

Complications as a Result of Entry Techniques for creating Pneumoperitoneum and Recommendations to minimize Them in Laparoscopic Surgery: A Review of Literature

¹Muzzafar Zaman, ²Rajneesh K Mishra, ³Rikki Singal, ⁴Aliya Shah, ⁵Bhanu Pratap Sharma

ABSTRACT

It is an evidence-based fact that laparoscopic surgery is superior to conventional open surgery. Any laparoscopic surgical procedure has many advantages for the patients, health care system, and society, although it is not devoid of disadvantages.

Advantages of Minimal Access Surgery

Minimal access surgery often offers better visualization than conventional surgery, particularly better visualization of the hiatus and deep structures in the pelvis.

- Laparoscopic surgery offers dramatic advantages in terms of the quality of life after the operation.
- Postoperative pain is less, which decreases postoperative analgesic (narcotic) use and its complications. This also aids in lower respiratory complications.
- Smaller wounds are associated with fewer wound complications, less scarring, and better cosmesis.
- Laparoscopic procedure results in reduction of postoperative adhesions.
- Patients stay in the hospital for a shorter period and recover faster.
- Patients are able to return to their normal activities faster (e.g., feeding, school, office).

Disadvantages of Minimal Access Surgery

- Operating time is longer.
- The complication rate is higher during the learning curve of the procedure.
- Loss of tactile sensation occurs.
- With current technology, the video camera can provide only a two-dimensional image, although three-dimensional views are becoming available.
- Controlling bleeding laparoscopically is difficult.
- The number of instruments and angles in which they can be applied are limited. Robotic applications using wrist technology is improving this problem.

Numerous new techniques, technologies, and guidelines have been introduced to eliminate/decrease the risks associated with entry techniques in laparoscopy.¹ The two major entry techniques widely carried out include the closed technique (Veress) and open technique (Hasson). The other techniques employed include use of direct trocar insertion, use of disposable shielded trocars, radially expanding trocars, and visual entry systems. No single method or equipment has been proven to eliminate laparoscopic entry-associated injury.

Materials and methods: A systematic electronic search was conducted and various articles were studied and reviewed and this review article was prepared.

Keywords: Complications, Entry, Laparoscopy, Trocars.

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INTRODUCTION

Minimal Access Surgery (MAS) is a specialized form of surgery that allows surgeons to operate without making large incisions as are done in conventional (open) surgery. As laparoscopy is carried out with the help of small incisions, patients have less postoperative pain, spend shorter time in the hospital, and recover significantly faster than after open surgery. Access into the abdomen is associated with injuries to the gastrointestinal tract or major blood vessels, and 50% of these complications occur before the beginning of the surgery. The majority of these injuries are due to insertion of primary umbilical trocar. Increased morbidity and mortality result when surgeons do not recognize injuries early and do not address them quickly.² Methods of primary trocar insertion are split between “open” and “closed” techniques.

To minimize entry-related injuries, several techniques, instruments, and approaches have been introduced in recent years.

Common Entry Complications during Mas

The three main complications during creation of pneumoperitoneum in MAS are bowel injuries, vascular injuries, and urological injuries. Up to 50% of all major

¹Assistant Professor, ²Chief, ³Professor, ⁴Postgraduate Student, ⁵Postgraduate

^{1,3}Department of General Surgery, MM Institute of Medical Sciences and Research, Ambala, Haryana, India

²World Laparoscopy Hospital, Gurgaon, Haryana, India

⁴Department of Microbiology, MM Institute of Medical Sciences and Research, Ambala, Haryana, India

⁵Department of Surgery, MM Institute of Medical Sciences and Research, Ambala, Haryana, India

Corresponding Author: Muzzafar Zaman, Assistant Professor Department of General Surgery, MM Institute of Medical Sciences and Research, Ambala, Haryana, India, Phone +918059931554, e-mail: muzzafarzaman@yahoo.com

intraoperative complications associated with laparoscopy occur at the time of surgical entry. The most devastating among these is major vascular injury, and half of all bowel injuries occur during entry, with the small intestine at highest risk.

Bowel Injury

Bowel injury during MAS is a rare but serious complication. A cautery injury to the bowel can cause delayed perforation of the viscus, thus increasing the possibility of a preventable morbidity. Patients presenting with features of perforation peritonitis within 24 hours and up to 2 to 3 weeks after laparoscopic Bovie injury to the bowel have been reported in the literature.

Cautery injury to the bowel has a hidden depth, causing a slow transmural tissue necrosis, and it might also impair local healing and eventually lead to perforation. Thus, the patient may present later than the usual period for wound healing and remodeling as previously reported. Given the disastrous consequence, it is imperative to perform a good surgical repair of even a minor cautery injury to the bowel.³

The small intestine was most frequently injured (55.8%), followed by the large intestine (38.6%). In most of these cases the diagnosis was made during the laparoscopy or within 24 hours thereafter. Laparoscopy-induced bowel injury is associated with a high mortality rate of 3.6%.⁴

Vascular Injury

Vascular injuries are usually induced by the insertion of the Veress needle or the first/primary trocar, because both are usually introduced blindly. The insertion of the secondary trocars has a lesser risk, because they are placed under direct vision. During access into abdominal cavity the most dangerous complications of entry are to great vessels like aorta, vena cava, and common iliac vessels. Vascular injury is one of the major causes of mortality from laparoscopy, with a reported mortality of 15%. The reason of these injuries is the close proximity of anterior abdominal wall to the retroperitoneal vascular structures. The most common minor vascular injury is to the inferior epigastric vessels and superior epigastric vessels occurring in up to 2.5% of lap hernia repairs.⁵

Urological Injuries

The incidence of bladder injury during laparoscopic procedures ranged from 0.02 to 8.3% as is evident from various studied articles. Most frequently, these injuries occurred during laparoscopic-assisted vaginal hysterectomy. Sharp electrosurgical dissection was the leading instrument causing injury. Ureteral injuries during laparoscopic gynecological surgeries typically occur during

laser ablative endometriosis surgery or laparoscopic-assisted vaginal hysterectomy. There are reports of ureteral injuries during laparoscopic tubal ligation, adnexectomy, and lap uterosacral ligament ablation.

Ureteral injuries were identified with incidence rates ranging from 0.025 to 2%.^{6,7}

RECOMMENDATIONS FOR SAFE ENTRY

- In case of a patient with history or presence of periumbilical hernia, periumbilical adhesions, three failed insufflation attempts at the umbilicus, left upper quadrant point known as Palmer's point should be considered for entry.⁸ Other sites that can be used are transuterine, trans cul-de-sac, 9th or 10th intercostal space.
- Wagging of Veress needle from side to side must be avoided as this can enlarge a small puncture injury to a bigger one.⁹
- Various Veress needle tests can be done, though these provide very little information on the placement of needle.
- Attach the carbon dioxide source to the Veress needle on entry as Veress intraperitoneal pressure is a reliable indicator of correct intraperitoneal placement of Veress needle.
- The angle of the Veress needle insertion should vary according to the body mass index of the patient, from 45° in nonobese women to 90° in obese women.¹⁰
- Adequate pneumoperitoneum should be determined by a pressure of 20 to 30 mm Hg and not by predetermined CO₂ volume.
- Hasson's method of entry can be used as an alternative to Veress needle technique, although there is no evidence that the open entry technique is superior to or inferior to the other entry techniques currently available.
- Direct insertion of the trocar is associated with less insufflation-related complications, e.g., gas embolism and its insertion without prior pneumoperitoneum is considered as a safe alternative to Veress needle technique.
- Shielded trocars may be used in an effort to decrease entry-related injuries.^{11,12}
- After introduction of the telescope, the bowel should be inspected for obvious injury and abdomen visualized for presence of adherent bowel around the umbilicus.

CONCLUSION

Any surgical procedure whether open/conventional or laparoscopic has its respective risks and associated complications. Complications can occur even at the best of hands and it is vital that these are recognized promptly

and immediately taken care of. The importance of proper training and the value of expertise are clear. It must be our primary aim to inculcate in ourselves the necessary skills and encourage the development of specially designed training programs for those performing the most advanced procedures.

It is important for every laparoscopic surgeon to follow the recommended steps and guidelines to minimize various entry-related complications of laparoscopy and for excellent outcome of the procedure done.

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