

Long-Term Study of Port-Site Incisional Hernia After Laparoscopic Procedures

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ABSTRACT

Background: Laparoscopic surgery is widely practiced and offers realistic benefits over conventional surgery. There is considerable variation in results between surgeons, concerning port-site complications. The aim of this study was to evaluate the laparoscopic port closure technique and to explore the factors associated with port-site incisional hernia.

Methods: Between January 2000 and January 2007, 5541 laparoscopic operations were performed by a single consultant surgeon for different indications. The ports were closed by the classical method using a J-shaped needle after release of pneumoperitoneum. The incidence of port-site incisional hernias was calculated. All patients were followed up by outpatient clinic visits and by their general practitioners.

Results: During a 6-year period, 5541 laparoscopic operations were performed. Eight patients (0.14%) developed port-site hernia during a mean follow-up period of 43 months (range, 25 to 96) and required elective surgery to repair their hernias. No major complications or mortality was reported.

Conclusion: Laparoscopic port closure using the classical method was associated with an acceptable incidence of port-site hernia. Modification of the current methods of closure may lead to a new technique to prevent or reduce the incidence of port-site incisional hernias.

Key Words: Port-site incisional hernia, Pneumoperitoneum, Port closure.

INTRODUCTION

Laparoscopic port closure (LPC) is usually performed by different techniques after release of pneumoperitoneum (PP). There has been progressive development of new methods and refinement of existing techniques to achieve the best outcome. However, serious complications due to the closure techniques have been reported. In general, the classical method of port-site closure is widely used because of its simplicity and cost effectiveness. In some of the closure techniques, special instruments and types of needles are used to perform the LPC. Yet, occasionally this closure can be difficult and is associated with the predictable fear of injuring or including the underlying bowel loops, omentum, or other abdominal organs by the needle. This may result in less optimum closure and subsequent complications, including port-site incisional hernia (PIH).

Studies show that the incidence of PIH ranges from 1% and 6%.^{1,2} Several closure methods have been tested, and some of these have proved to cause less morbidity. Due to the variable rates of PIH and its drastic complications reported in these studies, it is important for individual surgeons to audit their results to prevent or reduce these complications. This study evaluates the classical closure method and discusses the factors associated with port-site incisional hernia.

MATERIALS AND METHODS

Study Design

This is a retrospective study of 5541 patients who underwent laparoscopic procedures for different indications under the care of a single consultant surgeon between January 2000 and January 2007. Veress needle technique was used to create the pneumoperitoneum in all patients. We used 5-mm, 10-mm, and 12-mm ports, depending on the type of operation and a 3-edged reusable trocar for creation of ports. We used disposable ports in bariatric surgery and an Xcel [Ethicon] port in cases of possible adhesions from a previous laparotomy. The data were retrieved for patients who developed port-site complications, including port-site incisional hernia (PIH). The man-

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agement and follow-up of these complications are reported herein.

Selection Criteria

All patients who underwent laparoscopic surgery and the classical port closure technique under the care of a single laparoscopic surgeon were included in this study, regardless of American Society of Anesthesiology grading, body mass index, type of procedure, and age of the patient. The patients who had their ports closed using techniques other than the classical one were excluded from this study.

Closure Technique

The ports were cleaned with 10% povidone iodine solution, and 3-mL to 5-mL of 0.5% Marcaine was infiltrated into the ports along the planes. At the end of the procedure, the PP was released and closure was performed using J-shaped needle and PDS suture.

Closure of the fascial defect was performed for all ports >5 mm in adults and as small as 5 mm in children. The skin was closed using monocryl suture. In bariatric and morbidly obese patients, a port closure device was used to achieve secured closure of the fascial defect. The closure time of a single port ranged from 1 minute to 3 minutes.

RESULTS

Different laparoscopic procedures were performed in 5541 patients. These included 250 appendectomies, 1621 cholecystectomies, 63 gastric bypasses, 198 diagnostic laparoscopies, 456 Nissen funduplications, 1833 herniorrhaphies, 40 bowel resections and anastomoses, and 1080 procedures for different indications, including splenectomy, adrenalectomy, release of adhesions, ectopic testis, and bypass gastrointestinal surgery. The mean age of patients was 52 years (range, 8 to 91).

The 8 port-site incisional hernias (PIH) were subsequently repaired as elective cases. The incidence therefore is 0.14%. All these hernias developed in adult patients. Two hernias developed after cholecystectomy and one hernia after Nissen fundoplication. The other 5 hernias developed after groin hernia repair. No immediate major complications or mortality was reported in relation to port-site complications. All patients attended the first visit of follow-up in the clinic, which was 4 weeks to 6 weeks after the operation. Patients who had simple operations, such as appendectomy, hernia repair, or cholecystectomy, were discharged to their general practitioner's care after

the first visit and advised to call our unit in case of problems including port-site complications. Other patients who are the majority were followed up regularly by our team. The mean follow-up was 43 months (range, 25 to 96).

DISCUSSION

This study evaluates PIH following emergency and elective laparoscopic procedures. It also explores the safety and efficacy of port closure after the release of pneumoperitoneum.

Laparoscopic surgery, as any other intervention, is not without complications. One of the preventable complications is PIH, which could develop at any port site. However, our experience showed that it most frequently develops at the midline, possibly because of the absence of supporting muscle. The incidence of PIH is variable from center to center, depending on several factors including surgical technique and, of course, surgical experience.

The fact that the incidence and spectrum of laparoscopic complications is greater than previously perceived³ made development and continuing improvement of the access techniques, instruments, and laparoscopic training important to reduce these avoidable complications, especially the dangerous problems like incarcerated hernia.⁴ The extent of laparoscopic access complications is found to correlate with the experience of the surgeon and the learning curve. The incidence of these complications in a study of 4857 laparoscopic operations⁵ was incisional hernias 0.5%, bleeding from abdominal-wall vessels 0.2%, bowel injury 0.06%, and wound infections 0.06%. The incidence of PIH was reported to be as low as 0.08 in another large series.⁶

The risk factors for development of PIH are the trocar diameter, the trocar design, pre-existing fascial defects, and some operation- and patient-related factors,⁷ in addition to the direction of the port insertion, use of a drain, and the site of the port. The risk of trocar-site hernia is greater in obese and bariatric patients because of the larger preperitoneal space and elevated intraabdominal pressure; thus, fascial closure alone is not adequate,⁸ while the size of the port is another major risk factor, and some authors advise closure of holes >5 mm at the fascial level.⁹ However, surprisingly, PIH was reported for 3-mm ports in children¹⁰ and as small as 5-mm ports with bowel obstruction in adults.¹¹ This raises concern and questions as to whether to close these small ports. Tonouchi et al¹² reviewed 63 studies of trocar-site hernias and concluded

Table 1.
The Incidence of Port-site Hernia for Specific Procedures

Type of procedure	No Port-site Incisional Hernia
Nissen fundoplication	1
Cholecystectomy	2
Groin hernia repair	5
Total	8

that a fascial defect of ≥ 10 mm should be closed, including the peritoneum, while opinion varies as to whether a 5-mm trocar-site defect should be closed.¹²

In children, we used a 5-mm port as the smallest port, and this is routinely closed at the fascial level, while in adults we would close any port >5 mm. In spite of this, 8 of our patients developed PIH with an incidence of 0.14%. However, the 8 hernias occurred in the last 2 years and were not related to the experience or the learning curve. All these developed following the classical closure technique with J-shaped needle at 10-mm epigastric and umbilical port and 5-mm lumbar ports in adult patients. **Table 1** indicates the number of hernias that developed after several types of operations. Incisional hernias occurring during the follow-up and all hernias were repaired electively. There were no immediate major perioperative complications related to the closure technique. These 8 PIH, which came to our attention during a mean follow-up of 40 months, represent an acceptable incidence in such large series compared with reports in the literature.^{13,14} The easy closure and cost-effectiveness associated with the classical method are promising compared with other techniques, such as Deschamps needle and nonbladed laparoscopic trocars.^{15,16}

It is difficult to anticipate which patient will develop PIH during follow-up. Taking into consideration the above-mentioned risk factors for development of PIH, the incidence of it can be reduced and the most serious bowel strangulation may be prevented. The follow-up program in hernia surgery may be the major inherent weaknesses. Clinically, surgeons may misdiagnose PIH in symptomatic patients, because of the absence of physical signs or no appropriate imaging study is arranged. In a symptomatic patient, the PIH may be incidentally detected in the course of investigating other pathologies. We usually follow our patients at outpatient clinics. If they have no complications after surgery, they are usually discharged and told to call our unit in case of complications. Alternately, they can be referred to our clinic by their general practitioner to

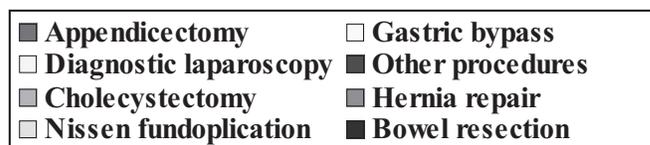


Figure 1. The percentage of laparoscopic procedures performed.

confirm specifically whether a hernia has developed or not, because hernia development is time-dependent. Depending on the clinical findings, a subsequent ultrasound or MRI scan is arranged to confirm or to rule out PIH.

The number of complications in our series is low, and this reinforces the idea that closure of all sites >10 mm is extremely important, and it confirms the conclusion of Tonouchi et al.¹² The laparoscopic workload is variable from surgeon to surgeon. Our practice workload is about 75 laparoscopic operations per month. The real number of minimal access operations may be higher in other practices, but this does not influence the conclusion of this study because a large number of cases were included.

There may be asymptomatic hernias that develop later, and therefore, with long follow-up, the incidence of PIH is expected to increase. Eight clinical hernias out of 5541 operations is an acceptable rate; however, the iceberg phenomenon did exist, and the true incidence of PIH in our series is expected to be $>0.14\%$. In that context, the diagnosis of all subclinical hernias was not possible with this study, and imaging to confirm subclinical and asymptomatic PIH is difficult to arrange for more than 5000 patients.

CONCLUSION

The meticulous closure of laparoscopic ports is important to prevent or reduce the incidence of port-site incisional

hernia and its complications. Although the classical closure method with a curved or J-shaped needle has been associated with an acceptable incidence of port-site hernia, development of a new technique of closure is suggested to further prevent or reduce this.

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