Review Article

Laparoscopic trocar site hernia: a case report and literature review

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Received October 20, 2015; Accepted December 2, 2015; Epub January 15, 2016; Published January 30, 2016

Abstract: Laparoscopy-associated complications like trocar site hernia (TSH) have resulted from the increasing use of the technique in surgery. TSH is rare, but a well-established problem. We report a case of a 69 year old female patient with a 12-mm TSH following a right laparoscopic adnexectomy for right ovarian cystic teratoma. Ultrasonography was used to diagnose TSH on the 9th post-operative day. The patient underwent an emergency laparotomy to reduce the hernia. The fascial defect was also repaired. Thus, this case suggests that ultrasonography can be used as a primary diagnostic tool in suspected cases of herniation, without any risk for radiation exposure. Additionally, this report tries to explain the potential factors leading to laparoscopic TSH.

Keywords: Laparoscopic, trocar site hernia, ultrasonography, early onset, surgery

Introduction

Since its introduction in 1987 by Mouret, laparoscopic surgery has been frequently employed and thus evolved as a major surgical technique [1]. It contributes enormously in reducing all the open surgery related complications. However, as a critical disadvantage, laparoscopic surgery has been found associated with a specific type of complication referred to as the trocar site hernia. The condition has also been defined as port site hernia by some authors. TSH may be defined as an incisional hernia occurring on the trocar incision site following minimally invasive surgery [2]. A rare surgical complication is represented by TSH; a pooled prevalence of 0.5% was reported by a systematic review with the range of incidence between 0 and 5.2% [3]. However, all the available data in this regard till date have been obtained from symptomatic patients [3, 4]. Also, clinically diagnosed TSH forms the basis of most available data, further questioning their effectiveness, more so in the obese patients. Furthermore, the present available literature lacks long-term studies and is based on short-term follow-up [5, 6]. The overall incidence might increase when a more efficient diagnostic tool like computed tomography (CT) or ultrasonography can be routinely used to examine the abdominal wall with a long-term follow-up.

According to Tonouchi et al [7], there are three types of TSH. (i) Early onset type: Characterized by early onset following surgery wherein anterior and posterior fascial plane and peritoneum dehisce. Generally, it presents as a small bowel obstruction as in Richter’s hernia. (ii) Late onset type: Several months after surgery, the hernias are developed appearing as asymptomatic wound site swelling but not associated with small bowel obstruction. Anterior and posterior fascial planes dehisce while hernia sac is constituted by the peritoneum. (iii) Special type: Takes place almost immediately after surgery. This is not a typical herniation where the whole abdominal wall dehisces with no visible sac.

Here, we describe the case report of a 12-mm TSH diagnosed by sonography and analyze the potential risk factors that may lead to TSH.
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Additionally, we discuss the incidence, causes and preventive measures associated with this condition.

Case report

A 69 year old, multiparous female, BMI 17.8, underwent a right laparoscopic adnexectomy for right ovarian cystic teratoma. The surgery was completed in 30 minutes. At the end of the surgery, all the trocars were removed under direct vision followed by the release of pneumoperitoneum. The fascia and peritoneum were left open.

On the second post-operative day, she experienced nausea while defecating. Two days later, she developed progressively acute nausea and vomiting. The patient was febrile, her blood counts and C-reactive protein were normal. Abdominal examination revealed a 5×4×3 cm mass under the left lower quadrant, 12-mm trocar wound with slight tenderness (Figure 1). X-ray of abdomen showed dilated small bowel. At first, we suspected that the patient might have paralytic ileus and hematoma. Meanwhile, the symptoms continued to persist even after five days of conservative treatment. Dynamic ultrasonography was performed to verify the nature of mass. Investigation revealed that the bowel herniated through fat tissue of the left trocar site. The proximal and distal bowel moved normally. CT scan of the abdomen was also performed to confirm the hernia. The CT scan showed a loop of small bowel herniating through the left lower trocar site with dilated proximal bowel and collapsed distal bowel (Figure 2).

Emergency laparotomy was done by extending the original trocar incision. Upon examination, the small bowel was found to be viable and was returned to the abdominal cavity (Figure 3). In the surgery, the line segment of the incision and the defect of fascia, the one of peritoneum were found not vertical to the skin. The abdominal muscles were found weakened (Figure 4). The defect was closed with interrupted suture in layers.

Materials and methods

For the review of literature, we carried out a search for published articles in the databases, Pubmed, Pubmed CENTRAL and Cochrane. The keywords used for the search included “trocar site hernia”, “laparoscopic trocar site hernia” “trocar” and “12-mm trocar site hernia”. The articles were then thoroughly assessed for their relevance. Inclusion criteria were: a significant case number and/or information with regard to causes of TSH and its prevention. Based on their relevance, we used the published articles for the review (until September 2015). Between the different published TSH

Figure 1. A mass under the left lower quadrant 12-mm trocar site.

Figure 2. Bowel herniating through left trocar site with an air fluid level.

Figure 3. A segment of small bowel protruding from the trocar site after releasing the adhesion, a trace of herniating can be seen.

Additionally, we discuss the incidence, causes and preventive measures associated with this condition.

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Figure 4. The weakened abdominal muscles in the patient.

types, no general agreement about their classification could be found [7-9]. Significant level of heterogeneity amongst the studies and absence of large-sized randomized controlled trials limit the prospect of meta-analysis for incidence of this rare complication.

Incidence

In 1968, Fear first published a case of TSH following a gynecological procedure [10]. Similar observations were cited by other authors [11-13] while gastrointestinal surgery-associated TSH was first reported in 1991 by Miao and Ruchman [14]. The large series of published TSH incidence ranged between 0.18% and 2.8% from 1994 to 2006. However, it has been generally accepted that a number of TSH cases remain undiagnosed in the absence of long/medium-term postoperative follow-up [12, 15]. This has mainly to do with the asymptomatic patients or those who attach little importance to any detected symptoms and refrain from visiting the doctors. Hence, the actual impact of TSH should only be assessed through prospective studies which did not appear till 1997 when Mayol reported a 1.50% incidence in a 403 cases [16]. In the same year, Nassar reported an incidence of 1.80% in 870 cases [17]. Retrospective studies with varying results were also reported simultaneously besides these prospective studies. The low incidence rates showed by many of these studies may be attributed to incomplete follow-up [12, 18] as also premature reporting at the beginning of laparoscopy [16]. TSH cases are more frequently reported now with the increase in application of laparoscopic procedures in several diseases along with a longer follow-up, and the availability of modern diagnostic tools [19-23].

Pathogenesis

The literature review suggests that there are two major groups of factors that lead to the occurrence of TSH [24, 25]:

Material used and surgical technique

Trocar location: Most of the retrospective studies are suggestive of the umbilical trocar site as the location for higher TSH incidence [21, 26-28]. According to such findings, the location of the trocar can greatly influence the TSH appearance; but there were contradictions in results and opinions. Some of them linked post-TSH development with the incidental finding of an umbilical hernia [15, 29], while others were of the opinion that the lateral abdominal wall anatomy with two muscular structures causes difficulty for the occurring of hernias at these sites [11]. Contradictory to those observations, Nassar [17] was of the view that the appearance of TSH was favored in patients with paraumbilical or umbilical parietal defects. Side-localized occurrence of TSH has also been reported by some of the studies with the hole showing a diameter ≥10 mm [30, 31]. Therefore, increased incidence of TSH at the umbilical site is probably due to pre-dominant abdominal surgery wherein the location of the 10 mm diameter trocars was at the navel level.

Trocar size: In addition, there is a general agreement that the trocar orifice diameter has a critical role to play in the predisposition of TSH occurrence. Thus, more than 80 percent of TSH appeared at holes >10 mm [19, 32-34]. However, there are reports highlighting the occurrence of TSH at sites <5 mm depending upon certain patient characteristics that have been discussed later [35-37]. Most of the authors are of the opinion that suturing should be done at the fascia level for all sites ≥10 mm; not doing so increases the chances of TSH to a great degree [7, 19, 33]. As a matter of fact, defective or incomplete suture contributes enormously in herniation. Some of the authors suggested for the individual evaluation of each site irrespective of the diameter and based on the surgery and/or patient characteristics [25-27, 30].
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Materials: Technical issues like the use of Hasson trocar or Veress needle as an initial approach have also been analyzed in some studies [16]. But no conclusion can be drawn in this regard due to the unavailability of comprehensive studies. It should be noted though that a number of reports regarded the widening of umbilical injury as a potential risk factor of TSH at that site [7, 16, 17].

Patient characteristics

Obesity: A clear relationship between obese patients and higher TSH incidence can be noticed [21, 38, 39]. But there might be a general level of difficulty in the closure of holes in such individuals, instead of obesity itself playing a role [7], since there are studies showing no significant statistical relationship between increased occurrence of hernias and obesity [40].

Aging and diabetes: Aging was found to be a risk factor for TSH in two of the studies along with other associated factors such as obesity [25, 41]. Diabetes was considered to be an important factor by Uslu et al. [25] while closing the fascia hole. Hence, he advised for the closure of all trocar holes in diabetic patients irrespective of their diameter.

Nutrition and wound infection: A lot of discussion goes into the role of poor nutrition influencing TSH development but we could not find any concrete evidence to such claims. Wound infection has been linked with TSH appearance in some of the reviews; however the sample size was too small to confirm such a relationship [2, 21].

Clinical manifestation

Following surgical intervention, the onset of TSH symptoms could range from a few to several months [31]. However, TSH itself might have taken place within a few days post-operation. Generally, immediately after operation, the onset of one-third of the cases takes place while for the rest it may be beyond several months following surgery. Thus, TSH cases can be divided based on interval between onset and laparoscopic surgery. Incarcerated hernia should be highly suspected in case of a patient presenting symptoms within two weeks following laparoscopic surgery along with small-bowel obstruction, as observed through radiographic evidence [42].

The special type can be diagnosed without any modalities. In case of the early-onset type, the site of incarceration can be located by computed tomography followed by surgical repair and reduction of hernia without any major puncture wound enlargement, thus doing away with a full laparotomy [43]. Early-onset type hernias could be detected with computed tomography [22, 44], while Beck et al. reported high sensitivity and specificity of ultrasonography in diagnosing incision hernia [45].

No physical examination is carried out for a good number of asymptomatic patients [31]. However, late onset type hernias sometimes show asymptomatic lumps. It is a matter of discussion whether such asymptomatic patients carrying insidious trocar site hernias need any further examination.

Prevention

Based on available literature, it can be said that the trocar hole diameter has a big role to play in the appearance of TSH. Thus, most of the authors are in favor of closing all trocar holes ≥10 mm for the prevention of TSH development [7, 19, 33] while some studies recommend for the closure of <10 mm holes in combination with other factors like diabetes, obesity, advanced age and long intervention [21, 38]. Although TSH occurrence could be best prevented through fascia closure, there is a good deal of technical difficulty in closing the suture [7]. Different conclusions have been drawn in the available literature regarding suture. Suturing of all incisions and fascia is recommended by Tonouchi et al. [7], while others recommended for the direct vision of suture and extension of incision, if necessary [42, 46]. Special closure materials are taken into consideration when proper closure cannot be ensured by the usual techniques (e.g. 2 mm trocar [46], spinal cord needle [47], or Deschamps needle [48]). Umbilical orifice may also be properly closed by the use of Polypropylene double-sided mesh (ePTFE) [49]. However, there are no adequate follow-up studies for the evaluation of the use of prophylactic mesh in trocar holes. Furthermore, TSH occurrence may be prevented by the use of blunt trocars [50], although there are reports that contradict such view [51].
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There are also proponents for the non-closure of fascia in laparoscopic port site when the trocars are used away from the midline [52]. However, the validity of the statement could only be counted upon with more prospective studies consisting of sufficient cases.

Discussion

The risk factors of TSH can be classified into technical factors and host problems. The host problems include chronic bronchitis, obesity, old age, malnutrition, wound infection, diabetes, pre-existing umbilical hernia and multiparity [15, 17, 53-57]. The technical factors include the trocar diameter, trocar design, location of trocar, wound extension, closure of the fascial defects or leaving them open, duration of operation, decompression of the pneumoperitoneum by suction [11, 17, 25, 37, 55-59]. Tonouchi et al. [7] asserted that the main risks are associated not with the host factors but rather with the technical ones. Among them, leaving the defect open, pyramidal trocars, 12-mm trocars and a long duration of surgery were identified as the most important technical risk factors behind the pathogenesis of TSH [3, 7]. In our patient, multiparity, old age, leaving the fascial defect open and large 12-mm trocar may have given rise to the TSH. The doctors in our department used to leave the defect open before this particular case. The patient had relatively low BMI which may imply weakened abdominal muscles. Low BMI has not been documented in previous studies as a risk factor for TSH. In addition, we found that the line segment of the incision and the defect of fascia, the one of peritoneum were not vertical to the skin. This implies that the real defect was larger than the actual size of the trocar. So insertion of trocars at an acute angle to the abdominal wall may be another risk factor that needs to be taken into account.

TSH can be classified into three major types [7]. Early onset type presents in the perioperative period and usually involves an obstruction of small bowel. Late onset type presents several months later and usually occurs as an asymptomatic abdominal swelling at the wound site without the small bowel obstruction. The special type involves the protrusion of intestine and/or omentum and develops immediately after surgery [7]. The clinical presentation of TSH is variable. Mass and pain at trocar site may be hard to differentiate from a hematoma or wound infection. Duron et al. [11] reported that 46% of mechanical intestinal obstructions were due to TSH. Huang and coworkers [37] also reported that small bowel is the most frequently herniated organ, even with 5-mm trocar size. Therefore, a small bowel obstruction after laparoscopic surgery should be viewed as a potential sign of TSH.

Computed tomography has been recognized as a golden standard in early-onset-type hernias [43, 59]. In our case, however, ultrasonography was used as a primary diagnostic tool. Beck et al. [45] reported that sonography shows high sensitivity (98%) and specificity (88%) in the diagnosis of incision hernia. The use of sonography for primary diagnostics in TSH has not been documented before. Our case demonstrates that sonography represents a good alternative to CT with additional benefits of no radiation exposure and instant bedside interpretation.

Once TSH diagnosis is verified, all patients with an early onset type require an operation to resolve the small bowel obstruction because the early onset TSH may lead to dehiscence of fascial plane and peritoneum. It cannot be solved without surgery, and non-operative treatment may lead to severe conditions such as strangulation, the cutting-off of the blood flow to a part of intestine that has severe, life-threatening consequences [60].

With the modern updated tools and diagnostics facilities, it is proved beyond doubt that herniation is not negligible and hence before starting a laparoscopic surgery should be taken into consideration. Since TSH is a subclinical complication, there might be much higher incidence of TSH than reflected in the available reports. In order to find out the real impact, controlled and regularly monitored studies of patients undergoing laparoscopy are needed. To draw further conclusion, prospective studies that include all potential predisposing factors for TSH, consisting of large number of cases are needed to be carried out.

Conclusion

We have successfully detected and repaired a 12-mm trocar site hernia in this case of 69 year old patient. The use of sonography for primary
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diagnostics in TSH has not been documented before. Our case demonstrates that sonography represents a good alternative to CT with additional benefits of no radiation exposure and instant bedside interpretation. We also find that low BMI could be a potential risk factor for TSH development which has not been previously documented. Further reports are needed for the accurate determination of the importance and occurrence of this complication.

Disclosure of conflict of interest

None.

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