

COMPARATIVE EVALUATION OF TRANSUMBILICAL AND INFRAUMBILICAL 5 MM BLIND TROCAR INSERTION FOR CAMERA PORT IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

BACKGROUND

Transumbilical 10 mm camera port insertion through the umbilical fossa is enthusiastically practiced for laparoscopic cholecystectomy throughout the world considering its advantages of hidden scar and better cosmetic outcome. Direct trocar insertion and Veress needle insufflation are very commonly used for first trocar insertion. In the present study, we have compared the clinical outcome of transumbilical versus infraumbilical approach by a 5 mm camera port instead of the traditional 10 mm, by direct trocar method in 3 port laparoscopic cholecystectomy.

METHODS

A randomised prospective study was conducted in a unit in Department of General Surgery, Government Medical College and Hospital, Chandigarh, India. A modified method was performed on 200 patients with 100 patients each in transumbilical and infraumbilical group from January 2017 to April 2018 with 3 months of follow up.

RESULTS

In the study, it was found that the transumbilical approach for creation of pneumoperitoneum by direct trocar with 5mm camera port had statistically better results than the infraumbilical approach in terms of the time required for the successful start of creation of pneumoperitoneum, number of attempts and better cosmesis and therefore transumbilical approach is an effective alternative to infraumbilical approach for using 5 mm camera port by direct technique for creation of pneumoperitoneum.

CONCLUSIONS

Following strict aseptic technique and decreasing the size of the camera port to 5 mm, transumbilical is a promising better alternative method for first trocar entry with no increased risk of port-site infection or a hernia and with the added advantage of better cosmetic outcome and patient satisfaction.

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BACKGROUND

We live in an era of minimally invasive surgery which is both desired by the patient and welcomed by the health care providers as out-turn of miniaturization of instruments, and improved affordability. The widespread approval and integration of laparoscopic surgery is especially attributed to advantages like decreased post-operative pain, hospital stay, improved patient pain score and early return to work.¹ Laparoscopic cholecystectomy has now become the gold standard for the gallstone disease.

The aim of minimal tissue trauma and the invasiveness of the minimally invasive surgery can further be improvised by reducing the number and size of the trocars and camera port from 10 mm to 5 mm. (Figure-1, 2) The various port site complications can be attributed to the size of the port and tissue handling. The entry into the peritoneal cavity in laparoscopic cholecystectomy by smaller port size does not require sheath closure and are cosmetically more satisfying.²

Many randomized and non-randomized clinical trials from all over the world have interpreted that the reduction in the size of trocar reduces traumatic stress, pigmentation, enhances full recovery of the wound, requirement of postoperative analgesia, port site complications, better cosmetic results, and good acceptance among different patient groups.^{3,4} The various reported port site complications are infection, pyoderma gangrenosum, hernia, foreign body granuloma formation and hypertrophic scar.⁵

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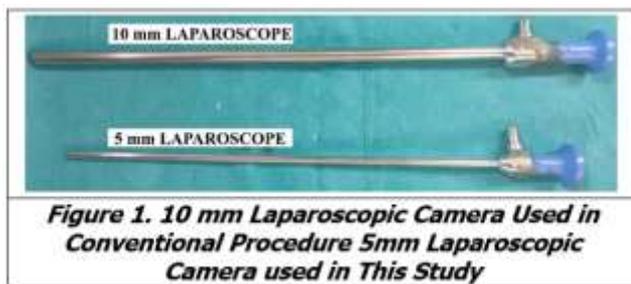


Figure 1. 10 mm Laparoscopic Camera Used in Conventional Procedure 5mm Laparoscopic Camera used in This Study

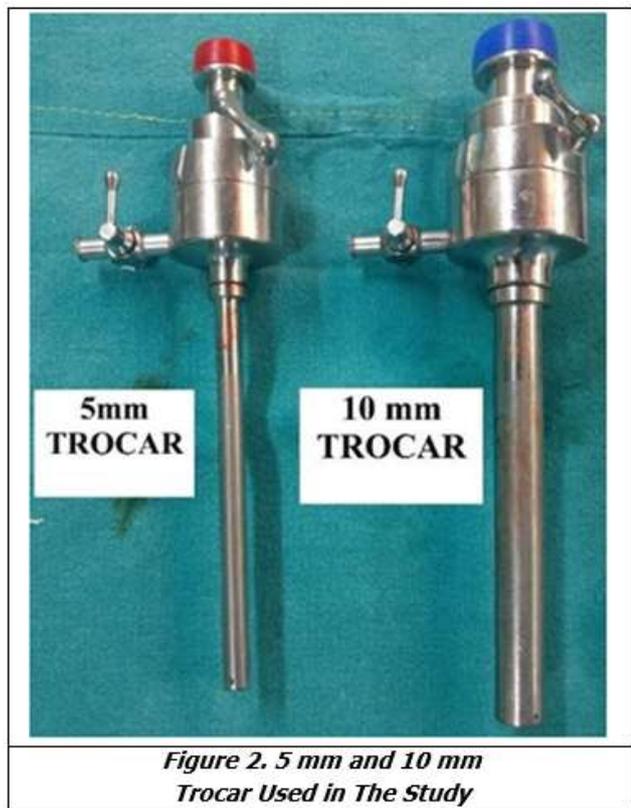


Figure 2. 5 mm and 10 mm Trocar Used in The Study

The most critical and conceivably dangerous first step in laparoscopy is a safe and successful insertion of the primary port without causing intrabdominal injuries and locoregional port site complications. The laparoscopic camera port insertion is achieved after the creation of pneumoperitoneum through the supraumbilical, infraumbilical, transumbilical or Palmer's point by various techniques like Veress needle insertion, open laparoscopy (Hassan's technique) or direct trocar insertion.¹ (Figure-3) There is no evidence as to the optimum camera port insertion site. The camera port site entry affiliated difficulties faced during the placement of the first trocar are bleeding, failed attempts in obese patients, subcutaneous emphysema, leaking port in open technique, port displacement, omentum entrapment, nerve injury.⁶

The incision for camera port insertion was antecedently described in the infraumbilical or supraumbilical site. Transumbilical port insertion through the umbilical fossa has also been advocated. While knowing the anatomy of the umbilicus, technical advantages include comparative ease, successful entry in the very first attempt, less force required even in obese patients for entry into the abdominal cavity, the procedure being comparatively bloodless and patient

satisfaction due to invisible scar.² However, there was apprehension that transumbilical peritoneal entry adds to the risk of developing a wound infection and port site hernia and hence previously this route has been avoided by the surgeons for camera port insertion.

Today, an increasing number of reports are available demonstrating the advantages of transumbilical camera port insertion site for laparoscopy surgery without significantly increasing the risk of infections and port site herniation. If attention is given to cleaning, hemostasis, and proper closure, the infection and port site hernia rates are only 0.4% and 0% respectively without compromising the procedure safety with no visible scar and better cosmetic results.⁷ Even though any modification of the conventional procedure is adopted, the surgeons must always strike a balance between patient and procedure safety and technical changes. Keeping in view the distinct theoretical advantages of smaller size trocar and transumbilical site direct trocar entry, in the present study we have compared the clinical outcome of transumbilical versus infraumbilical approach by a 5 mm camera port in LC.

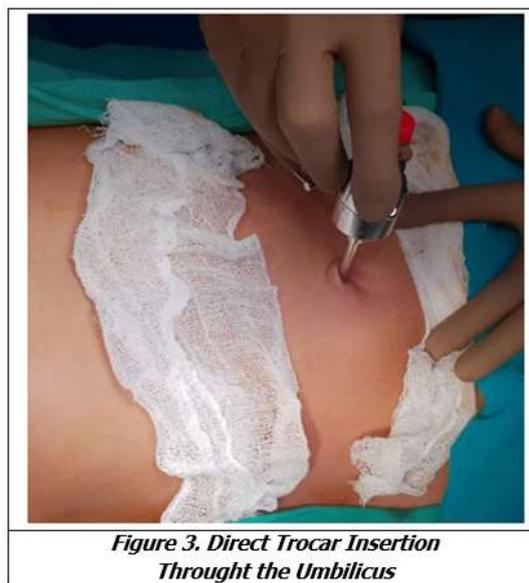


Figure 3. Direct Trocar Insertion Through the Umbilicus



Figure 4. Infraumbilical Incision with a Surgical Clip

METHODS

This prospective randomised study has been carried out in the Department of General Surgery in a unit at Government Medical College and Hospital 32, Chandigarh. The patients undergoing laparoscopic cholecystectomy for gallstone disease during the study period in the Department of General Surgery in a unit have been included. All patients have been monitored for 5 mm camera port outcomes by two approaches postoperatively. Those with the past history of open abdominal surgery and those who have been converted to open procedure and requiring more than 3 attempts for trocar insertion have been excluded from the study.

Technique

After meticulous cleaning of the umbilicus with 10% povidone, the central axle /apex of the umbilicus was incised with an 11 No. straight blade after retraction of the umbilical folds. The anterior abdominal wall was lifted with the hands both above and below the umbilicus and 5 mm trocar was inserted blindly. (Figure-3) The superior or inferior umbilical folds were not lifted by towel clips or any other traumatic forceps as described in other studies/literature.⁸ Location was confirmed visually with the laparoscope. All laparoscopic cholecystectomies were performed with 5 mm camera port. (Figure 1)



Figure 5. Transumbilical Incision

A working 10 mm trocar is inserted in the epigastrium and a 5 mm port along the right anterior axillary line between 12th rib and the iliac crest in the right lower abdomen for holding the gallbladder is also inserted. Following the procedure, the umbilical fascia was not closed. The skin was sealed with antiseptic dressing pack without suturing and a single clip was applied in cases of infraumbilical approach. (Figure- 4, 5) The specimen in all the patients was removed through the epigastric port. All patients were given post-operative analgesia (diclofenac sodium, intravenous injection) every 8 hourly for first 24 hours. Any extra analgesic requirement was noted. Then, the patients were discharged on analgesic in the form of tablet Diclofenac 50 mg SOS and a course of antibiotic. All patients were given proton pump inhibitors intravenously pre and postoperatively. Reusable 5 mm ports were used in

all the cases. All the cases were operated by a single consultant. No fascial closure was done at 5 mm camera port insertion site through the umbilicus.

RESULTS

Patients were of the age ranging from 22 to 79 years with most being between 41 to 50 years. Almost all of the patients belonged to the Indo-Gangetic belt of the Indian subcontinent. The total number of female patients with cholelithiasis in the study were 142 and 58 were male patients. In our study, a total of 21 patients were obese with 7 patients in transumbilical and 14 in the infraumbilical category.

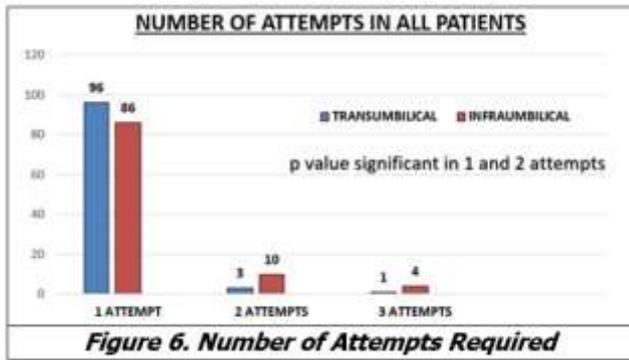
In 182 (91%) patients only one attempt was required for successful insertion of the first trocar to create pneumoperitoneum. Rest 18 (9%) patients required more than one attempt of which 13 (6.5%) patients required 2 attempts with 3 in the transumbilical category and 10 in infraumbilical and 3 attempts in 1 and 4 patients respectively in the transumbilical and infraumbilical category. Patients requiring 3 attempts form about 2.5% of all the 200 cases i.e. 5 of 200. The p value for single and 2 attempts is 0.013 and 0.045 respectively for the two groups which is significant. So, transumbilical approach led to requirement of a smaller number of attempts for performing the surgery. (Figure 6)

15 of the 21 total obese patients had >1 attempt for the insertion for the first trocar. In the infraumbilical group of the 10 patients who had 2 attempts, 8 were obese and two were with normal BMI. In the transumbilical group, 2 obese patients required 2 attempts and the other had normal BMI. In the infraumbilical group of the 4 patients who required 3 attempts, all were obese with a BMI of more than 30 kg/m². In the transumbilical group, 1 obese patient required 3 attempts.

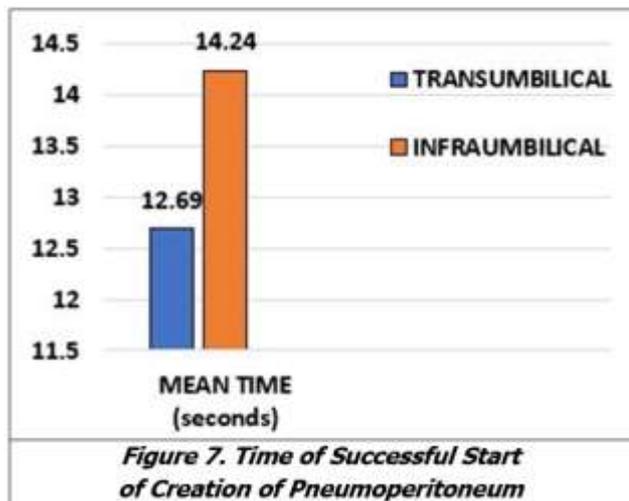
The mean time for the successful start of the creation of pneumoperitoneum overall in 200 patients was 13.46 seconds which is starting from giving an incision in the abdomen for trocar insertion to proper positioning in the peritoneum and starting insufflation of CO₂. The time of successful start of the creation of pneumoperitoneum was more in the infraumbilical group (mean- 14.24 seconds) than the transumbilical (mean-12.69 seconds) and was found to be significant (p=0.039). (Figure 7)

The two groups were similar in patients having intraoperative gallbladder rupture and bile spillage, postoperative pain score at time of discharge, after 8 days and after 3 months on follow up, analgesic requirement, postoperative vomiting, antiemetic requirement, time to resume feeding the mean duration of surgery which was 34.24 minutes with the range being from 14 minutes to 90 minutes overall in all the cases.

A single surgical clip was applied at the infraumbilical site in all the participating patients. A small betadine gauze was all that was used at the transumbilical site with no clip application. Only 1 patient in the transumbilical category had a minor ooze from the wound which stopped by applying a clip after the surgery.



None of the patients had any complications like infection, subcutaneous emphysema, leaking port, loss of port position, hernia, necrosis, gas embolism, necrosis, granuloma, hematoma, hypertrophic scar and injury to internal abdominal organs at the first laparoscopic trocar insertion site.



DISCUSSION

Now-a-days, due to increasing awareness about the various treatment and surgical modalities, the patients are increasingly sensitive to the size and site of the incisions created in the laparoscopic cholecystectomy due to the cosmetic consequences. With the introduction of the minimal access surgery, the addition of the laparoscopic techniques to the surgical armamentarium and the growing exposure of "medical evidence", the techniques of the laparoscopic surgeries are changing as per experience and expertise of the individual surgeon. To transpose into surgical practice, for a new surgical method, in general, it is mandatory that it must be safe, reproducible, and cost-effective and above all be a benefit for the patient. For it to enter into the daily surgical repertory, it must also be endorsed and preferred by both surgeons and patients alike. It must be equivalent or better than the gold standard LC.

By reducing the port number and size i.e. from 10 mm to 5 mm or from 5 mm to 3 or 2 mm, the advantages are that the wounds heal leaving imperceptible scars, reduced postoperative analgesic use, potentially reduced risk of trocar hernias, lower incidence of wound complications, a

smaller sheath that makes the introduction smooth and effortless decreasing the risk of intraabdominal lesions, with a high satisfaction rate and possibly a faster recovery.^{9,10}

The umbilicus is an embryonic natural orifice and a scar itself; it conceals the intraabdominal entry point for surgical procedures minimizing the skin incision morbidities with the procedure remaining same as traditional laparoscopic surgery. The mechanical properties of the umbilicus are sustained due to the increasing strength of umbilical fascia and the attachment of falciform ligament behind the umbilical ring.¹¹ The peritoneum is firmly attached to the base of the umbilicus. Therefore, for obtaining passage through the umbilical ring in the older children and adults, the umbilical apex is used.

Transumbilical approach for camera port was not very much favoured owing to the risks of infection and hernia but at the same time it was advocated to have a better cosmetic outcome and has been used in almost all disciplines of all the various surgical fields gynecological, urological, bariatric surgeries mostly by open technique using 10 mm camera port.^{12,13} Using precautions for proper sterilization before the incision and reducing the size of the trocar for camera port i.e. 5 mm trocar from 10 mm it is possible to reduce the risk of umbilical port site infection and hernia.¹⁴ The advantage of safe insertion of the first trocar was thus combined with a cosmetically impeccable placement of the scar.

The modification of the reduction of the 10 mm camera port used through the umbilicus to 5 mm in this study has been mentioned as "5-10-5" in the literature.¹⁵

The present study suggests that the overall outcome of laparoscopic cholecystectomy in both the groups are comparable. However, blind insertion of 5 mm camera port through transumbilical approach is technically easy, requires less number of attempts and lesser time to start successful creation of pneumoperitoneum with the advantage of cosmetically impeccable scar inside the umbilicus and higher patient satisfaction.

Study Strength

1. This study is a single-blinded randomized prospective study eliminating selection bias.
2. The participating patients had to incur no extra amount of money for opting the procedure as the instruments were reusable.
3. There is a balanced proportion of male and female patients in both groups.

Study Weakness

Wound remodeling occurs even at one year after surgery. Studies should follow participants for at least one year if cosmesis is assessed.¹⁶

CONCLUSION

In experienced hands, laparoscopic cholecystectomy by a 5 mm camera through a 5 mm transumbilical port using the direct trocar method for creation of pneumoperitoneum is an equally safe and technically easier option along with

additional advantages of a smaller incision, requiring a lesser number of attempts and lesser time to start pneumoinsufflation.

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