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Original Research Article

Trans umbilical first trocar access during laparoscopic surgery

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ABSTRACT

Background: In order to perform laparoscopic procedures, it is necessary to first access the peritoneal cavity and establish carbon dioxide pneumoperitoneum. The placement of the first trocar remains a critical step in laparoscopic surgery. In order to minimize complications associated with placement of first trocar, several techniques have been reported. Author describe a surgical technique that provides a quick, safe, and reliable initial access to the peritoneal cavity with its excellent functional and cosmetic results.
Methods: Retrospective study of patients who underwent various laparoscopic procedures at Maxx lyfe Hospital, Bathindi, Jammu was carried out by the closed technique for initial access to the peritoneal cavity through the umbilicus from July 2016 to May 2019. In this study, patients who had a prior midline laparotomy with involvement of the umbilicus were excluded.
Results: Authors analyzed 456 patients (M = 190; F = 266) in the study period. Average age of the patients was 32 years (range:12-86). A physiologic defect was identified in the umbilical region in all patients who had no history of previous abdominal surgery in that region. The average time to access the peritoneal cavity was 30 seconds (range: 20-50).
Conclusions: This technique is quick, safe, reliable, simple, and easy to learn and easy to perform. It is associated with no mortality and minimal morbidity and has excellent cosmetic results. Based on authors experience, authors believe that this method provides surgeons with an effective and safe way to insert the first trocar and recommend it as a routine procedure to access the peritoneal cavity for abdominal laparoscopic surgery.

Keywords: Closed technique, Laparoscopy, Pneumoperitoneum, Port, Umbilicus, Veress needle

INTRODUCTION

In minimally invasive surgery, safe access to the peritoneal cavity is the first step towards a successful laparoscopic procedure. One of the most critical moments of the laparoscopic approach is the access to the peritoneal cavity.[1] The most common cause of stressful surgery is wrong port position and the dreadful complications that may occur during the insertion of the first trocar are vascular and intestinal injuries.[2,3] The risk of complications when entering the abdominal cavity increases with a history of previous abdominal operations. Among the various techniques for introducing the first trocar to achieve carbon dioxide pneumoperitoneum, two common methods are usually performed.[1-4] The first, also called the closed technique, requires the Veress needle, which is inserted in the abdominal cavity for carbon dioxide (CO_2) insufflation followed by blind introduction of the first trocar. The second, also called open technique was first described by Hasson.[5]

This technique begins with a small incision at the umbilical site and subsequently, all layers of the abdominal wall are incised. The first trocar is then inserted under direct vision followed by gas insufflation. [6-8]

Despite the associated risks, the closed technique is still one of the most popular ways to achieve access to the peritoneal cavity.[9-11] Authors also prefer the closed technique for primary access through the Umbilicus. This is mainly because the open technique requires more time to perform and there is an increased risk of gas leakage through incision and has the similar incidence of complications as with the closed method of insertion.[12] The central location and ability of the umbilicus to camouflage scars make it an attractive primary trocar site for laparoscopic surgery.

Umbilicus is a naturally weak area due to absence of all the layers and its weakness is also due to its location at the midpoint of the greatest diameter of the abdomen. Initially, there was controversy regarding use of umbilicus for first port access. First concern was regarding infection. Umbilicus is a naturally dirty area and many surgeons were having the impression that it may cause infection of the port site. The umbilical skin cannot be cleaned of all bacteria even with the most potent antiseptic solutions.

Second fear of using umbilicus was ventral hernia as it is the weakest area of abdominal wall. Due to the fear of these two possible complications of using umbilicus for primary access, many surgeons started using supra-umbilical or infra-umbilical region of the abdominal wall for primary access instead of going through the umbilicus.

This study has proved that umbilicus does not have increased incidence of infection or ventral hernia as compared to other sites if few precautions are taken. Authors feel that the trans umbilical approach, which they have been using for almost three years, is simple, safe and effective alternative. The aim of this paper is to report the result of this experience in the routine use of the laparoscopic trans umbilical approach for the primary access to the peritoneal cavity.

METHODS

This study includes retrospective analysis of 456 patients operated at Maxx Lyfe Hospital, Bathindi, Jammu from July 2016 to May 2019 by the laparoscopic technique using trans umbilical first port access to the peritoneal cavity. Exclusion criteria were patients who had undergone midline laparotomy with distortion of the anatomy of the umbilicus.

Various parameters like patient demographics, characteristics of their operation, post-operative complications, time to access the peritoneal cavity, date of discharge from the hospital and date of last follow up visit were recorded.

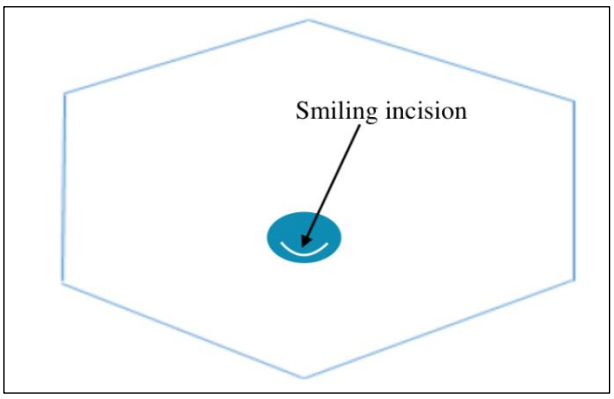

Figure 1: Smiling incision made over inferior crease in umbilicus.

Technique

All the patients in the study were administered general anesthesia and placed in supine position. As a routine, umbilicus was cleaned thoroughly with the spirit and 10% Povidone iodine lotion before incision. In non-obese patients, inferior crease of umbilicus is the best site of making the incision. This is called as smiling incision. In obese patients, trans umbilical incision is preferred because this area has minimum thickness of fat. In obese patients, the veress needle should be inserted perpendicular to the abdominal wall because if oblique entry is tried, the full length of the veress needle will be somewhere within the fat pad and there is chance of creation of pre-peritoneal space making access to peritoneum difficult. Before making incision along the inferior crease of umbilicus, it should be stabilized with the help of ellis forceps. Once ellis forceps catches the umbilicus, the crease of umbilicus will be everted, and it is easy to give smiling incision. Initially 1 mm incision should be given with No. 11 blade. Some surgeons give 10 mm incision in the beginning itself, but this is not good because gas may leak from the side of puncture of veress needle due to tear in the rectus and this will interfere with the Quadro-manometric indicator of carbon dioxide insufflator. Initial stab wound should be given just skin deep and any puncture of rectus or peritoneum should be avoided. The veress needle should be held at an angle of 45 degrees to the body surface by pointing the distal end of the needle towards anus. To prevent creation of pre-peritoneal slip of tip of the veress needle, it is necessary that the needle should be perpendicular to the abdominal wall, but there is a danger of injury of great vessels or bowel. To avoid both the difficulties (creation of pre-peritoneal space and injury to bowel or great vessels), the lower abdominal wall should be lifted in such a way that it should lie at 90 degree angle in relation to the veress needle, but in relation to the body of the patient veress needle will be at an angle of 45 degree pointed towards anus. Lifting of abdominal wall should

be adequate so that the distance of abdominal wall from viscera should increase. If less muscle relaxant is given in muscular patient, sometimes lifting of the abdominal wall becomes difficult. In multipara women patients, lifting lower abdominal wall is very easy. For years many surgeons were using towel clip to elevate the abdominal wall. This technique of lifting abdominal wall was advocated by Johns Hopkins University, but after some time, it was realized that towel clip technique increases the distance of skin from rest of the abdominal wall more than distance of abdominal wall from viscera. Abdominal wall should be held full thickness with the help of thenar, hypothenar and all the four fingers. It is lifted in such a way that angle between veress needle to abdominal wall should be 90 degree and between veress needle and patient should be 45 degree. At the time of entry of veress needle, surgeon can hear and feel two click sounds. The first click sound is due to rectus sheath and second is due to puncture of peritoneum. Anterior and posterior rectus form one sheath at the level of umbilicus so there will be only one click for rectus. Once these two click sounds are felt, surgeon should stop pushing veress needle further inside. After adequate carbon dioxide insufflation through veress needle, a 10 mm blunt tip trocar is inserted through umbilicus blindly into the peritoneal cavity and then telescope introduced and procedure performed. At the end of the procedure, the surgical wound at umbilicus is irrigated with saline solution and the fascia is exposed with small rectangular skin retractors and is closed with interrupted sutures (Using No. 0 vicryl) in a subcuticular fashion.

RESULTS

Authors analyzed 456 patients (M=190; F=266) in the study period (Table 1). Average age of the patients was 32 years (range: 12 to 86). A physiologic defect was identified at the umbilical region in all patients who had no history of previous abdominal operations in that region. The average time to access the peritoneal cavity was 15 seconds (range: 10 to 50 seconds).

Table 1: Demographic data.

Characteristics	No. of patients
Total number of patients	456
Age (years) (mean)	32
Sex ratio (f:m)	1.4: 1
Incidence of small bowel injury	3 (0.65%)
Post-operative port infection	4 (0.87%)
Post-operative herniation	1 (0.21%)
Average time taken to access peritoneum	15 seconds
Average duration of hospital stay	12-24hours

The types of operations performed were laparoscopic cholecystectomy (280 cases), laparoscopic appendectomy (90 cases), laparoscopic Ovarian Cystectomy (70 cases) and laparoscopic inguinal hernioplasties (16 cases). Post-operative complications occurred in 8 patients (1.75%) of which the main complication was small bowel injury which occurred in three patients (0.65%), superficial port site infection in four patients (0.87%) and incisional hernia at the umbilical port site only in one patient (0.21%). There was no major blood vessel injury in our series. In three patients in whom Small bowel got injured while entry of the first trocar through the umbilicus, two gave history of abdominal koch's in the past and one had undergone abdominal hysterectomy by the midline infra-umbilical incision in the past. In all these three cases, loop of small gut was adherent around the umbilical and peri-umbilical region intra-peritoneally and injury was suspected, and they were converted to open surgery and injured bowel repaired by interrupted 000 vicryl sutures and intraperitoneal drain kept and laparotomy wound closed. All the three patients recovered after a stay of 9 days in the hospital. The four patients whom superficial umbilical port infection occurred got recovered in 2 weeks period by local dressings. One patient who developed umbilical port hernia was undertaken for mesh hernioplasty after 12 weeks of laparoscopic surgery. Average hospital stay after laparoscopic surgery was 12-24 hours, though in three cases of iatrogenic small bowel injury, stay exceeded to 9 days in the hospital. All 586 patients recovered and there was no mortality in this series.

DISCUSSION

For more than two decades, laparoscopic surgery has become the most commonly performed procedure in surgery around the world.[1] Many surgeons have surpassed the learning curve for most procedures and therefore, major complications have been reduced significantly. Azevedo et al, in a study of 696,502 patients who underwent a laparoscopic procedure using the closed technique (Veress needle) to enter the abdominal cavity have reported an incidence rate of vascular and visceral injuries of 0.018% and of 0.0024%, respectively.[15] Currently, the closed technique is the preferred technique among most laparoscopic surgeons despite the associated risks.

This is due largely to successful personal experiences and the fact that the open technique has been linked to some technical difficulties such as increased time to access the peritoneal cavity compared to the closed technique and gas leakage through incision.[13-18] In a meta-analysis by Bonjer et al, vascular injuries occurred in 0.083% of patients using the closed technique and in 0.075% of patients using the open technique, while visceral injuries occurred in 0.048% of patients using the closed technique and in 0.0% using the open technique.[19] The meta-analysis showed a tendency to eliminate visceral injuries and reduce the risk of major complications with the open technique. The open technique was described by Hasson in 1971 and was recommended in patients with a previous laparotomy in whom they expected to find adhesions.[3-5,12] The major technical problem encountered

was gas leakage through the incision resulting in modifications and the development of newer techniques derived from the original one.[16-20] Today, trocars have advanced designs; they are equipped with a security system capable of preventing the leakage of gas and the incidental extraction of the trocar.[20] The European Association of Endoscopic Surgery guidelines concluded that there is no available evidence to support any of the two techniques.[1] A recent analysis of 3,000 cases of open vs. closed entry techniques showed that the open technique has better outcomes in terms of major complications, which included failure to create pneumoperitoneum, emphysema extending up to the neck causing dyspnoea, bowel perforation, bladder perforation and mesenteric vascular injury (open vs. closed: 1.33% vs. 0.13, $p < .001$).[20] Authors describe closed trans umbilical technique of primary port insertion using blunt trocar after veress needle puncture and this method provides a fast, secure, safe and effective way of entering abdominal cavity.

The technique uses the umbilicus, a region that had remained unused in this type of procedures for a long time.[21] Some of the advantages of this method are that it does not require a long time to perform, it is safe and effective, and it can be used in many clinical situations like protuberant abdomen in obese patients where entry through umbilicus can be possible using routine length trocar as about 2-2.5 cm distance gets reduced when author enter through umbilicus. In this series, the surgical site infection rate was almost similar (0.87%) to that reported in the literature (0.6%).[22] Although speed of entry into the abdominal cavity was one of the main outcome of the study, Authors showed that this technique is simple to learn and perform, and, once mastered, it can be done safely without causing much complications.[23,24] Lastly, the cosmetic effect of an umbilical incision is believed to be superior, as the scar gets hidden by the umbilicus itself when depressed into its natural position.

CONCLUSION

Umbilicus is an excellent site for primary access to the peritoneal cavity during laparoscopic surgery because it is the site of thinnest abdominal wall with no significant blood vessels resulting into easy and safe access. Trans umbilical access to peritoneal cavity is also cosmetically and ergonomically better. This technique is quick, safe, reliable, simple, and easy to learn.

It is associated with no mortality, minimal morbidity and has excellent cosmetic results. Based on this experience, authors believe that this method provides surgeons with an effective and safe means to insert the first trocar and authors recommend it as a routine procedure to access the peritoneal cavity for abdominal laparoscopic surgery.

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REFERENCES

1. Neudecker J, Sauerland S, Neugebauer E, Bergamaschi R, Bonjer HJ, Cuschieri A, et al. The European Association for Endoscopic Surgery clinical practice guideline on the pneumoperitoneum for laparoscopic surgery. Surgl Endosc. 2002; 16(7):1121-43.
2. Perunovic RM, Scepanovic RP, Stevanovic PD, Ceranic MS. Complications during the establishment of laparoscopic pneumoperitoneum. J Laparoendosc Adv Surg Tech A. 2009;19(1):1-6.
3. Munro MG. Laparoscopic access: complications, technologies, and techniques. Current Opinion in Obstetrics and Gynecology. 2002;14(4): 365-74.
4. Rosen DM, Lam AM, Chapman M, Carlton M, Cario GM. Methods of creating pneumoperitoneum: a review of techniques and complications. Obstetrical and Gynecological Survey. 1998; 53(3):167-74.
5. Hasson HM. A modified instrument and method for laparoscopy. Am J Obst Gynecol. 1971;110(6):886-7.
6. Vilos GA, Ternamian A, Dempster J, Laberge PY, Vilos G, Lefebvre G, et al. Laparoscopic entry: a review of techniques, technologies, and complications. J Obstet Gynecol Can. 2007;29(5):433-65.
7. Inan A, Sen M, Dener C, Bozer M. Comparison of direct trocar and veress needle insertion in the performance of pneumoperitoneum in laparoscopic cholecystectomy. Acta Chirurgica Belgica. 2005; 105(5):515-8.
8. Schäfer M, Lauper M, Krähenbähl L. Trocar and Veress needle injuries during laparoscopy. Surgi Endoscop. 2001;15(3):275-80.
9. Schoonderwoerd L, Swank DJ. The role of optical access trocars in laparoscopic surgery. Surg Technol Int. 2005;14:61-7.
10. String A, Berber E, Foroutani A, Macho JR, Pearl JM, Siperstein AE. Use of the optical access trocar for safe and rapid entry in various laparoscopic procedures. Surg Endosc. 2001;15(6):570-3.
11. Ma L, Sun N, Liu X, Jiao Y, Zhao H, Deng XW. Organ-specific expression of Arabidopsis genome during development. Plant Physiol. 2005;138(1):80-91.
12. Merlin TL, Hiller JE, Maddern GJ, Jamieson GG, Brown AR, Kolbe A. Systematic review of the safety and effectiveness of methods used to establish pneumoperitoneum in laparoscopic surgery. Br J Surg. 2003;90(6):668-79.
13. Ballem RV, Rudomanski J. Techniques of pneumoperitoneum. Surgical laparoscopy & endoscopy. 1993;3(1):42-3.
14. Sadhu S, Jahangir TA, Sarkar S, Dubey SK, Roy MK. Open port placement through the umbilical cicatrix. Indian J Surg. 2009;71(5): 273-5.
15. Azevedo JL, Azevedo OC, Miyahira SA, Miguel GP, Becker OM, Hypólito OH, et al. Injuries caused

by Veress needle insertion for creation of pneumoperitoneum: a systematic literature review. Surg Endosc. 2009;23(7):1428-32.
16. Barwijuk AJ, Jakubiak T, Dziag R. Use of the Hasson technique for creating pneumoperitoneum in laparoscopic surgery. Ginekologiapolska. 2004;75(1):35-8.
17. Lal P, Singh L, Agarwal PN, Kant R. Open port placement of the first laparoscopic port: a safe technique. JSLS. 2004;8(4):364-6.
18. Lal P, Sharma R, Chander J, Ramteke VK. A technique for open trocar placement in laparoscopic surgery using the umbilical cicatrix tube. Surg Endosc. 2002;16(9):1366-70.
19. Bonjer HJ, Hazebroek EJ, Kazemier G, Giuffrida MC, Meijer WS, Lance JF. Open versus closed establishment of pneumoperitoneum in laparoscopic surgery. Br J Surg. 1997;84(5):599-602.
20. Taye M. Open Versus Closed Laparoscopy: Yet an Unresolved Controversy. JCDR. 2016;10(2):QC04.
21. Lal P, Vindal A, Sharma R, Chander J, Ramteke VK. Safety of open technique for first-trocar placement in laparoscopic surgery: a series of 6,000 cases. Surgical Endoscopy. 2012;26(1):182-8.
22. Penfield AJ. How to prevent complications of open laparoscopy. Jo Reprod Med. 1985;30(9):660-3.
23. Esposito C. Transumbilical open laparoscopy: a simple method of avoiding complications in pediatric surgery. Pediatr Surge Int.1997;12(2/3):226-7.
24. Moberg AC, Petersson U, Montgomery A. An open access technique to create pneumoperitoneum in laparoscopic surgery. Scandinavian J Surge. SJS :official organ for the Finnish Surgical Society and the Scandinavian Surgical Society. 2007;96(4):297-300.

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