



## Original Research Article

# Predisposing Factors, Prevention and Treatment of Trocar site Hernia

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## Introduction

Laparoscopic cholecystectomy by two pioneer laparoscopic surgeons: Prof. Dr. Mederich Muhe of Germany in 1985 and Phillippe Mouret of France (Lyors – 1987) revolutionarised surgery and opened a new path for minimal access surgery. The improved postoperative comfort, reduced pain and shorter convalescence made minimal access surgery an instant hit in modern medicine and also among patients. Soon it became a procedure of choice and by 1990 it spread all over the world.

In the next 1 to 2 decades there was emergence of new technique, considerable improvement in instruments and also vast improvement in quality of surgeon's training. All these resulted in great decline in dreaded complications like injury to great retroperitoneal vessels, intestinal injury and injury to bile duct. But there was emergence of new specific complications like trocar site hernia (port site hernia), trocar site infection and late appearance of biliary stenosis due to bile duct injury mostly from cautery.

Trocar site hernia is occurrence of hernia at the site of insertion of trocar. Trocar site hernia is an important yet under-recognised complication of laparoscopic surgery, which carries a high risk of strangulation due to the small size of the defect involved. Crist and Gadacz<sup>1</sup> defined Trocar site hernia as the development of hernia at cannula insertion site. Hitoshi Tonouchi, Yukinari Ohmori et al<sup>2</sup> have classified trocar site hernia into three types:

(a) Early onset hernia – There is dehiscence of anterior and posterior fascial planes and peritoneum with intact skin, usually presents as small bowel obstruction and is apparent within 2 to 12 days.

(b) Late onset hernia– There is dehiscence of fascial planes with intact peritoneum and skin. Peritoneum constitutes the hernia sac. Hernia usually develops several months after surgery and there is no small bowel obstruction.

(c) Special type hernia – There is dehiscence of whole abdominal wall with protrusion of intestine

and/or greater omentum. It is seen just after the operation and even during the operation.

The incidence of laparoscopic trocar site hernia varies in different surgical sub specialities. Older age (age>60), female sex, increased body mass index, diabetes mellitus, long operation time, size-type-site of trocar are risk factors for developing a trocar site hernia.

The aim of our study is to evaluate the predisposing factors, prevention and treatment of trocar site hernia.

### Materials and Methods

From January 2014 to December 2017, 1200 cases of laparoscopic surgery were carried out at department of general surgery, Nalanda Medical College Patna. This included 1050 cases of cholecystectomy and 150 cases of appendectomy. Procedures were carried out after written and informed consent. For laparoscopic cholecystectomy, one primary port of 10 mm at infra or supra umbilical, another port of 10 mm at epigastric region, two 5 mm ports at right hypochondrium and right lumbar region were made. Gall bladder was extracted out through epigastric port under vision with laparoscope passed through umbilical port. For laparoscopic appendectomy, one 10 mm primary port at infra or supra umbilical region and two 5 mm ports at suprapubic and left iliac fossa region were made. Appendix was taken out through umbilical port. Trocar and cannula for primary port was introduced through dip method and Hansen's trocar and cannula was not used in any case.

In 960 (80%) cases, where the port diameter was 10mm, port site fascia were closed after the laparoscopic procedure, whereas in 240 (20%) cases fascial defect were left open. In all cases where the port diameter was 5 mm, fascial closure was not done. In 72 (7.5%) cases of laparoscopic cholecystectomy, enlargement of 10mm epigastric port was done for removal of gall bladder.

### Observation

About 18 (1.5%) cases, who came for follow up with complaints of pain and/or swelling related to umbilical and epigastric port, were found on clinical and ultrasonographic examination to be suffering from trocar site hernia. 3 (16.66%) cases of these were of early onset type and came within 10 days of postoperative period. They were treated urgently by exploring the wound by a small midline vertical downward extension of previous incision. After reducing hernia, fascias were sutured continuously with prolene suture. Remaining 15(83.33%) cases were of late onset type. Depending upon the symptoms and duration, these late onset cases were further classified into asymptomatic and symptomatic types. 6(40%) cases of late onset type were of asymptomatic type, whereas 9(60%) cases were of symptomatic type.

- (A) Asymptomatic cases had small umbilical trocar site hernia. Duration varied from months to year. All of them were less than 2 cm in size and there was no pain or increase in size in hernia. These were further followed up for emergence of any symptom.
- (B) Symptomatic cases had complaint of progressive increase in size of swelling associated with pain. Patients with hernia size between 2.5 to 5 cm (6 in number) were treated with fascial suture. Patients with hernia size more than 5 cm (3 in number) were treated with sublay prolene mesh repair. None of the above cases of repair with simple suture or mesh repair have reported for recurrence till date.

All 18 trocar site hernias occurred in sites where the diameter was 10mm. Out of them, 16(88.89%) cases were at umbilical and 2(11.11%) cases were in epigastric region. In epigastric region, all cases developed where stretching of trocar site was done for removal of gall bladder. No port site hernia occurred where the diameter was 5 mm.

**Table 1.**Types of Trocar Site Hernia

Type	Frequency	Percent	Valid Percent	Cumulative Percent
Early onset type	3	16.66	16.66	16.66
Late onset type	15	83.34	100.00	100.00
Special type	0	0.00	0.00	100.00

**Table 2** Types of late onset trocar site hernia according to symptom

Type	Frequency	Percent	Valid Percent	Cumulative Percent
Symptomatic	9	60	60	60
Asymptomatic	6	40	40.0	100.00

**Table 3** Site of trocar site hernia

Site	Frequency	Percent	Valid Percent	Cumulative Percent
Epigastric	2	11.11	11.11	11.11
Umbilical	16	88.89	88.89	100.00
Right hypochondrium	0	0	0	100.00
Right lumbar region	0	0	0	100.00

**Table 4.**Predisposing factors present in patients who developed trocar site hernia

Sl.no.	Procedure	Frequency	Percent
1	Obesity	4	22.22
2	Diabetes mellitus	2	11.11
3	Wound infection	3	16.66
4	Chronic obstructive pulmonary disease	1	5.55
5	Pre existing umbilical or para umbilical hernia	0	0.0
6	Malnutrition	0	0.0

## Discussion

Widespread use of laparoscopy has reduced the incision related complications but led to development of specific complications like trocar site hernia. Presence of pre existing umbilical or para umbilical hernia, comorbidities like chronic obstructive pulmonary disease, diabetes mellitus, immune deficiency, malnutrition and obesity, infection of wound, larger trocar size predisposes to development of trocar site hernia. Pre-existing umbilical or para umbilical hernia should be repaired at the end of laparoscopic surgery with fascial suture or with mesh if larger in size. Azurin DJ, Go LS et al<sup>3</sup> has also reported increased incidence of port site hernia in case of presence of comorbidities like diabetes mellitus and obesity. Infection of wound is one of the important factor responsible for port site hernia. Callery MP, Strasberg SM et al<sup>4</sup> reported infection of umbilical port as a predisposing factor in laparoscopic procedures.

Trocar size is also important factor in occurrence of trocar site hernia. In our series 16(88.89%) port

site hernia occurred at 10 mm umbilical port and 2 (11.11%) trocar site hernia occurred at 10 mm epigastric port. No trocar site hernia developed in 5 mm port. Crist DW, Gadacz TR et al<sup>1</sup> has also reported that large sized trocar favours trocar site hernia. Midline trocar site is more prone to hernia than laterally placed trocar site due to presence of two fascial planes and muscles (Duron JJ, Hay JM, Msika S, et al<sup>5</sup>). Many authors have shown that most hernias appeared at the site of midline trocars, and that umbilical sites were most common<sup>6</sup>. Other authors have commented regarding the anatomical and inherent weakness of the paraumbilical region. Azurin et al<sup>3</sup> and Ahmed et al<sup>7</sup> reported that an incidental umbilical hernia, which existed preoperatively, leads to a trocar site hernia..

Stretching the port site for removal of gall bladder might be involved in the occurrence of trocar site hernias. Nassar AH, Ashkar KA, et al<sup>8</sup> reported extension of umbilical fascial defects as an important risk factor for trocar site hernia. Kopelman D, Schein M, et al<sup>9</sup> emphasized fascial

closure for stretched ports. Mcmillan J, watt I<sup>10</sup> also illustrated the need of careful fascial closure of all the 10 mm ports whether or not the gall bladder has been removed through them or whether or not they have been extended.

Several series related to postoperative complications of laparoscopic cholecystectomy have been reported. Mayol et al<sup>11</sup> and Nassar et al<sup>8</sup> have reported an overall incidence of 1.50% in their studies. Baird DR, Wilson JP, et al<sup>12</sup> have reported an incidence of 0.125%, Al-Haijar N, Duca S, et al<sup>13</sup> reported an incidence of 0.68%, whereas Larson GM, Vitale GC, et al<sup>14</sup> in similar series have reported an incidence of 0.15%. The true incidence might be much higher than the reported figures as an unknown percentage of patients who are asymptomatic might not report to the surgeon<sup>15</sup>. In our series, the total incidence was 1.50%.

### Conclusion

Incidence of trocar site hernia is bound to increase as popularity and acceptance of minimal access surgery has broken all limits. Larger trocar size ( $\geq 10$  mm), leaving the fascial defects unsutured, infection, stretching and over manipulation, long operation time and comorbidities like chronic obstructive pulmonary disease, diabetes mellitus, immune deficiency, malnutrition and obesity predisposes to development of trocar site hernia. Incidence of trocar site hernia can be minimized by avoiding excessive manipulation during operation and unnecessary delay in operation time, proper sterilization of laparoscopic instruments, more use of trocar of less than 10 mm size and proper selection of patient. In case of trocar size  $\geq 10$  mm, all layers including peritoneum should be repaired under direct vision. Velasco JM, Vallina VL, et al<sup>16</sup> has suggested repair of fascial defects of  $\geq 10$  mm trocar under direct vision. Symptomatic cases with hernia size between 2.5 to 5 cm should be treated with fascial suture and those with hernia size more than 5 cm should be treated with sublayprolene mesh repair. Patients presenting with small bowel obstruction

should be treated as emergency and standard operative procedure should be adopted.

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