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Original Research Article

Direct trocar access: a safe method to create pneumo peritoneum, experience from GI and minimal access surgery unit, RIMS, Imphal

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ABSTRACT

Background: The establishment of pneumoperitoneum is a prerequisite for all laparoscopic surgeries. The standard techniques of creating pneumoperitoneum are open and closed technique. Recent studies showed, complications associated with Veress needle insufflation such as gas embolism, sub cutaneous emphysema etc. Hasson's method has shown to minimise vascular injuries but doesn't reduce bowel injuries along with gas leak and port instability. The present study was conducted to assess the safety and efficacy of direct trocar insertion in patients undergoing elective laparoscopic procedures.
Methods: The present study was conducted prospectively on 476 patients undergone various laparoscopic abdominal procedures using direct trocar access to create pneumo peritoneum during a period from May 2014 to July 2017 in unit 1 of Department of Surgery, RIMS, Imphal, India.
Results: All patients age varying from 14 to 70 years are included. The average time taken from skin incision to create pneumoperitoneum was 1 mt. However, author is unable to use this technique in 4 patients having central obesity and switched on to conventional Veress needle for creating pneumoperitoneum. No injuries to bowel, vessels and other insufflation related complication were encountered.
Conclusions: No technical difficulty was encountered while inserting trocar directly. No intra-abdominal injuries of bowel, mesentery or vessel were detected. Intra operatively all patients were found to be stable hemodynamically. Post-operatively and on follow up no port site complication such as infection, granuloma formation, induration and herniation were encountered.

Keywords: Direct trocar insertion, Laparoscopy procedure, Open technique, Pneumoperitoneum, Veress needle

INTRODUCTION

The establishment of pneumoperitoneum is a pre-requisite for most laparoscopic surgeries and the method used is not necessarily dependent on the procedure for which it is intended. Access is associated with injuries to the gastrointestinal tract and major blood vessels and at least 50% of these major complications occur prior to commencement of the intended surgery. This complication rate has remained the same during the past 25 years.[1,2] The number of vascular injuries in laparoscopy is 2 in 10,000 procedures and a serious complication associated with mortality occurs in 3.3 per 1,00,000.[3,4] Rapid advances in laparoscopic surgery have made it an invaluable part of general surgery, but there remains no clear consensus as an on optimal method of entry into the peritoneal cavity. Techniques for the creation of pneumoperitoneum at laparoscopy include the standard technique of insufflation after insertion of the veress needle (closed method), open laparoscopy (Hasson

technique, direct trocar insertion) as well as variations of these techniques.[5-8] The predominant method is the closed technique. This technique may have the potential for visceral and vascular injury due to its blind insertion of veress needle and trocars. In 1971, Hasson introduced the concept of open laparoscopy to eliminate the risks associated with blind insertion of the veress needle and trocar. Recent studies have shown complications associated with veress needle technique include gas embolism, sub cutaneous emphysema, failed pneumo-peritoneum with resultant failed laparoscopy and bowel and visceral insufflation. Hasson's method has advantage of minimizing vascular injuries but complications like gas leak, port instability, bowel insufflation still encountered.

Direct trocar insertion (DTI) technique was first introduced by Dingfielder in 1971. Adequate abdominal wall relaxation, proper skin insertion, use of sharp trocar is the pre-requisite for a successful DTI. Recent literatures are showing direct trocar insertion is a safe alternative to conventional approaches to create pneumoperitoneum, as DTI is associated with fewer insufflation related complications and less operating time.[9-13] The present study was conducted to assess the safety and efficacy of direct trocar insertion in patients undergoing elective laparoscopic procedures.

METHODS

A prospective cross-sectional study of 476 patients who underwent operative laparoscopy from May 2014 to July 2017 in Unit 1, Department of Surgery, RIMS, Imphal, India was performed. The team of surgeons performing these techniques were highly experienced, advanced laparoscopic surgeons operating with residents and fellows in endoscopic surgery.

Inclusion criteria includes patients of age 14 to 70 years and undergoing various elective laparoscopic inter-ventions.

Exclusion criteria includes patients of age <14 and >70 years, pregnancy and emergency surgeries.

Technique of Direct trocar insertion

All study subjects were placed in the laparoscopic surgery position. Operating table was lowered at or below the level of surgeon's waist. After institution of adequate General anesthesia for relaxation of lower abdomen, patient was kept in reverse Trendelenburg position followed that left lateral position. A 10-12 mm skin incision was made horizontal at the level of umbilicus, infraumblical or supra umbilical wide enough for trocar to be inserted without undue resistance from the skin. Care was taken to make the incision length slightly greater than the diameter of trocar, and all the layers of skin are cut down to peritoneum through entire length of the incision. The lower abdominal wall was lifted by left hand grasping between the umbilicus and pubic symphysis and elevated with moving the skin upward.

With elevated abdominal wall tip of 10 mm trocar was freely inserted through the incision at a 45-60 degree angle and advanced in a controlled manner into the abdomen into the peritoneal cavity with a twisting semi-circular motion. Surgeon holds the trocar with his index finger positioned 3-4 cm away from the trocar tip to guard against sudden uncontrolled entry into the abdomen. In contrast to Veress needle insertion, where one can feel the penetration through the fascia and peritoneum separately a distinct single "Click" on entering/piercing sheath and peritoneum was being felt with palm of right hand which signifies that trocar has pierced the fascia and peritoneum. These simple steps allow easier introduction of trocar with minimum force and maximum control. The laparoscope was then introduced, proper intraperitoneal placement ascertained, and a pneumo-peritoneum created with gradual increase of CO_2 insufflations. The CO_2 stopcock was left open so as to relieve the negative intra-abdominal pressure caused by the abdominal wall elevation and allow apposed viscera to fall back. The underlying structures are then examined carefully for injury.[14-18] In all the study subject's skin incision, adequate wall relaxation and use of sharp trocar was done (Figure 1-6).

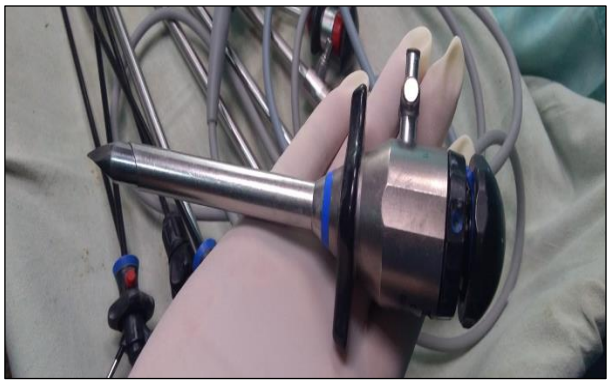

Figure 1: Sharp trocar with cannula.

Figure 2: Infra umbilical Incision for port site creation.

Figure 3: Direct trocar entry after lifting up of abdominal wall.

Figure 4: Trocar in situ with CO_2 insufflation.

Figure 5: Gradual increasing of CO_2 insufflation pressure.

Figure 6: Port site (post-operative).

RESULTS

The study has been carried out in 476 patients after using exclusion criteria. All patients, age varying from 14-70 years studied and majority of them were females (Figure 7).

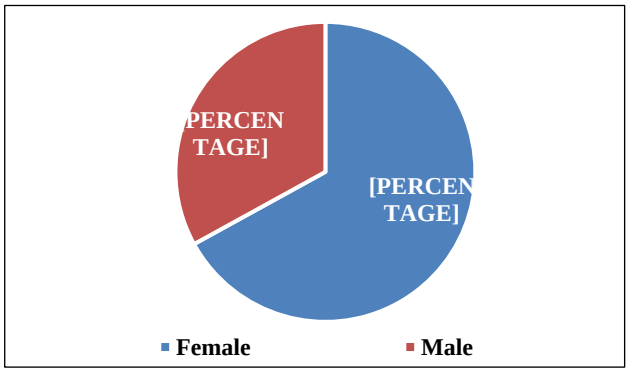

Figure 7: Male to female distribution.

Procedures done were laparoscopic cholecystectomy, lap chole+ovarian cyst excision, laparoscopic appendicectomy, lap chole+de roofing of liver cyst, laparoscopic hernia repair, lap chole+choledocho-duodenal fistulectomy (mirizzi syndrome type v) and diagnostic laparoscopy.

The patients included in this study had undergone previous abdominal surgeries like caesarean section, appendicectomy, exploratory midline laparotomy, and splenectomy. The average time taken from skin incision to create pneumoperitoneum was 55±10 sec. However, author was unable to use this technique in 5 patients having central obesity and previous operative scar and switched on to conventional Veress needle for creating pneumoperitoneum.

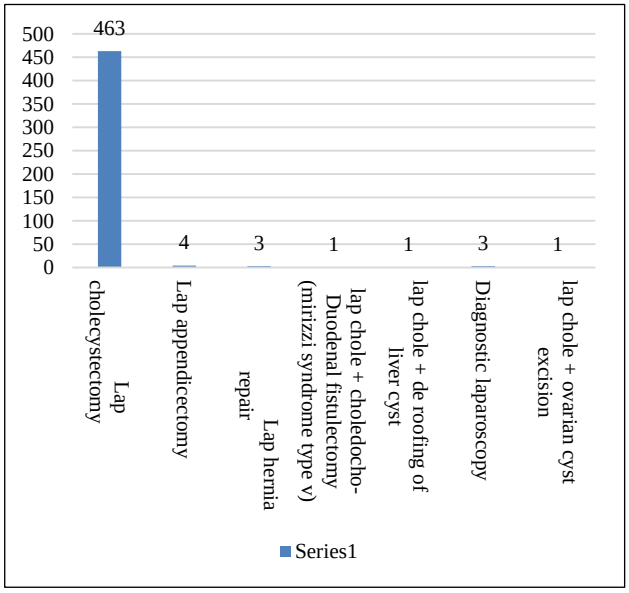

Figure 8: Different type of procedure done.

The average operative time was 35±10 min in case of surgeries without intra operative complications. There were 8 cases, which converted to open procedures due to intra operative complications and previous surgical scar.

No intra-abdominal injuries of bowel, mesentery or vessel were detected. Intra operatively all patients were found to be stable hemodynamically. Post operatively and on follow up no port site complication such as infection, granuloma formation, induration and herniation were encountered (Table 1 and 2). The post-operative stay in hospital was 2 days ±1 day.

Table 1: Complications while creating pneumoperitoneum.

Complications	No. of cases (476)
Technical difficulties	5
Injury to vessels and bowels	0
Subcutaneous emphysema	0
Gas embolism	0
Port site gas leak	0

Table 2: Post-operative complication related to port site.

Post-operative complications	No. of patients (476)
Port site granuloma	0
Port site infection	0
Port site induration	0
Port site herniation	0

DISCUSSION

Over the past 50 years, many techniques, technologies and guidelines have been introduced to eliminate the risks associated with laparoscopic entry. No single technique or instrument has been proved to eliminate laparoscopic entry associated injury. The Basic techniques are used to create pneumoperitoneum are closed Veress needle technique, open Hasson technique, direct trocar insertion and optical trocar insertion. Traditional closed method of pneumoperitoneum involves initial blind entry into abdomen, and more than half of such injuries are related to this primary blind access and occur before the start of actual anatomic dissection. To prevent these complications other methods were introduced in practice like open technique as devised by Harrith Hasson, direct trocar insertion, optical trocars, radically expending trocars and use of disposable shielded trocars.[19-23]

The DTI technique was first reported by Dingfelder in 1978 and later described by Copeland et al, in 1983. Direct trocar insertion without previous pneumo-peritoneum has been shown before to be a safe and effective method associated with fewer complications. Vascular and visceral injuries were the main focus while creating pneumoperitoneum with different approaches. Champault et al, described an incidence of vascular injuries of 0.04% and visceral injuries of 0.06% in more than 100000 patients using the Veress technique. A randomized controlled trial comparing blind versus open approach requires 10000 patients in each group to detect a difference in serious complications and such a study does not exist. Guidelines from the European Association for Endoscopic Surgery concluded that available data does not favor the use of either technique. However, they agree that major vascular injuries most often occur with the Veress approach.

The study conducted by Hurd et al, demonstrated modification of the Hasson technique without using special instruments, but gas leakage in 14% and an access time of 3 min vs 3.8 min using Veress technique. A study from Alexandra hospital, London also concluded that, there is no major associated complications and very high feasibility (99.5%) in the case of DTI technique. DTI has statistically significantly lower incidence of bowel injury as compared to the technique (1.9/1000 for V.N. 1.5/1000 for open and 0.3/1000 for D.T.I). Direct trocar entry is only one blind cutting manoeuvre in D.T.I. as against that of veress needle: two blind entries with one intervening blind insufflation, insufflation and trocar insertion. Another benefit of D.T.I. is that it takes less time to establish pneumoperitoneum. Prieto et al, reported a laparoscopic insertion time that was significantly different between two techniques (D.T.I. 1.5±0.5 versus V.N. 3.0±0.4 minutes <0.001).[24-26] Comparison of time taken for creating pneumoperitoneum has been described in Table 3.

Table 3: Comparison of present study with other studies.

Study	Access time for DTI	Access time for VN insertion
Present study	50±10 sec	
Borgotta L et al[20]	2 min	2.2 min
Angoli r et al	2.69 min	3.54 min
Tariq et al	4±1 min	5±1 min
Byron JW et al[21]	4.2±1.3	5.9±2.2

This study on direct trocar insertion for creating pneumoperitoneum for 476 laparoscopic surgeries was conducted prospectively in unit 1 of the department of surgery RIMS Imphal from May 2014 to July 2017, and assessed on its accessibility, time to create desired level of pneumo peritoneum, intra-abdominal injuries of vessels and bowels, hemodynamic stability of the patients, post-operative and long-term complications of patients.

Author have found in this study that, author could create desired level of pneumo peritoneum in 50±10 secs in contrast to 3-5 mins in other techniques such as veress needle, Hasson's etc. No technical difficulty was encountered while inserting trocar directly by infra or supra umbilically after lifting the abdominal wall except in five patients having central obesity of abdomen and

previous operative scar. Author have switched to veress needle technique in this patient. No intra-abdominal injuries of bowel, mesentery or vessel were detected. Intra operatively all patients were found to be stable hemodynamically. Post operatively and on follow up no port site complication such as infection, granuloma formation, induration and herniation were encountered. The present study was conducted to assess the safety and efficacy of direct trocar insertion technique. Author findings were consistent with those from the literature with no major complications

CONCLUSION

Auhtor concluded that direct trocar insertion to establish for initial access in laparoscopic surgery is safe, fast, efficacious and provides quick entry into peritoneal cavity without prior pneumoperitoneum. It has very high feasibility rate and was found to be free of major complications. DTI is underutilized and safe alternative to VN and open entry technique.

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