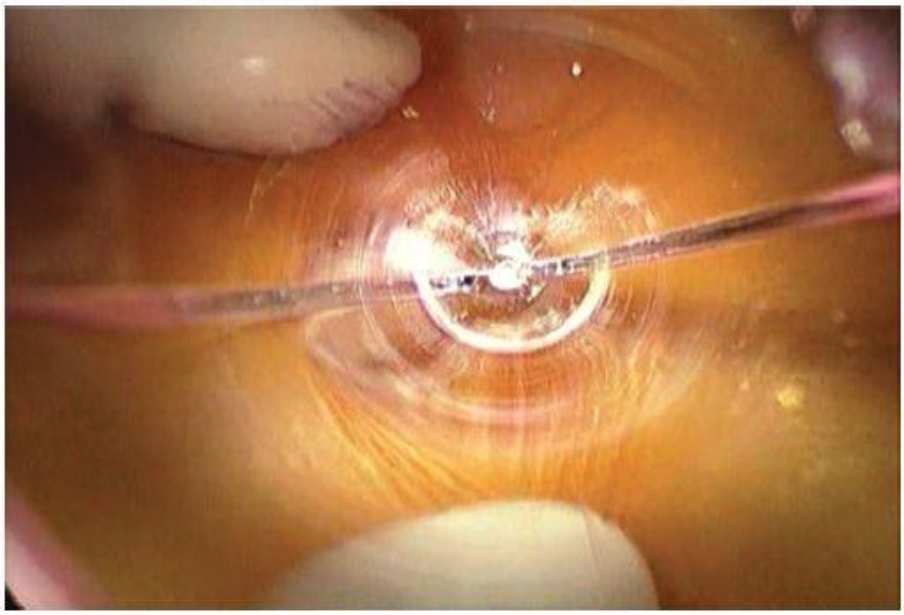

Figure 2. View through the optical access trocar just before entry in the subcutaneous tissue.

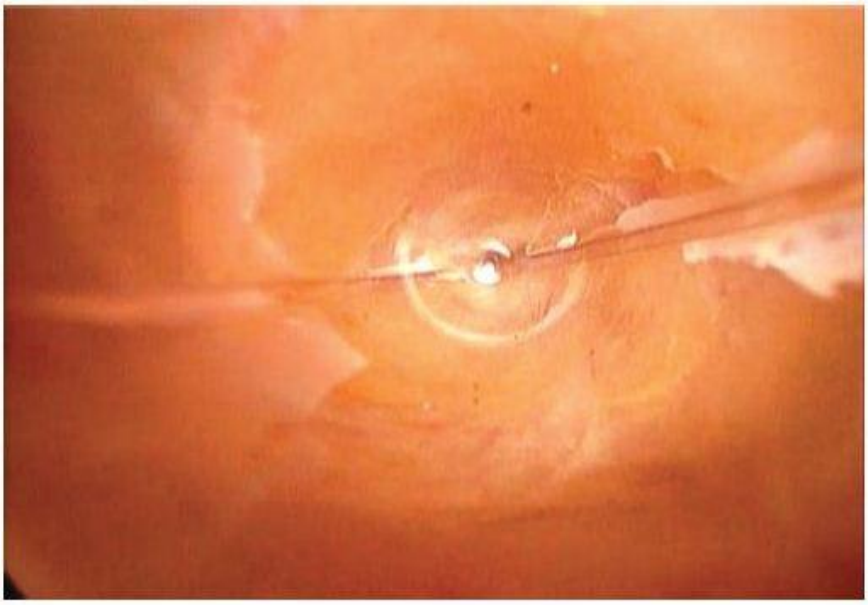

Figure 3. View through the optical access trocar while passing through the subcutaneous tissue.

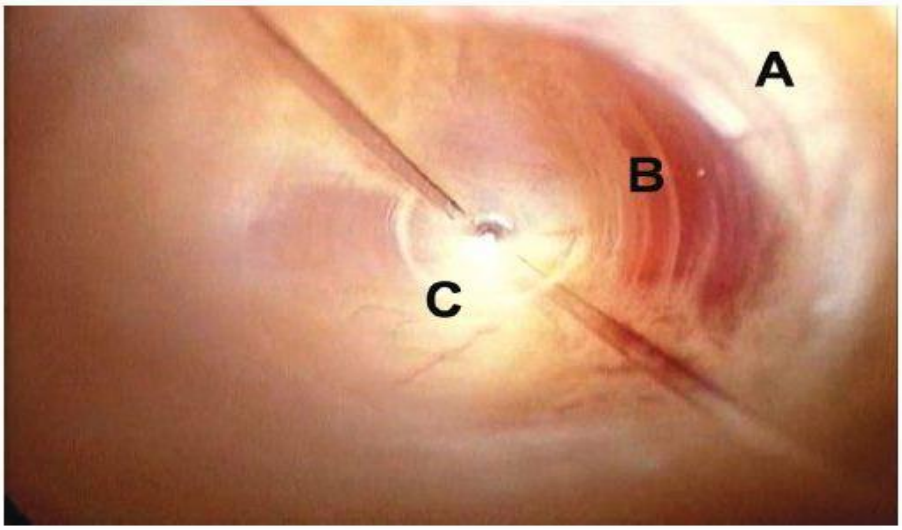

Figure 4. View through the optical access trocar after passing through the anterior sheath (A) of the rectus abdominis muscle, displacing laterally the muscle (B) and in contact with the posterior rectus sheath (C).

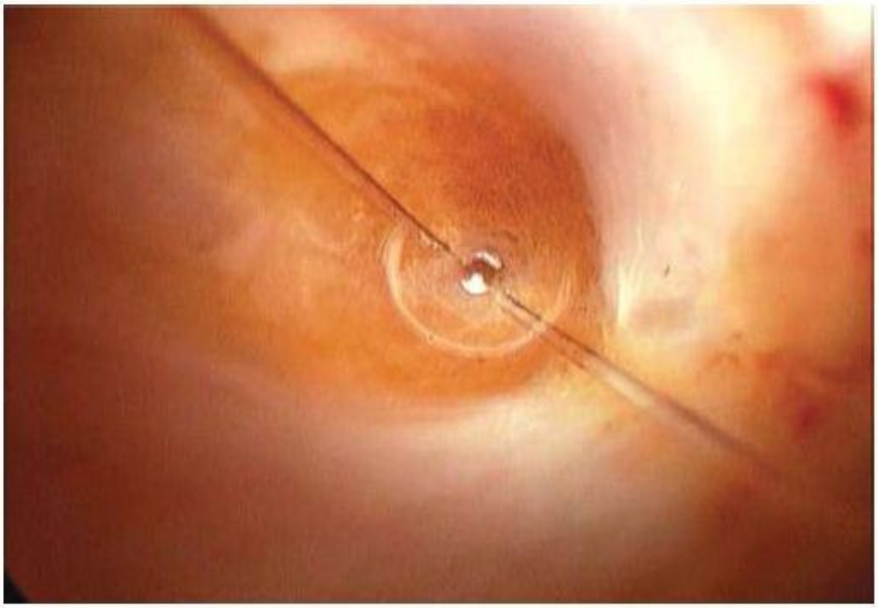

Figure 5. View through the optical access trocar while passing through the posterior rectus sheath into the preperitoneal space.

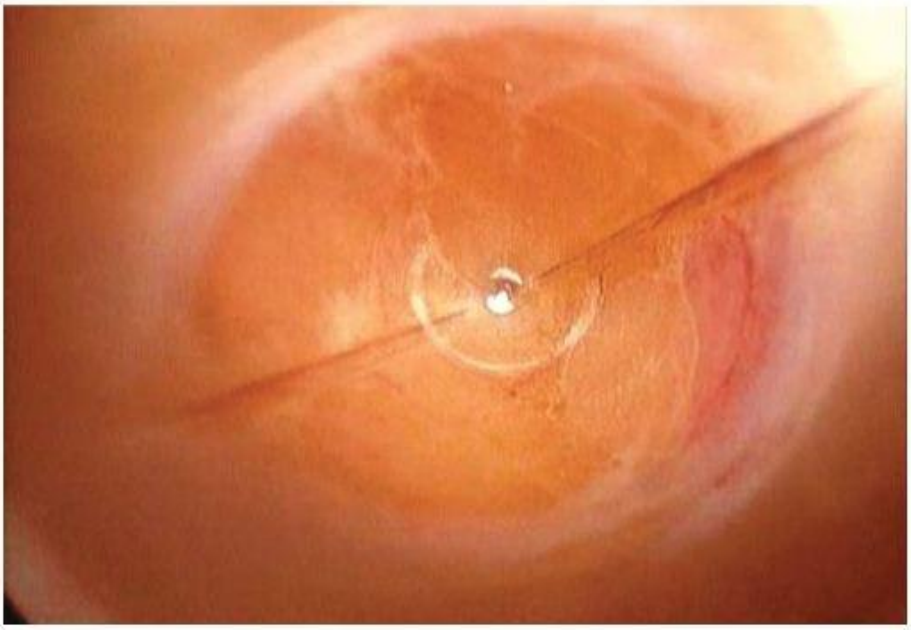

Figure 6. View through the optical access trocar while entering the peritoneal cavity.

There are several various types of OT available, and each manufacturer has a different suggested method for inserting them. The Ethicon Endo path Xcelbladeless OT, for instance, is positioned by gradually twisting it into place and boasts a bladeless optical tip. Similarly, under 0° laparoscope viewing, the Bladeless OT works by radially dilation of the tissue. The manufacturer frequently advises utilizing these trocars in conjunction with a Veress needle insufflation method. The practical safety of OT has been investigated by several researchers. String et al. showed a significantly reduced risk of complications in their assessment of 650 patients who underwent various general surgical procedures in a time period of 4 years. Two injuries were reported: one involving the gallbladder and one involving the colon, both of which were addressed promptly.Overall, the entry-level complication rate was a very low 0.3%[34]. Both injuries happened to patients who underwent surgeries previously. A comparable, smaller dataset by Hallfeldt et al. confirmed these findings. With the exception of one wound infection, they found no problems with the use of optical entry trocars in their analysis of 200 patients having various general surgical operations. It's interesting to note that even though an entrance site was chosen that was a few millimeters away from a prior incision site, adherent small bowel was seen and deferred in four cases[35].

Both investigations examined the speed of entrance into the abdomen and concluded that it was rather quick in addition to safety. The time to entrance was short in both series; Hallfeldt et al reported an average of less than 4 minutes, whereas String et al. reported an average of 1.5 to 2 minutes[34,45].

Hasson technique

The term "Hasson technique" describes one open approach technique for abdominal access during lap surgery. In this technique patient positioned in a supine position and making a tiny, 1.5 – 2 cm incision either superior or inferior to the umbilicus. Depending on the surgeon's discretion, the actual incision may be made vertically or horizontally. A suitable tool, such a Kocher forceps, is then used to grab and lift the abdominal fascia once the incision has been stretched into the subcutaneous tissues. Retractors, such the S-retractor or Langenbeck, can help see the fascia on the skin. Gripping the umbilical stalk and tenting it superiorly may also be required in individuals with more subcutaneous tissue in order to reveal the fascia[36].

A scalpel is used to cut the fascia into 1 to 2 cms sections once it has been gripped on each side of the midline. This should make it possible to see and grab the peritoneum using a smaller tool, like a snap or Kelly. After that, the peritoneum is cut while being directly seen. To determine whether or not access has really been gained, the surgeon places a finger or blunt tool, such a Kelly clamp, into the peritoneum while it is open. To help secure the access trocar and close the incision at the conclusion of the case, an anchoring stitch can be positioned on each side of the incision if no adhesions or resistance are noted. As an alternative, the fascia may be stitched before the incision.

When adhesions or damage to the underlying organs are not evident, a suitable lap trocar is inserted into the abdomen. Three distinct parts make up the conventional Hasson trocar, often known as a cannula: a blunt introducer, a cone-shaped attachment, and an outer sheath[37].

The cannula may be safely introduced into the abdominal cavity using the blunt introducer, and a cone-shaped attachment can be secured to the skin incision to stop carbon dioxide

leaking and the concomitant loss of pneumoperitoneum. Furthermore, the length of the cannula needed to reach the abdomen may be accommodated by adjusting the cone-shaped connection along the sheath. By encircling the securing threads around certain struts on each side of the sheath, the cannula may be further fastened.

With the blunt introducer in position, the complete constructed device should be entered into the peritoneum to insert the Hasson cannula. The cone-shaped attachment is secured to the sheath at the skin incision after enough cannula has been inserted into the abdomen.The trocar is then further held in position by tightening the anchoring sutures onto the struts. The same entrance method may be applied to a range of trocars, including reusable and disposable substitutes, in the event that a genuine Hasson trocar is not available. The open access method to the abdominal cavity remains unchanged, even without additional cone-shaped connectors and struts.

The abdomen is inflated to 15 mmHg once the access trocar is secured. As pneumoperitoneum is reached, it is crucial to closely monitor the gas insufflator because it may offer critical clues about where to implant the trocar. The ideal gas flow rate for a 12 mm port is about 10 liters/minute, and the pressure measurement should gradually rise to the required levels. The normal abdomen requires around 3–6 liters of gas to insufflate. At first, the abdominal pressure should be modest (3–4 mmHg), while in obese people it may be closer to 8 mmHg.

The surgeon conducts a laparoscopy after achieving the appropriate pneumoperitoneum and inserting a laparoscope. In order to inspect any underlying structures,

such the intestine or omentum, for damage from initial entry, the laparoscope is first inserted vertically. It is safe to carry out the suggested lap treatment as long as no harm has been sustained.

The open approach can be used for various port placement positions, as described for both supra-umbilical and infra-umbilical access.The Hasson approach is frequently mentioned as the safest entrance method as it depends on direct vision of the fascia and peritoneum during insertion. It works especially effectively for people who have had abdominal surgery in the past or who have other conditions that might cause intra-abdominal adhesions. Almost all operations may be performed lapally once pneumoperitoneum has been securely established.

Unfortunately, there are certain difficulties associated with lap surgery, and most of them arise at the initial abdominal entrance. The obturator and laparoscope insertion, the peritoneal division, or the fascial incision can all result in complications. Complications can be classified as minor or life-threatening, regardless of the mechanism of damage. Abdominal wall hematomas, subcutaneous emphysema, and superficial wound infections are examples of minor side effects. Injuries to the intestine, bladder, and main abdominal cavity, abdominal wall, or retroperitoneal vasculature are among the serious, potentially fatal consequences. Significant morbidity and mortality, reoperation, and the conversion of a lap procedure to an open procedure are all possible outcomes of such difficulties.

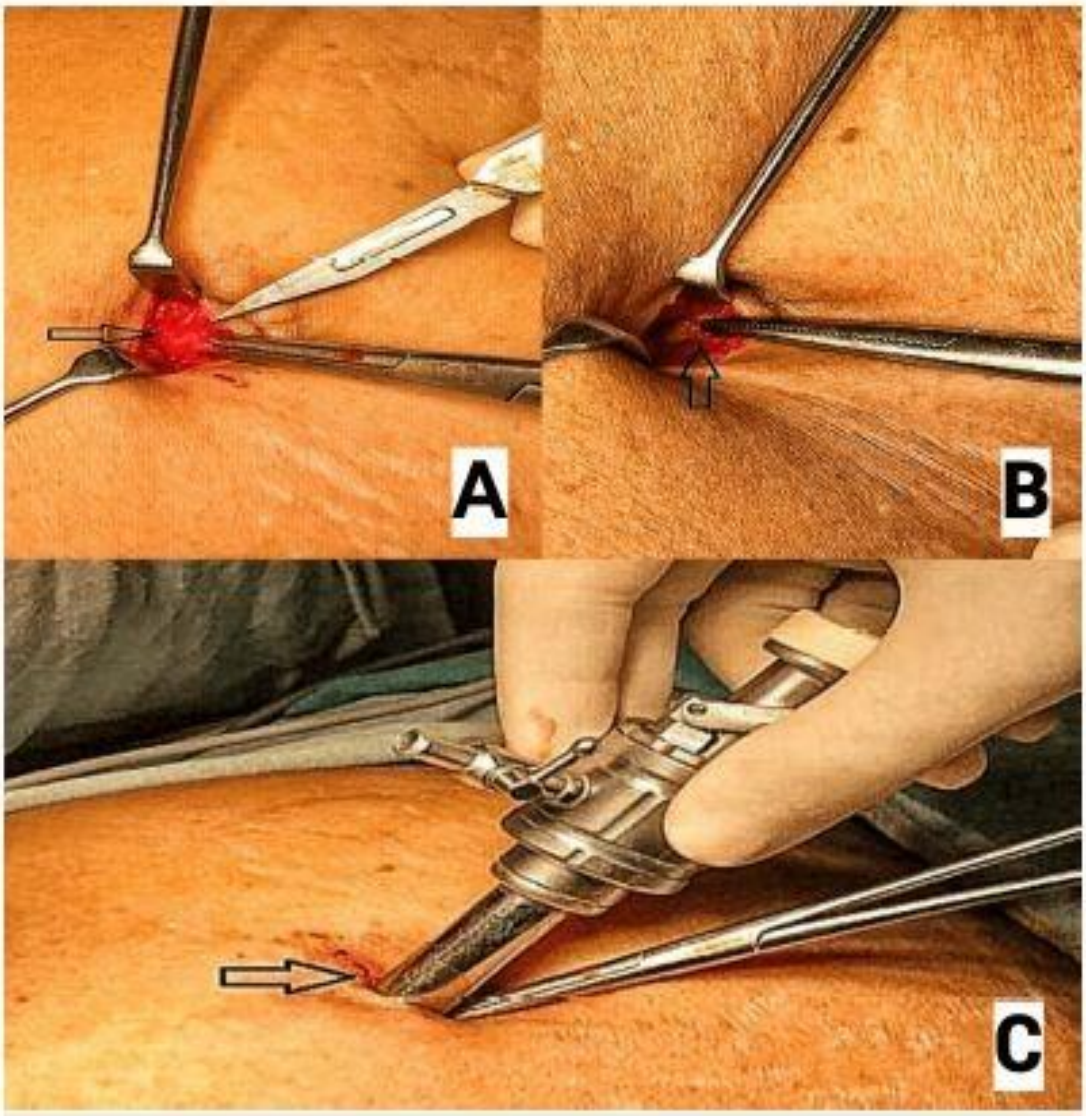

FIGURE 7: Hasson's technique. Panel A shows the rectus sheath through a small supraumbilical incision. Panel B represents the dissection of the rectus sheath. Panel C displays the insertion of a Hasson's port.

Modified Hasson Technique[38]

Using a #11 scalpelblade, a 5 mm skin incision was made 5 mm caudal to the umbilicus. The linea alba was seen by exposing and resecting subcutaneous fat. A mosquito Klemmer was used to raise the abdomen wall, and a #11 scalpel blade was used to cut it. Two mosquito Klemmers were used to grab the surgical margins in order to raise the abdomen wall and then introduce a blunt cannula. After confirming instrument placement and examining the abdomen with the laparoscope, the insufflation tube was connected to the trocar. Insufflation of carbon dioxide (CO2) was initiated and maintained until a pressure of 8–10 mmHg was achieved.

A 0, 5 mm, 29 cm laparoscope was attached to a camera with a light source after the first port was made using the VNT or MHT. The laparoscope was then inserted into the abdomen. Following the visual examination of the abdominal cavity, a mini-laparotomy was performed by placing a second cannula cranial to the umbilicus[39].

Recent Literatures:

Lafullarde T et al[40] (1998) investigated the MHT in order to achieve a pneumoperitoneum without running the danger of experiencing the problems that come with inserting a Veress needle. They stated that in every instance, MHT was shown to be possible. Ten individuals experienced a brief serous discharge, but there were no vascular or visceral problems.Follow-up lasted 5 to 52 months.They came to the conclusion that MHT need to be utilized in lap operations at all times.

Mettler L et al[41] (1999) evaluated the various methods for trocar and Veress needle entrance under direct view, as well as the issues that arise with lap entry. They discovered that 0.86% of patients who had endoscopic procedures experienced problems. Trocar entrance difficulties accounted for 43.1% of the 116 lap complications. They asserted that while problems are inevitable in any surgical operation, even laparoscopy, direct visibility at entrance can significantly lower the risk of trocar entry lacerations.

Schafer M et al[42] (2001) evaluated the harm that trocars and Veress needles caused to intraabdominal organs and arteries. Twenty-two trocar and 4 needle injuries (rate = 0.2%) were reported, including seven vascular damage and 19 visceral lesions. The small bowel was the most frequently affected organ, involved in six cases, followed in incidence by the liver and large bowel.With the exception of one right iliac artery laceration, all vascular lesions manifested as venous hemorrhage of the mesentery or larger omentum.

Under close supervision, fourteen trocars were implanted. Intra-op, 19 trocar injuries were identified; post-op, two small bowel and one bladder injuries were diagnosed. All needle injuries were identified during surgery. The remaining lesions were fixed openly; only five injuries could be corrected lapally. Five reoperations were required for one patient, and four patients had open reoperations. One person died (4%).

Bernik TR et al[43] (2001) reported thatcompared to the VN approach, the balloon blunt-tip trocar (BBTT) required a much shorter mean time to insert the laparoscope. Additionally, the BBTT took less time to install than the conventional HA method. Although no vascular or visceral damage was seen, the standard HA and VN groups' prolonged operating periods were caused by CO2 leakage and subcutaneous gas insufflation. A postop port-site herniation occurred in one patient in the BBTT group, although it was mostly healed without any negative effects.

Bhoyrul S et al[44] (2001) examined the risk variables for injuries brought on by using a disposable trocar. There were 30 hematomas on the abdomen wall, 182 additional visceral lesions, and 408 major blood vessel damages. Bowel injuries accounted for 19% and vascular injuries for 81% of the 32 fatalities. Disposable trocars equipped with safety shields were utilized in 87% of vascular injury fatalities, while those featuring a direct-viewing function accounted for 9% of such cases.The most frequently injured arteries in the fatal vascular injuries were the aorta (23%) and inferior venacava (15%).

Direct-view trocars were used in 7% of bowel injuries, whereas trocars with protective shields were used in 91% of cases. The death rate in this group was 21%, and 10% of patients had a delayed enterotomy diagnosis. Only once was a trocar malfunction discovered once the device was inspected, despite the fact that the surgeon first believed it had occurred in 10% of cases. No particular process or manufacturer was linked to the risk of harm.

Thomas MA et al[45] (2003) reported that7.4% of patients had the OT placed at the umbilicus, 34.7% in the right upper quadrant, and 58.5% in the left upper quadrant. The optical access trocar was linked to four injuries. Three patients had complications on the left side, and one on the right, including two epigastric vascular injuries, one mesenteric injury that resulted in a retroperitoneal hematoma, and one bowel damage. Three cases were identified and fixed right away, while one involving an epigastric vascular damage needed post-op treatment due to an increasing abdominal wall hematoma.

Brown JA et al[46] (2005) claimed that no vascular damage occurred throughout their investigation utilizing optical access lap trocars. A seromuscular injury and a through-and-through enterotomy of the middescending colon were among the 2.1% large-bowel injuries they saw, though. The large colon was shown to be adherent to the anterior abdominal wall in both instances, and the visible obturator was positioned lateral to the left rectus muscle. Two layers of repairs were made to the bowel damage. Without an open conversion, the surgeries were finished, and the recuperation went well. They asserted that there is a risk of serious harm when an optical-access obturator trocar is directly inserted into the desufflated abdomen.

Hajdinjak T et al[47] (2007), using an optical dilating trocar, they observed that in 67 instances, access was accomplished on the first try. It took less than ten minutes from the first

skin incision to the establishment of a preperitoneal space. The initial port for extraperitoneal laparoscopy radical prostatectomy may be introduced more easily, quickly, and safely using this approach, they said.

Rabl C et al[48] (2008) investigated the effectiveness and safety of utilizing an optical, bladeless trocar to enter the peritoneal cavity in individuals who were extremely obese and had never had pneumoperitoneum. They discovered that there were no significant damage to the intestines or abdominal vessels.

In 50% of instances, prior abdominal surgeries were performed. Three patients suffered from trocar-related injuries: two had superficial mesenteric lacerations, and one had a larger omentum artery laceration. Patients who are severely obese can safely enter the peritoneal cavity using the direct initial trocar insertion approach.

Bernante P et al[49] (2008) claimed that no signs of vascular damage during the first trocar implantation were seen. At the time of first trocar implantation, there was no indication of organ or hollowviscus damage. Every patient had a successful first trocar implantation. The mean trocar insertion time was 20 seconds, and the insertion time was unaffected by BMI. They said that morbidly obese individuals might safely undergo their method of accessing the abdominal cavity using a bladed OT without first undergoing abdominal insufflation.

Celia A et al[50] (2008) in their studyPneumoperitoneum in lap renal operations was created using the bladeless Optiview system. Safety, effectiveness, and complications were reported, and the outcomes were compared with the OHT. They claimed that both groups' BMI

values were comparable. The Bladeless and 12 mm Hasson trocars had respective mean insertion times of 125 and 443 seconds. With a mean delay to closure of 203 seconds, the bladeless group's incision was only closed when the defect was larger than 12 mm or expanded for specimen removal.

Two patients in the Hasson group had numerous adhesions that prevented confirmation of entrance into the abdominal cavity.Two intraabdominal structural injuries and one unsuccessful placement necessitating change to the Hasson method occurred in the Bladeless group. One instance of gas leaking occurred. At a mean follow-up of nine months, no port site herniation complaints were found. In contrast to the Hasson approach, they asserted that port placement time can be shortened by directly positioning a bladeless trocar in a desufflated abdomen under direct observation.

Long JB et al[51] (2008) evaluated the effectiveness and safety of an open lap entrance method. Intra-op complications include failure to enter (0.1%) and enterotomy (0.1%). No cases of entry-related vascular damage were observed. Hernia (0.9%), infection (2.5%), hematoma (0.05%), and noncosmetic healing (0.4%) are among the post-op problems that have been documented. Obesity and post-op hernia, as well as prior abdominal surgery and post-op infection, were markedly correlated.

Sabeti N et al[52] (2009) reported thattheir set of patients included four vascular injuries (0.18%). Three needed vascular repair and conversion tolaparotomy, and one was treated lapally. Every injury happened when the player was off-midline. There were no deaths as a result of using the OT. The current research is the largest volume series describing the safe and efficient

use of OT with blades as the main peritoneal access technique in morbidly obese patients without prior insufflation. This device's midline insertion seems to be a secure entrance point.

Merdan I et al[53] (2016) evaluated the effectiveness and safety of Veress needle methods (VN) and direct trocar insertion (DTI) in comparison to the modified open insertion technique (MOIT). Of the 210 patients, they reported that 33.3% underwent surgery using the VN technique, 33.3% underwent surgery using the DTI technique, and 33.3% underwent surgery using the MOTI technique. The patients' ages varied from 17 to 76 years, and 82% of them were female and 18% were male.

Patients using the VN method took an average of 3.6 minutes to enter, whereas those undergoing the DTI and MOTI procedures took 1.8 and 2 minutes, respectively. VN method linked to a greater incidence of minor issues 45.7% of patients reported during DTI, compared to 10% and 7.1% during MOTI, respectively with remarkable variation; Major complications such as gas embolism and visceral or vascular damage were not recorded in this investigation. To sum up, both the DTI and MOTI techniques are safe and efficient ways to produce pneumoperitoneum during lap surgery. Compared to the VN approach, they have no failure rate and just a few mild side effects.

Bianchi G et al[54] (2016) evaluated the results of several lap access methods in order to determine which was the safest. They discovered that although the blind trocar approach is the most often utilized, it has the most problems. Although OT procedures are the least prevalent, they appear to be the safest. The approach developed by Open Hasson is used by 28.2% of surgeons. The overall rate of intra-op complications was 3.3%. The rates of open conversion, transfusion, and total post-op complications were 0.33%, 1.13%, and 2.53%, respectively. They came to the

conclusion that lap access is a low-complication, safe procedure. The majority of problems may be treated lapally or conservatively.

Chotai NR et al[55] (2017) found that the veress needle group's mean operating time for access was 5.12 minutes, compared to 3.94 minutes for the open technique. The open technique had a little greater gas leakage at the port site. No significant issues arose in any of the groups. Minor issues such as omental damage, port site leakage of gas, loss of space, and entrance in the incorrect plane occurred with both access techniques. They asserted that both the open and closed techniques are safe for intraperitoneal access during laparoscopy, and that the open technique was faster than the closed one.

Tanaka C et al[56] (2018) examined the duration of trocar insertion in patients undergoing lap gastrointestinal surgery utilizing an open technique and OT access. According to their findings, the OT access group required much less time for trocar insertion than the open group. An unskilled surgeon was the single risk factor for a prolonged duration of time for the first trocar insertion utilizing the OT access, according to the multivariable analysis. They asserted that in lap gastrointestinal surgery, OT access can be advised for the initial trocar insertion.

Mohammadi M et al[57] (2018) assessed the speed and complications of the two lap trocar insertion techniques (Hasson and Visiport TM) in urologic surgery. Patients in the Hasson and Visiport lap groups were, respectively, 41.4 and 41.6 years old on average. Patients who had the Visiport trocar system and the Hasson lap approach had mean first trocar placement times of 37.7 and 95.4 seconds, respectively. There was a noticeable speed difference between the two lap trocar insertion procedures.

Additionally, 8% of patients who had the Visiport trocar system had problems. However, the Hasson laparoscopy group did not have any difficulties. They asserted that compared to open laparoscopy, the Visiport OT approach is quicker for first trocar implantation. In contrast to open laparoscopy, it is linked to problems.

Ciravolo G et al[58] (2019) described the lap procedure with the gasless OT and examined the problems encountered. They observed that the patients' average age was 40.6 years. 22.1 kg/m2 was the mean BMI. The rate of complications was 0.31% overall. A single stomach hole, two ileal perforations, and one blood vascular perforation were among the major consequences.

Initial access was obtained through the omentum for twelve surgeries, and two were obtained through an ovarian cyst. Because the OT was unable to enter the abdominal cavity in five operations, a laparotomy was necessary. The percentage of problems that required further intervention was 0.12%. They asserted that a viable lap entrance method with fewer risks is the optical gasless trocar.

Sreejith V et al[59] (2019) evaluated individuals undergoing elective lap surgeries to determine the safety and effectiveness of direct trocar insertion. The average time from skin incision to pneumoperitoneum formation was one meter. The author, however, was unable to apply this method to four individuals with central obesity and instead used a traditional Veress needle to create pneumoperitoneum.

There was no bowel or vascular damage or other complications due to insufflation. There were no technical issues with the immediate trocar insertion. There was no visible intra-abdominal bowel, mesentery, or vascular damage. All patients were determined to be hemodynamically stable during surgery. No port site complications, including infection, granuloma development, induration, or herniation, were seen throughout the post-op period or during the follow-up period.

George R et al[60] (2019) assessed MHT's ability to produce NP. The most frequent indication was correction of an inguinal hernia. Two minutes was the average admission time. Port site seroma (0.6%) and port site infection (0.6%) were among the surgical consequences. Both issues were discovered at the umbilical port and after appendicular perforation surgery.

Preperitoneal port placement, intraabdominal damage, port site hematoma, and port site hernia were not seen. The research group did not experience any mortality. They came to the conclusion that MHT is a rapid and safe abdominal entry method.

George R et al[61] (2019) evaluated the efficiency of the MHT with VT. Group A consisted of 156 individuals who had laparoscopies performed by MHT. Group B consisted of 149 individuals who underwent the VT. Regarding age and surgical indications, there was no distinctive between the two groups. Group A's entrance time (2.1 min vs. 4.6 min) was substantially shorter than group B's. Group A experienced two problems in total, which was substantially less than group B. Mortality, port site seroma, infection, hematoma, failure to penetrate the abdomen, intraperitoneal damage, and extraperitoneal port insertion did not significantly vary between the two groups.However, group A saw much fewer port site hematomas than group B. According to them, MHT was shown to be significantly superior than Veress needle entrance because it was easier for novice lap patients to use, took less time to achieve pneumoperitoneum, and required less time for surgery in their research.

Abdullah AA et al[62] (2019) evaluated the effectiveness and safety of the veress needle and the direct trocar procedure as the main entrance methods for creating pneumoperitoneum. They claimed that the direct trocar method was quicker (2.3 minutes) than the VT method (5 minutes), that the trocar method only causes one instance of CO2 leakage, whereas VT does not; that the veress method only causes extraperitoneal insufflations in 5.3% of cases; and that port site infection develops in 2.6% of cases of the direct trocar method and in one instance of the veress cannula. With the direct trocar technique, there is just one instance of port site hematoma. They came to the conclusion that the direct trocar procedure is a quick, simple, and safe way to create the main entry point into the peritoneal cavity and, consequently, the pneumoperitoneum; there were no notable differences in minor problems and no large ones.

Abass MO et al[63] (2020) evaluated the various lap entry methods and reported that 324 individuals, with an average age of 26.2 years, were included in the research. Women made up the majority of the patients. Lap appendicectomies accounted for 77.2% of the lap operations, whereas LC accounted for 18.8%. DTI was utilized in 20.4% of instances, the open approach in 29.9%, and the Veress needle technique in 49.7% of cases.

When compared to the other methods, direct trocar insertion demonstrated statistically shorter process duration. Although there was no remarkable difference between the three access strategies, 0.6% of patients had access-related problems. Although the safety of several access methods used in lap surgeries is confirmed by this study, each patient should choose their own access type.

Majeed FA et al[64] (2020) assessed the lap port access safety profile of Hasson's method in LC patients. The patients' average age, they discovered, was 44.7 years. Because to the existence of inflammatory adhesions and anatomic access, the operation was straightforward in 63.2% of the 1037 patients and complicated in 36.8% of them. There was no gut perforation, vascular damage, omental damage, or intra-abdominal damage.

About 0.57% of patients received a port-site infection diagnosis during the six-month follow-up. In just 0.09% of patients, an umbilical hernia was identified. They discovered that the first lap port access method, known as the Hasson technique, was a safe method with few access-related difficulties for creating a pneumoperitoneum.

Coskun M et al[65] (2020) sought to determine if employing a bladeless OT for abdominalentry in individuals who are severely obese is safe and feasible without causing pneumoperitoneum. In the first five patients, the Veress needle access did not work. All patients, including the first five, had successful first access utilizing a bladeless OT that did not cause pneumoperitoneum. Insufflation and trocar insertion took an average of 58 seconds after the skin incision. Two individuals experienced omental damage as a result of trocar implantation. No further issues arose. No patient had any facial defect closures done. Roux-en-Y gastric bypass and sleeve gastrectomy had mean operating times of 203 and 76 minutes, respectively. There were no trocar site hernias over the 24-month follow-up period.They asserted that in patients who are very obese, first abdominal access with a bladeless OT that does not create pneumoperitoneum is a realistic, quick, safe, and efficient technique.

Bucheeri MM et al[66] (2021)examined the rates of switching to an open surgery as well as the frequency and kind of problems related to establishing pneumoperitoneum in obese individuals. They stated that throughout the course of three years, 821 people had bariatric surgery performed at their facility. Their average BMI was 45.9 kg/m2, and their average age was 34.2 years. In each of these patients, pneumoperitoneum was effectively produced with OT. In 0.97% of instances, complications were ascribed to OT entrance. Four of these eight individuals had a BMI more than 50 kg/m2, with an average BMI of 52.7 kg/m2. Among the problems were one omental vessel laceration, four mesenteric injuries, and three liver lacerations. Twelve mm OT caused four injuries, while five mm OT caused the remaining four. No patients needed to have a laparotomy since these issues were resolved lapally. They asserted that establishing pneumoperitoneum in obese individuals may be done safely by using non-bladed, OT insertion into the belly.

Haseeb OU et al[67] (2021) contrasted the post-op results and operating time for the open technique (group A) with the closed technique (group B). They reported that the average weight was 68 kg and the average age was 45.5 years. The average operating duration was 84.5 minutes. Of the patients covered, 69.8% had LC and 17.4% had lap appendectomy. A mild problem occurred in 15.1% of patients, including 2.3% in group A and 27.9% in group B. It was determined that there was a highly significant difference in the efficiency of each approach between the two groups when compared by the development of the problems. They came to the conclusion that open lap approach has been associated with fewer surgical complications than closed lap access.

Bianchi A et al[68] (2021) compared the rates of intra-op problems utilizing the VNT and the open MHT, as well as the durations needed for the first portal's installation and the formation of pneumoperitoneum. The first portal placement and pneumoperitoneum establishment took 374 and 242.9 seconds, respectively, for the VNT and MHT. Their relative rates of significant problems were 20% and 0%. Their relative incidences of mild problems were 20% and 35%. Laparotomy was not necessary for any surgical operations. When compared to the Veress needle approach, the MHT was linked to a reduced significant complication rate and took less time to construct the initial portal.

Datey A et al[69] (2021) claimed that the incidence of vascular injuries, visceral injuries, and other post-op sequelae was comparable in the groups who had trocar and Veress needle insertion. The failure rates of the two approaches did not differ much, according to the current study. According to their claims, both methods are equally safe, effective, and practical for creating pneumoperitoneum during lap procedures.

Virk AS et al[70] (2022)evaluated the safety, duration, and complications of the open and closed techniques for establishing pneumoperitoneum for performing LC. Since there was no remarkable difference, they observed that the open entrance approach is nearly identical to the closed entry technique in terms of the time required to finish the procedure and major and minor difficulties. Compared to closed techniques, they asserted that open access techniques are safer for all patients.

Shakoor N et al[71] (2022)contrasted the results of the OHT and CVT methods for producing pneumoperitonium in LC. The mean age of the patients in the OHT group was 37.2 years with a mean BMI of 25.2 kg/m2, whereas the mean age of the patients in the CVT group was 36.1 years with a mean BMI of 25.1 kg/m2. Women made up the majority of the patients. The OHT group's mean access time was 4.8 minutes shorter than the CVT group's, which was 6.1 minutes.

The OHT group's mean closure time was 6 minutes, whereas the CVT group's was 7.3 minutes. The CVT group had gas leaks more frequently (17.8%) than the OHT group (6.7%). The CVT group experienced more visceral damage (6.7% instances) than the OHT group (2.2% cases).4.4% of both groups experienced vascular damage, and no conversion instances were discovered. Hemostasis, infection, and umbilical hernia were more common post-op problems in the OHT group than in the CVT group. In this comparative investigation, they asserted that the OHT strategy produced pneumoperitonium in LC more rapidly and effectively than any other technique.

Sharp HT et al[72] (2022) examined the quantity and kind of severe issues related to optical-access trocars. According to them, there have only been two significant side effects from the use of optical-access trocars documented in the medical literature.

Nevertheless, there have been reports of 79 major issues with these methods. These include three liver lacerations, one stomach perforation, 18 intestine perforations, 20 cases of severe bleeding from different locations, and 37 serious arterial injuries affecting the aorta, venacava, or iliac arteries. Four of these issues led to the death of the patient. They came to the conclusion that even while optical-access trocars can see tissue layers during insertion, they could be linked to serious damage.

Syed IN et al[73] (2024)intended to assess the risk of harm related to Veress and Hasson's methods in order to develop a safety index for the two methods of creating pneumoperitoneum in robotic and lap procedures. In 74% of emergency cases, they observed, Hasson's open approach of main port installation was employed, whereas 26% of emergency procedures employed the Veress needle technique.

On the same note, Hasson's open approach was the most often used method for creating pneumoperitoneum in elective surgical procedures (77%). Considering safety index of the two methods for creating pneumoperitoneum, we discovered that neither method was linked to any significant PPPIs, and that both methods had a low rate of small PPPIs. Furthermore, no perioperative deaths linked to the initial trocar insertion were noted.

Kumar S et al[74] (2024)assessed the effectiveness and safety of intraperitoneal access using OHT and CVT for lap surgery's pneumoperitoneum formation. Pneumoperitoneum was created on average in 5.3 minutes using the open approach and 6.2 minutes using the closed method. In our study, the open group's mean time for umbilical port closure was 7.3, whereas the closed group's was 8.8. Neither of the techniques utilized to create the pneumoperitoneum in their investigation resulted in any vascular or visceral damage. In both groups, post-op problems were nearly equal. They asserted that the generation of pneumoperitoneum during peritoneal laparoscopy may be accomplished safely and effectively using both open and closed intraperitoneal access techniques.

MATERIALS

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METHODS

MATERIALS AND METHODS

Study Design:

Prospective comparative analytical study

Study Area:

Department of General Surgery in RL Jalappa Hospital and research Center, Kolar

Study population:

Patients who underwent lap surgical procedures

Study period:

April 2023 to September 2024

Inclusion criteria:

- Patients aged between 18-60 years of age
- Patients with ASA class I and class II
- Patient who underwent lap surgical procedure

Exclusion criteria:

- Patients with previous abdominal surgery
- Immunocompromised status
- Chronic liver disease
- Impaired liver function test
- Pregnant women
- Abdominal malignancy
- Local skin infections

Sample size:

Sample size was caluculated by using the difference in mean time between Visiport and open Laparoscopy from the study Mehrdad Mohammadi et al[57] as 37.7 min and 95.4 min. Using these values at 99% Confidence limit and 90% power sample size of 22 was obtained in each group by using the below mentioned formula and Med calc sample size software. With 10% nonresponse sample the sample size was arrived as 25 in each each group which was rounded off to 30. Hence a total of sixty cases were included with thirty cases in each group.

Group OT (Bladeless Optic Trochar) = 30 cases

Group MH (Modified Hansson's) = 30 cases

Ethical committee approval:

Approval for this study was granted by the Institutional Human Ethics Committee.

Data Collection:

After obtaining written informed consent, participants' demographic and clinical information was collected by the principal investigator using a standardized proforma.Cases were allotted in each group based on computer generated random numbers.

Apart from the demographic variables, time taken for achieving the access, complications and conversion of lap to open were the key parameters assessed.

Operative technique

OT

Inserting a 30◦ 5 or 10 mm laparoscope into a 5 mm or 12 mm OT, respectively, marked the beginning of pneumoperitoneal establishment. The vision was then focused and white balanced onto a gauze using these non-bladed OT. A modest reverse Trendelenburg posture was used for the patient. An 11 blade is used to make a skin incision 2 cm left of the midline and 15–18 cm inferior to the xiphisternum. The skin incision was created large enough to facilitate the easy insertion and advancement of the port without any resistance or undue strain. The combination versa port/laparoscope was placed into the skin incision, and the left upper quadrant was targeted by gently pressing and twisting the OT inferiorly with a 60◦ diagonal offset. Because the trocar was positioned off-midline, linea alba was avoided, making the layers of the abdominal wall easily recognizable.

The anterior rectus sheath, rectus muscle, and posterior rectus sheath were all visible after passing through the subcutaneous fat. The last layer to be pierced was the peritoneum. The OT was not pushed farther after puncturing the peritoneum, and insufflation was started right after. As insufflation proceeded, the port was the only part of the abdominal wall remaining after the perforator and laparoscope complex was removed. After that, the laparoscope was inserted into the port to see the peritoneal cavity. The region underneath the entrance site was inspected for any signs of bleeding or damage to any solid or hollow organs after the port was further pushed into the peritoneal cavity through the laparoscope and under vision. The fascial defect was not closed at the conclusion of the treatment.

Modified Hasson's Technique

Using an open approach, the open (Hasson) technique allows access to the abdomen for lap surgery. This technique involves making a little incision either superior or inferior to the umbilicus, measuring 1.5 to 2 cm. A blunt trocar or Hasson's cannula is then introduced when the incision is deepened to the sheath, which is gripped and cut.

Minimal access surgeons all over the world frequently employ the open access Modified Hasson method, which involves making a tiny umbilical incision under direct visualization to enter the abdominal cavity and then inserting a blunt trocar. However, this technique is blind and can result in complications during abdominal entry, such as solid organ injury, vascular injury, and visceral injury.

Figure 8: Bladeless OT

Figure 9: Metallic Trocar used in MH approach

Data analysis

The data were recorded in an Excel spreadsheet and analyzed using SPSS Version 21. Descriptive statistics, including mean, standard deviation, and proportions (%), were calculated for quantitative variables. Hypothesis testing was conducted using the Chi-square test, paired t-test, and independent samples t-test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

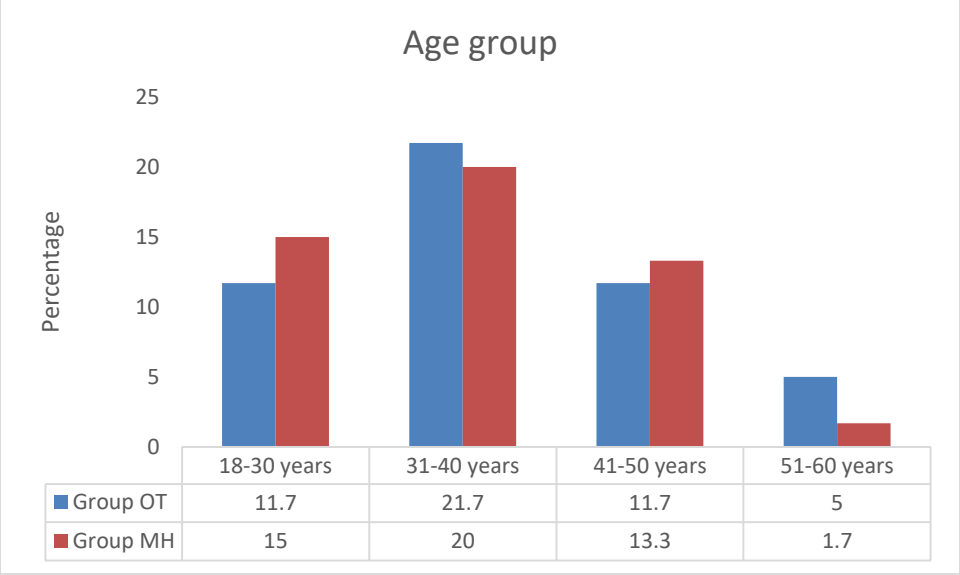
RESULTS

In this study, there were 26.7% belong to 18-30 years, 41.7% belong to 31-40 years, 25% belong to 41-50 years and 6.7% of cases belong to 51-60 years of age. When evaluating the relationship between age group across the two groups, no significant association was observed.

Table 1: Association of age categories between groups

Age group	Group OT	Group MH	Total	p value
18-30 years	7 (11.7)	9 (15)	16 (26.7)	0.7157
31-40 years	13 (21.7)	12 (20)	25 (41.7)	
41-50 years	7 (11.7)	8 (13.3)	15 (25)	
51-60 years	3 (5)	1 (1.7)	4 (6.7)	
Total	30 (50)	30 (50)	60 (100)	

Graph 1: Association of age categories between groups

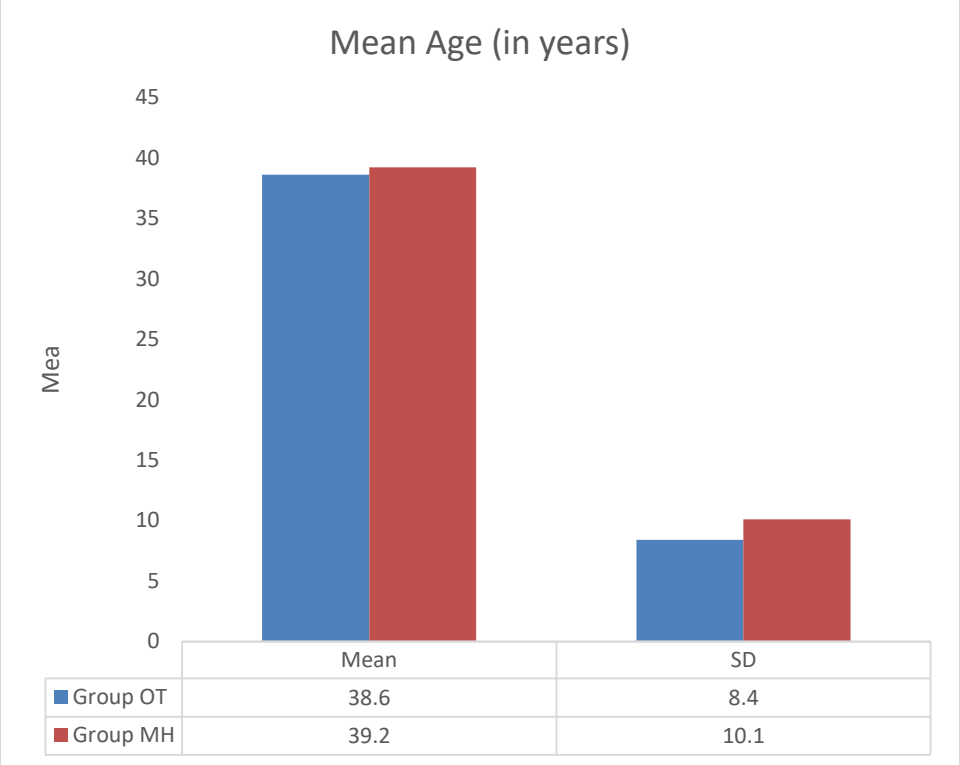


Mean age of cases in group OT was 38.6 years and the same in the group MH was 39.2 years. There was no statistically significant difference in mean age between the two groups.

Table 2: Mean difference in age between groups

Parameter	Group OT	Group MH	p value
Mean Age (in years)	38.6±8.4	39.2±10.1	0.7241

Graph 2: Mean difference in age between groups

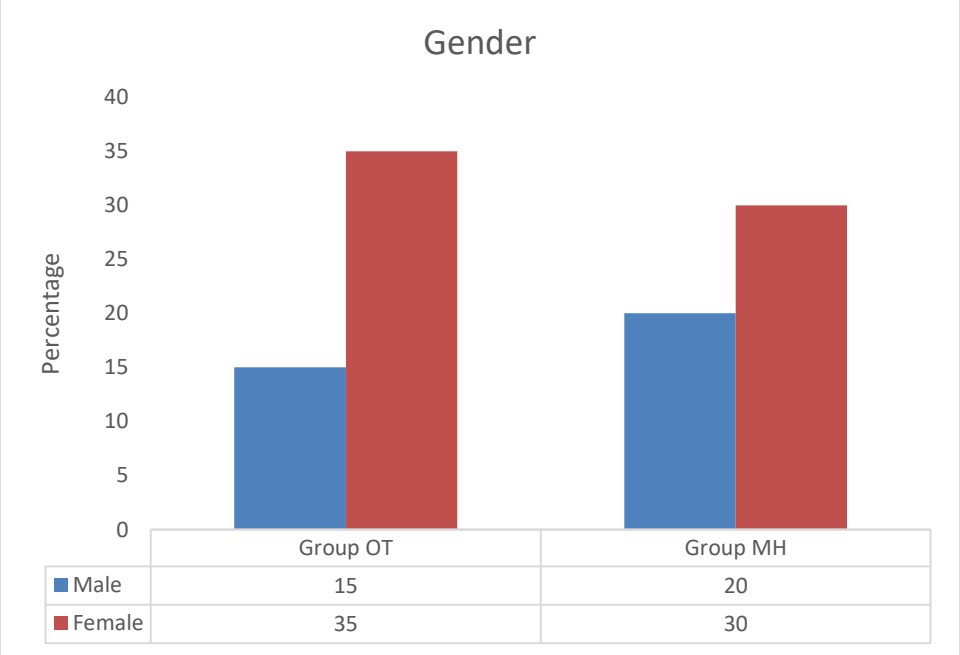


On assessing the gender distribution between the group OT and group MH, there were 35% and 65% of cases belongs to gender male and female, respectively. However, on assessing the association between the genders among the two groups, there was no association noted.

Table 3: Association between gender distributions between groups

Gender	Group OT	Group MH	Total	p value
Male	9 (15)	12 (20)	21 (35)	0.4167
Female	21 (35)	18 (30)	39 (65)	
Total	30 (50)	30 (50)	60 (100)	

Graph 3: Association between gender distributions between groups

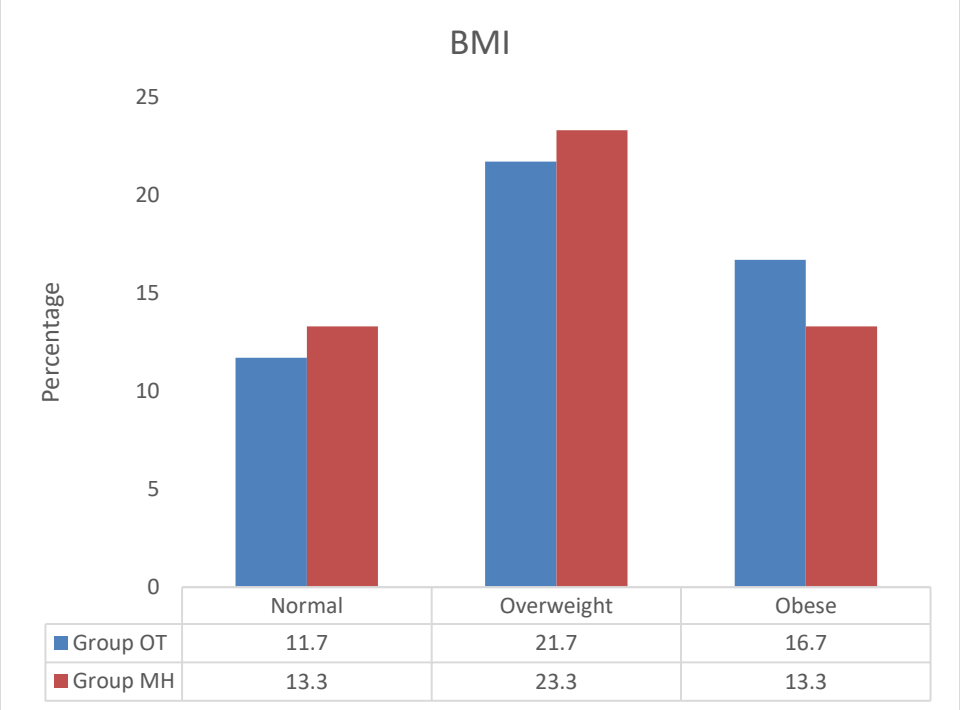


In this study, there were 25% cases had normal BMI, 45% cases were overweight and 30% were obese. However, on assessing the association between the different BMI categories among two groups, there was no significant association noted.

Table 4: Association of BMI categories between groups

BMI	Group OT	Group MH	Total	p value
Normal	7 (11.7)	8 (13.3)	15 (25)	0.8496
Overweight	13 (21.7)	14 (23.3)	27 (45)	
Obese	10 (16.7)	8 (13.3)	18 (30)	
Total	30 (50)	30 (50)	60 (100)	

Graph 4: Association of BMI categories between groups

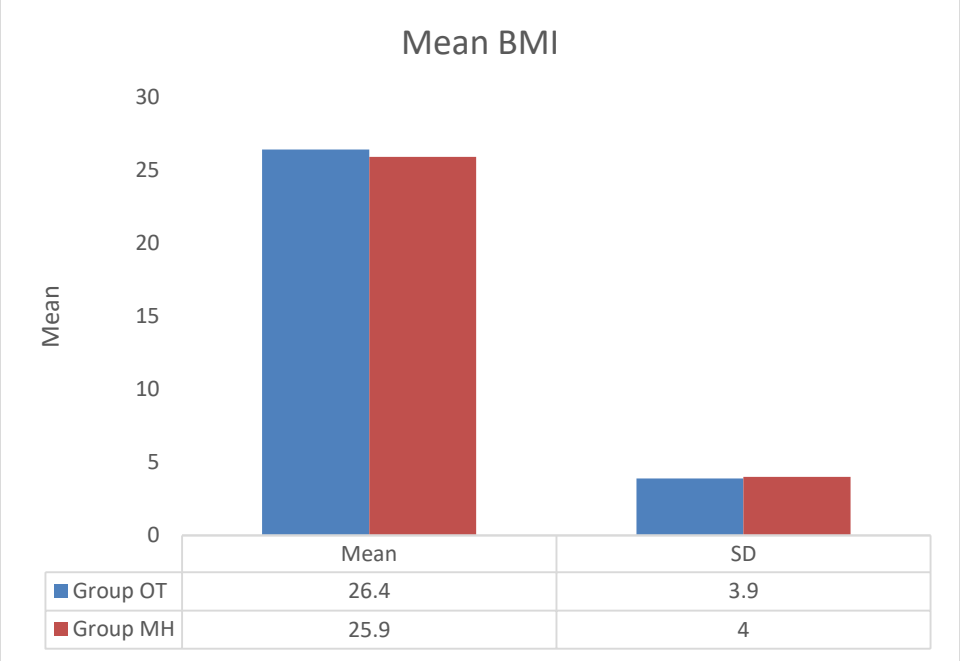


Mean BMI in group OT was 26.4 and the same in group MH was 25.9; notably there was no significant difference in mean BMI noted between the group OT and group MH, in this study.

Table 5: Mean difference in BMI between groups

Parameter	Group OT	Group MH	p value
Mean BMI	26.4±3.9	25.9±4.0	0.4895

Graph 5: Mean difference in BMI between groups



Based on ASA class there were 43.3% and 56.7% of cases belongs to ASA class 1 and ASA class 2, respectively; however on assessing the association, there was no significant association noted between ASA class among group OT and group MH.

Table 6: Association of ASA class between groups

ASA class	Group OT	Group MH	Total	p value
Class I	14 (23.3)	12 (20)	26 (43.3)	0.8496
Class II	16 (26.7)	18 (30)	34 (56.7)	
Total	30 (50)	30 (50)	60 (100)	

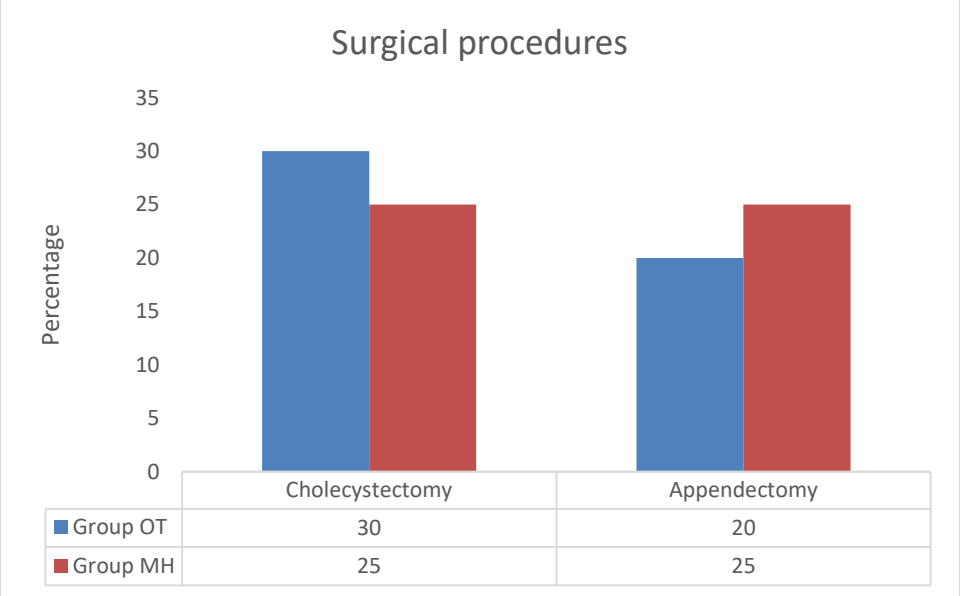
Graph 6: Association of ASA class between groups

On assessing the different surgical procedures carried out in each group, cholecystectomy, appendectomy and constitutes 55%, 45% respectively. On assessing the association, there was no remarkable association noted between the different surgical procedures between groups.

Table 7: Distribution of different surgical procedures between groups

Surgical procedures	Group OT	Group MH	Total	p value
Cholecystectomy	18 (30)	15 (25)	33 (55)	0.5292
Appendectomy	12 (20)	15 (25)	27 (45)	
Total	30 (50)	30 (50)	60 (100)	

Graph 7: Distribution of different surgical procedures between groups



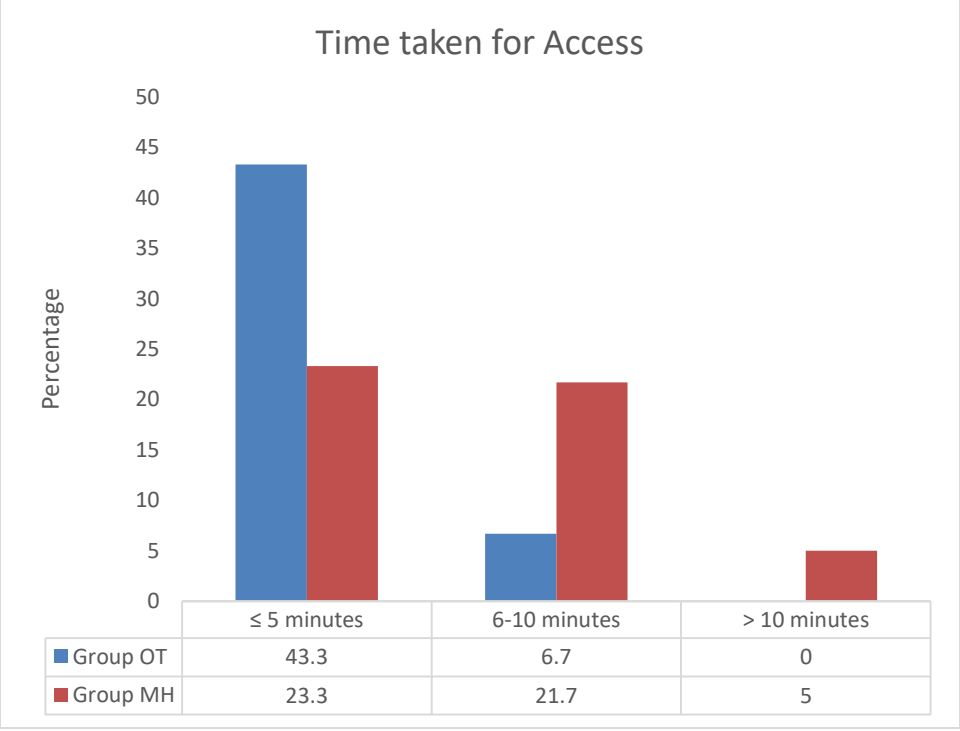
On assessing the time taken for achieving the access, in group OT, 43.3%, and 6.7% of cases took ≤ 5 minutes and 6-10 minutes, respectively. Similarly, in group MH, 23.3%, 21.7% and 5% of cases took ≤ 5 minutes, 6-10 minutes and 10 minutes, respectively.

Table 8: Association between time taken for access between groups

Time taken for Access	Group OT	Group MH	Total	p value
≤ 5 minutes	26 (43.3)	14 (23.3)	40 (55.7)	0.0034*
6-10 minutes	4 (6.7)	13 (21.7)	17 (28.3)	
> 10 minutes	0	3 (5)	3 (5)	
Total	30 (50)	30 (50)	60 (100)	

*Significant

Graph 8: Association between time taken for access between groups



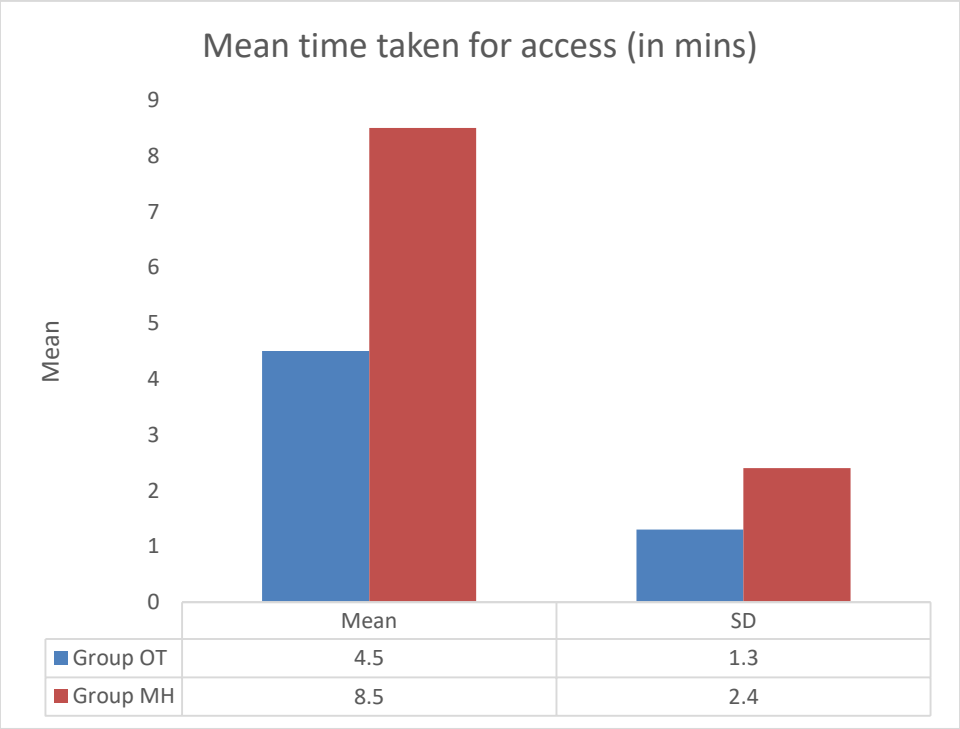
Mean time taken for achieving the access in group OT was 4.5 minutes and in group MH was 8.5 minutes and notably the difference in mean time for achieving the access between group OT and group MH was significantly different.

Table 9: Mean difference in time taken for access between groups

Parameter	Group OT	Group MH	p value
Mean time taken for access (in mins)	4.5±1.3	8.5±2.4	<0.0001*

*Significant

Graph 9: Mean difference in time taken for access between groups



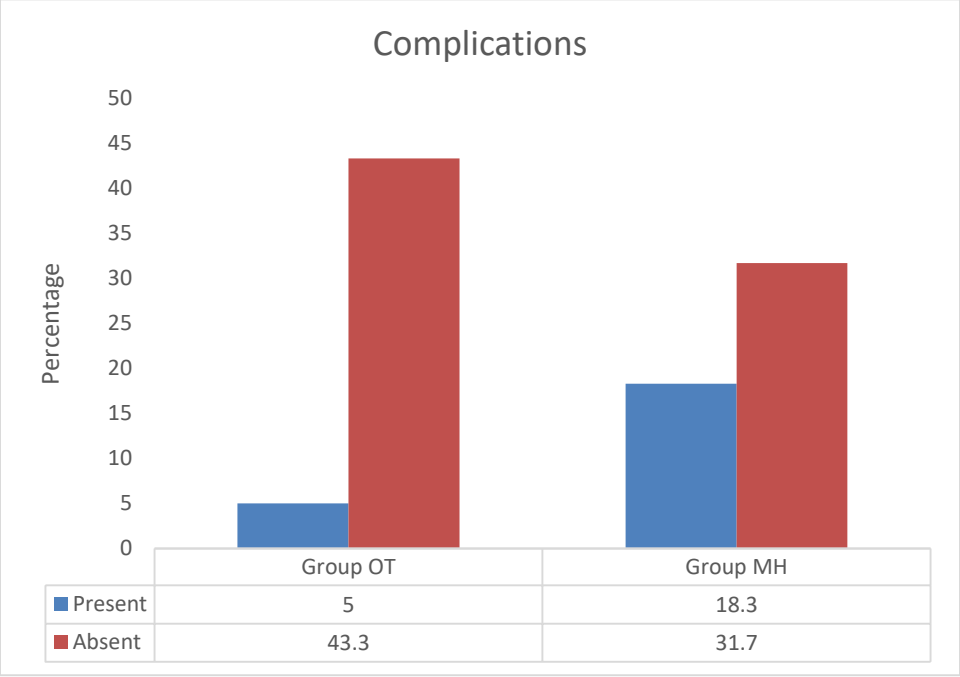
On assessing the incidence of complications in group OT and group MH, there were 5% and 18.3% of cases had complications in group OT and group MH, respectively. On assessing the association between occurrences of complications between groups, there was a significant association noted.

Table 10: Association between occurrences of complications among groups

Complications	Group OT	Group MH	Total	p value
Present	03 (5)	11 (18.3)	14 (23.3)	0.0175*
Absent	26 (43.3)	19 (31.7)	45 (75)	
Total	30 (50)	30 (50)	60 (100)	

*Significant

Graph 10: Association between occurrences of complications among groups

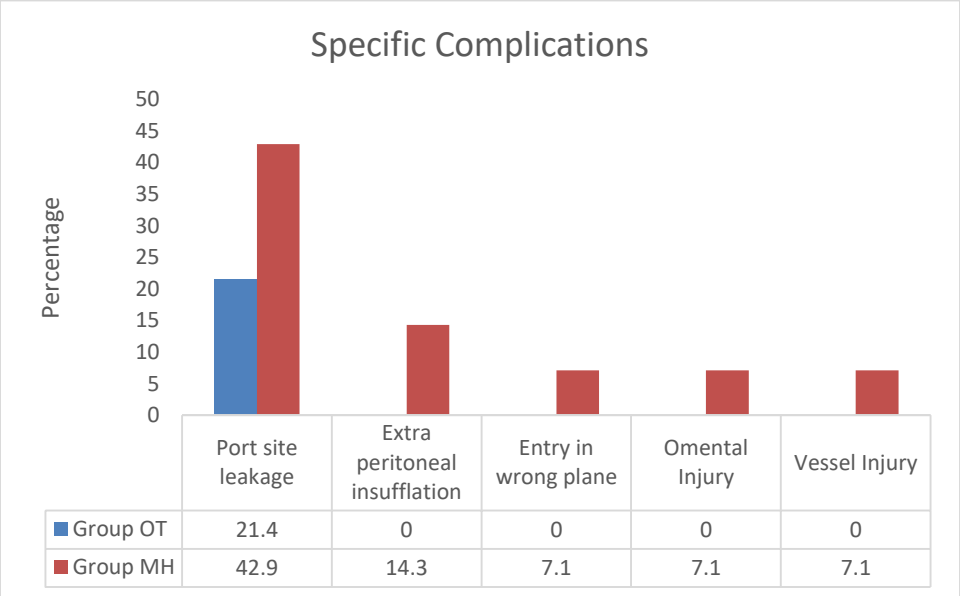


On assessing the proportions of different complications in group OT there was 21.4% of port site leakage among all complications. Similarly, in group MH, port site leakage, extra peritoneal insufflations, entry in wrong plane, omental injury and vessel injury were constitutes for 42.9%, 14.3%, 7.1%, 7.1% and 7.1% of all complications.

Table 11: Proportion of specific complication between groups

Specific Complications	Group OT	Group MH	Total
Port site leakage	3 (21.4)	6 (42.9)	9 (64.3)
Extra peritoneal insufflation	0 (0)	2 (14.3)	2 (14.3)
Entry in wrong plane	0 (0)	1 (7.1)	1 (7.1)
Omental Injury	0 (0)	1 (7.1)	1 (7.1)
Vessel Injury	0 (0)	1 (7.1)	1 (7.1)
Total	3 (21.4)	11 (78.6)	14 (100)

Graph 11: Proportion of specific complication between groups

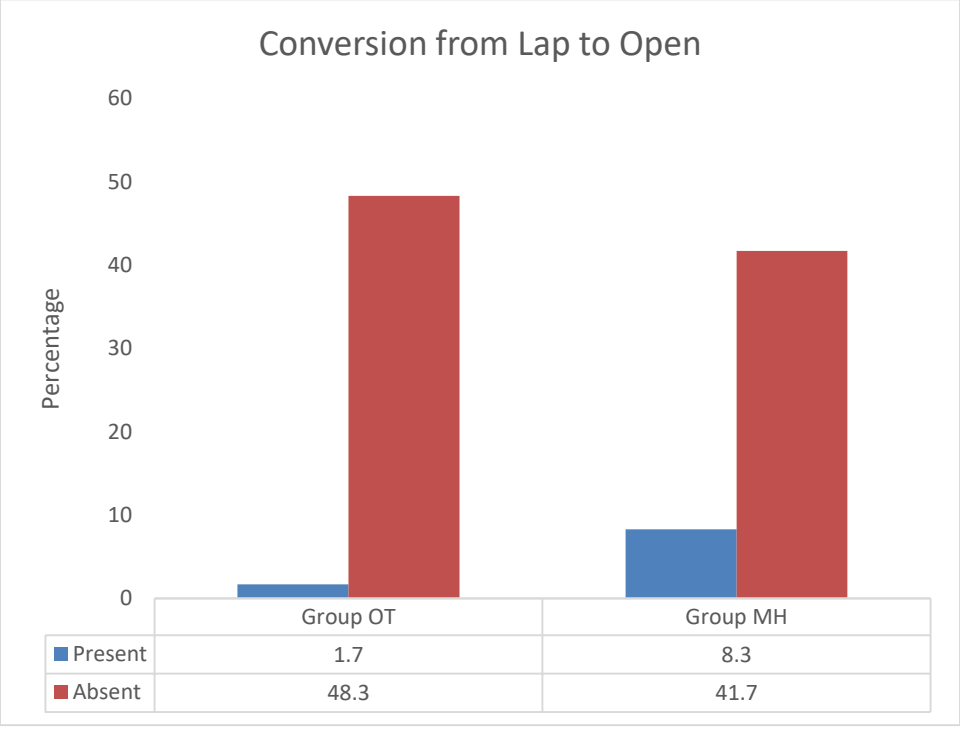


Notably, on assessing the conversion of lap to open surgical procedures, there were 1.7% and 8.3% of cases were converted from lap to open surgical procedure in group OT and group MH; however the association between conversion of lap to open surgical procedure among the group OT and group MH was not significant.

Table 12: Association of conversion from Lap to open between groups

Conversion from Lap to Open	Group OT	Group MH	Total	p value
Present	1 (1.7)	5 (8.3)	6 (10)	0.0851
Absent	29 (48.3)	25 (41.7)	54 (90)	
Total	30 (50)	30 (50)	60 (100)	

Graph 12: Association of conversion from Lap to open between groups



DISCUSSION

DISCUSSION

In this study, there were 26.7% belong to 18-30 years, 41.7% belong to 31-40 years, 25% belong to 41-50 years and 6.7% of cases belong to 51-60 years of age. However, on assessing the association between the age group among the two groups, there was no remarkable association noted. Mean age of cases in group OT was 38.6 years and the same in the group MH was 39.2 years. However, the difference in mean age between the two groups was not significant.

On assessing the gender distribution between the group OT and group MH, there were 35% and 65% of cases belongs to gender male and female, respectively. However, on assessing the association between the genders among the two groups, there was no association noted.

In this study, there were 25% cases had normal BMI, 45% cases were overweight and 30% were obese. However, on assessing the association between the different BMI categories among two groups, there was no significant association noted. Mean BMI in group OT was 26.4 and the same in group MH was 25.9; notably there was no significant difference in mean BMI noted between the group OT and group MH, in this study.

Based on ASA class there were 43.3% and 56.7% of cases belongs to ASA class 1 and ASA class 2, respectively; however on assessing the association, there was no significant association noted between ASA class among group OT and group MH. On assessing the different surgical procedures carried out in each group, cholecystectomy and appendectomy constitutes 55%, 45% respectively. On assessing the association, there was no remarkable association noted between the different surgical procedures between groups.

On assessing the time taken for achieving the access, in group OT, 43.3%, and 6.7% of cases took ≤ 5 minutes and 6-10 minutes, respectively. Similarly, in group MH, 23.3%, 21.7% and 5% of cases took ≤ 5 minutes, 6-10 minutes and . 10 minutes, respectively. Mean time taken for achieving the access in group OT was 4.5 minutes and in group MH was 8.5 minutes and notably the difference in mean time for achieving the access between group OT and group MH was significantly different.

On assessing the incidence of complications in group OT and group MH, there were 5% and 18.3% of cases had complications in group OT and group MH, respectively. On assessing the association between occurrences of complications between groups, there was a significant association noted. On assessing the proportions of different complications in group OT there was 21.4% of port site leakage among all complications. Similarly, in group MH, port site leakage, extra peritoneal insufflations, entry in wrong plane, omental injury and vessel injury were constitutes for 42.9%, 14.3%, 7.1%, 7.1% and 7.1% of all complications.

Notably, on assessing the conversion of lap to open surgical procedures, there were 1.7% and 8.3% of cases were converted from lap to open surgical procedure in group OT and group MH; however the association between conversion of lap to open surgical procedure among the group OT and group MH was not significant.

The results of the present study align with those reported in previous research.Lafullarde T et al[40]stated that in every instance, MHT was shown to be possible. Ten individuals experienced a brief serous discharge, but there were no vascular or visceral problems. The duration of follow-up varied from 5 to 52 months. They came to the conclusion that MHT need to be utilized in lap operations at all times.Mettler L et al[41]discovered that 0.86% of patients who had endoscopic

procedures experienced problems. Trocar entrance difficulties accounted for 43.1% of the 116 lap complications. They asserted that while problems are inevitable in any surgical operation, even laparoscopy, direct visibility at entrance can significantly lower the risk of trocar entry lacerations.Schafer M et al[42] reported that 22 trocar and 4 needle injuries (rate = 0.2%) were reported, including seven vascular damage and 19 visceral lesions. With six cases, the small bowel was the most damaged organ, followed by the liver and large bowel. With the exception of one right iliac artery laceration, all vascular lesions manifested as venous hemorrhage of the mesentery or larger omentum. Under close supervision, fourteen trocars were implanted. Intra-op, 19 trocar injuries were identified; post-op, two small bowel and one bladder injuries were diagnosed. All needle injuries were identified during surgery. The remaining lesions were fixed openly; only five injuries could be corrected lapally. Five reoperations were required for one patient, and four patients had open reoperations.

In consistent with this study, Bhoyrul S et al[44]examined the risk variables for injuries brought on by using a disposable trocar. There were 30 hematomas on the abdomen wall, 182 additional visceral lesions, and 408 major blood vessel damages. Bowel injuries accounted for 19% and vascular injuries for 81% of the 32 fatalities. Disposable trocars with safety shields were used in 87% of vascular injury fatalities, whereas disposable trocars with a direct-viewing function were used in 9% of cases. The most frequently injured arteries in the fatal vascular injuries were the aorta (23%) and inferior venacava (15%). Direct-view trocars were used in 7% of bowel injuries, whereas trocars with protective shields were used in 91% of cases. The death rate in this group was 21%, and 10% of patients had a delayed enterotomy diagnosis. Only once was a trocar malfunction discovered once the device was inspected, despite the fact that the surgeon first believed it had occurred in 10% of cases. No particular process or manufacturer was linked to the

risk of harm.Thomas MA et al[45] reported that7.4% of patients had the OT placed at the umbilicus, 34.7% in the right upper quadrant, and 58.5% in the left upper quadrant. The optical access trocar was linked to four injuries. Three patients had complications on the left side, and one on the right, including two epigastric vascular injuries, one mesenteric injury that resulted in a retroperitoneal hematoma, and one bowel damage. Three cases were identified and fixed right away, while one involving an epigastric vascular damage needed post-op treatment due to an increasing abdominal wall hematoma.

Additionally, Brown JA et al[46] claimed that no vascular damage occurred throughout their investigation utilizing optical access lap trocars. Among the 2.1% of large-bowel injuries observed, there were seromuscular injuries and through-and-through enterotomy of the mid descending colon.In both cases, the enlarged colon was observed to be adherent to the anterior abdominal wall, with the visible obturator positioned lateral to the left rectus muscle.Two layers of repairs were made to the bowel damage. Without an open conversion, the surgeries were finished, and the recuperation went well. They asserted that there is a risk of serious harm when an optical-access obturator trocar is directly inserted into the desufflated abdomen.Hajdinjak T et al[47] stated that using an optical dilating trocar, they observed that in 67 instances, access was accomplished on the first try. It took less than ten minutes from the first skin incision to the establishment of a preperitoneal space. The initial port for extraperitoneal laparoscopy radical prostatectomy may be introduced more easily, quickly, and safely using this approach.Rabl C et al[48]discovered that there were no significant damage to the intestines or abdominal vessels. In 50% of instances, prior abdominal surgeries were performed. Three patients suffered from trocar-related injuries: two had superficial mesenteric lacerations, and one had a larger omentum artery laceration. Patients who are severely obese can safely enter the peritoneal cavity using the direct

initial trocar insertion approach.Bernante P et al[49]claimed that no signs of vascular damage during the first trocar implantation were seen. At the time of first trocar implantation, there was no indication of organ or hollow viscus damage. Every patient had a successful first trocar implantation. Trocar insertion averaged 20 seconds, with BMI having no effect on timing.They said that morbidly obese individuals might safely undergo their method of accessing the abdominal cavity using a bladed OT without first undergoing abdominal insufflation.

In another study, Sabeti N et al[52] reported that their set of patients included four vascular injuries (0.18%). Three needed vascular repair and conversion to laparotomy, and one was treated lapally. Every injury happened when the player was off-midline. There were no deaths as a result of using the OT. The current research is the largest volume series describing the safe and efficient use of OT with blades as the main peritoneal access technique in morbidly obese patients without prior insufflation. This device's midline insertion seems to be a secure entrance point. Tanaka C et al[56] reported that OT access group required much less time for trocar insertion than the open group. An unskilled surgeon was the single risk factor for a prolonged duration of time for the first trocar insertion utilizing the OT access, according to the multivariable analysis. They asserted that in lap gastrointestinal surgery, OT access can be advised for the initial trocar insertion.Ciravolo G et al[58]observed that the patients' average age was 40.6 years. 22.1 kg/m2 was the mean BMI. The rate of complications was 0.31% overall. A single stomach hole, two ileal perforations, and one blood vascular perforation were among the major consequences. Initial access was obtained through the omentum for twelve surgeries, and two were obtained through an ovarian cyst. Because the OT was unable to enter the abdominal cavity in five operations, a laparotomy was necessary. The percentage of problems that required further intervention was 0.12%. They asserted that a viable lap entrance method with less risks is the optical gasless trocar.

George R et al[60]assessed MHT's ability to produce NP. The most frequent indication was correction of an inguinal hernia. Two minutes was the average admission time. Port site seroma (0.6%) and port site infection (0.6%) were among the surgical consequences. Both issues were discovered at the umbilical port and after appendicular perforation surgery. Preperitoneal port placement, intraabdominal damage, port site hematoma, and port site hernia were not seen. The research group did not experience any mortality. They came to the conclusion that MHT is a rapid and safe abdominal entry method.

However, Majeed FA et al[64]assessed the lap port access safety profile of Hasson's method in LC patients. The patients' average age, they discovered, was 44.7 years. Because to the existence of inflamatoryadhesions and access, the operation was straightforward in 63.2% of the 1037 patients and complicated in 36.8% of them. There was no gut perforation, vascular damage, omental damage, or intra-abdominal damage. 0.57% of patients received a port-site infection diagnosis during the six-month follow-up. In just 0.09% of patients, an umbilical hernia was identified. They discovered that the first lap port access method, known as the Hasson technique, was a safe method with few access-related difficulties for creating a pneumoperitoneum.Coskun M et al[65]sought to determine if employing a bladeless OT for abdominal entry in individuals who are severely obese is safe and feasible without causing pneumoperitoneum. In the first five patients, the Veress needle access did not work. All patients, including the first five, had successful first access utilizing a bladeless OT that did not cause pneumoperitoneum. Insufflation and trocar insertion took an average of 58 seconds after the skin incision. Two individuals experienced omental damage as a result of trocar implantation. No further issues arose. No patient had any facial defect closures done. Roux-en-Y gastric bypass and sleeve gastrectomy had mean operating times of 203 and 76 minutes, respectively. There were no trocar site hernias over the 24-month

follow-up period. They asserted that in patients who are very obese, first abdominal access with a bladeless OT that does not create pneumoperitoneum is a realistic, quick, safe, and efficient technique.

In consistent with this study, Datey A et al[69]claimed that the incidence of vascular injuries, visceral injuries, and other post-op sequelae was comparable in the groups who had trocar and Veress needle insertion. The failure rates of the two approaches did not differ much, according to the current study. According to their claims, both methods are equally safe, effective, and practical for creating pneumoperitoneum during lap procedures.Sharp HT et al[72]examined the quantity and kind of severe issues related to optical-access trocars. According to them, there have only been two significant side effects from the use of optical-access trocars documented in the medical literature. Nevertheless, there have been reports of 79 major issues with these methods. These include three liver lacerations, one stomach perforation, 18 intestine perforations, 20 cases of severe bleeding from different locations, and 37 serious arterial injuries affecting the aorta, vena cava, or iliac arteries. Four of these issues led to the death of the patient. They came to the conclusion that even while optical-access trocars can see tissue layers during insertion, they could be linked to serious damage.

CONCLUSION

CONCLUSION

In this study both OT group and modified Hasson's group were comparable in age, gender, BMI, ASA class and lap surgical procedures without any remarkable difference.

Notably, the time taken for peritoneal access was significantly lesser in OT group compared to modified Hasson's group (Mean time taken for accessGroup OT - 4.5±1.3min and Group MH - 8.5±2.4min p value - <0.0001).Additionally, the incidence of complications with the optic trocar was remarkably lesser than the incidence of complications in modified Hasson's approach.

However, the rate of conversion from lap to open surgical procedure was similar in open OT group and modified Hasson's group.

We infer that the bladeless OT are safe and efficacious in terms of faster access to peritoneum with lesser complications compared to modified Hasson's approach in lap procedures.

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