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OPEN VERSUS LAPAROSCOPIC INCARCERATED OR STRANGULATED INGUINAL HERNIA REPAIR – A REVIEW

Is laparoscopic repair a safety technique in emergency?

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Abstract

Minimal access surgery or laparoscopic surgery has revolutionized the surgical world since its introduction in the 1980s. The evidence for elective laparoscopic groin hernia repair is well established. However, there are only handfuls of literatures on the evidence of emergency laparoscopic groin hernia repairs. In this review article we delineated details on how laparoscopy in emergency incarcerated or strangulated inguinal hernia repair benefits patients, and surgical technique and special precaution required during the operation. During open surgery surgeon to idle for 10–20 min trying to make a return on the bowel condition to prepare for bowel resection, and since its emergency condition and time essence for the surgeon so most of the time, surgeon would just proceed for bowel resection. Whereas, laparoscopic surgery allows ample time for the strangulated bowel to recover, and this in fact will avoid unnecessary laparotomy and bowel resection since most of the time the strangulated bowel can recovered if it allowed enough time for them to revascularize. In conclusion, laparoscopic approach for incarcerated or strangulated inguinal emergency hernias repair has its benefits in several areas over minimal access surgeries which contribute to the improvement in clinical outcomes. However, careful selection of patients and a sufficient knowledge of anatomy and expertise in the reduction of the strangulated organs are required.

Keywords: Emergency, Incarcerated hernia, Strangulated hernia, Open surgery, laparoscopic surgery

Introduction:

An inguinal hernia occurs when tissue, such as part of the intestine, protrudes through a weak spot in the abdominal muscles. The resulting bulge can be painful, especially when you cough, bend over or lift a heavy object. Complications of an inguinal hernia include; ***Pressure on surrounding tissues:*** Most inguinal hernias enlarge over time if not repaired surgically. In men, large hernias can extend into the scrotum, causing pain and swelling. ***Incarcerated hernia:*** If the contents of the hernia become trapped in the weak point in the abdominal wall, it can obstruct the bowel, leading to severe pain, nausea, vomiting, and the inability to have a bowel movement or pass gas. ***Strangulation:*** An incarcerated hernia can cut off blood flow to part of your intestine. Strangulation can lead to the death of the affected bowel tissue. A strangulated hernia is life-threatening and requires immediate surgery.[1]

Worldwide, inguinal hernia repair is one of the most common surgeries, being performed in more than 20 million people annually. The lifetime occurrence of groin hernia – viscera or adipose tissue protrusions through the inguinal or femoral canal – is 27–43% in men and 3–6% in women.[2,3] Inguinal hernias are almost always symptomatic, and the only cure is surgery.[2] A minority of patients is asymptomatic; however, even a watch-and wait approach in this group results in surgery in approximately 70% within 5 years.[2,4] Surgical treatment is successful in the majority of cases.[2] The expected rate of recurrence following inguinal hernia repair is still 11% today. Only 57% of all inguinal hernia recurrences occurred within 10 years after the previous hernia operation. Some of the remaining 43% of all recurrences happened only much later, even after more than 50 years.[5] A further problem after inguinal hernia repair is chronic pain lasting more than 3 months, occurring in 10–12% of all patients. Approximately 1–3% of patients have severe chronic pain with long-term disability, thus requiring treatment.[2]

Strangulated hernia is one of the commonest causes of small bowel obstruction. For groin hernia the yearly strangulation risk is around 1–3%.[6,7] These patients have a wide spectrum of presentation, ranging from painful groin lump to severe sepsis in case of ischemic perforated bowel. Traditional management for emergency groin hernia conditions involve open anterior repair. This involves making an incision over the hernia site; identify the hernia sac and open the sac followed by the assessment of the incarcerated content. If the incarcerated bowel or organ is not viable, then bowel resection is performed, either through the groin wound or via separate laparotomy wound. If the intra-peritoneal assessment is inadequate through the groin incision, laparotomy will also be performed.[8,9]

Incarcerated obturator hernia is often managed with laparotomy.[10,11]

Minimal access surgery or laparoscopic surgery has revolutionized the surgical world since its introduction in the 1980s. Its benefits of faster recovery, lesser wound pain which in turn reduced respiratory complications, allows earlier mobilization, minimize deep vein thrombosis, minimize wound infection rate are well reported and accepted. It also has significant long-term benefits which are often neglected by many, such as reduced risk of incisional hernia and lesser risk of intestinal obstruction from post-operative bowel adhesion.

The continuous development and improvement in laparoscopic equipment and instruments, together with the better understanding of laparoscopic anatomy and refinement of laparoscopic surgical techniques, has enable laparoscopic surgery to evolve further. The evolution allows its application to include not only elective conditions, but also emergency surgical conditions. Performing laparoscopy and laparoscopic procedure under surgical emergencies require extra cautions. These procedures should be performed by expert in these fields together with experienced supporting staffs and the availability of appropriate equipment and instruments.

In this review article we delineated details on how laparoscopy in emergency incarcerated or strangulated inguinal hernia repair benefits patients. The surgical technique and special precaution required during the operation for emergency incarcerated or strangulated inguinal hernia conditions were also delineated.

Clinical Features

A bulge in the area on either side of the pubic bone indicates an inguinal hernia. There may be a burning, gurgling or aching sensation at the bulge, or pain or discomfort in the groin, especially when bending over, coughing or lifting. As the hernia progresses, contents of the abdominal cavity, can descend into the hernia. Occasionally, pain and swelling around the testicles occurs, when the protruding intestine descends into the scrotum.

An incarcerated hernia may be associated with inability to manipulate the hernia through the fascial defect. Pain, nausea, and vomiting, indicate bowel obstruction while persistence of pain and tenderness of an incarcerated hernia indicate strangulation. In addition, there may be systemic toxicity secondary to ischemic bowel.[12]

Diagnosis

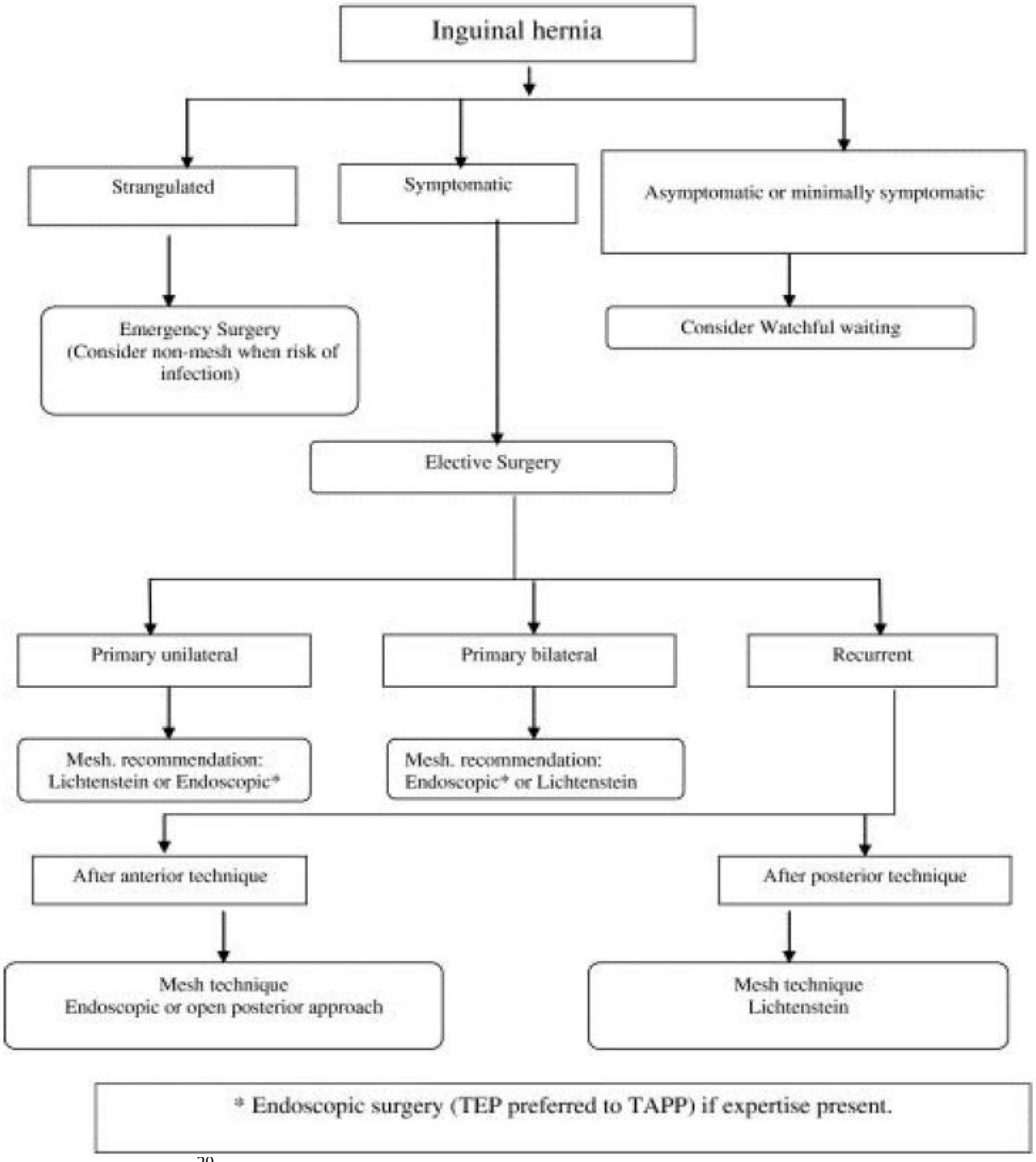
Most early inguinal hernias can be diagnosed by careful physical examination. The physical examination should begin by carefully inspecting the inguinal areas for bulges while the patient is standing. Then, the patient should be asked to cough or strain down (*i.e.,* Valsalva manoeuvre) while the physician observes for bulges. It is more challenging to diagnose a hernia in female patients. Diagnosis is based not only on inspection but also by palpation with an open hand over the groin area which might feel a bulge or detect the impulse of a hernia during a Valsalva maneuver or with a finger introduced into the scrotum.[13]

Although imaging is rarely needed to diagnose a hernia, it may be useful in certain clinical situations (*e.g.,* suspected sports hernia; recurrent hernia; uncertain diagnosis; surgical complications, especially chronic pain).[13] Young surgeons should however note that its use is limited to a small number of patients, because in the vast majority of patients, clinical examination is sufficient. Ultrasound may be useful in diagnosing inguinal hernias in patients who report symptoms but do not have a palpable defect. It may also be helpful in differentiating an incarcerated hernia from a pathologic lymph node or other cause of a firm, palpable mass.[14] Magnetic resonance imaging (MRI) provides the most sensitive detection of a hidden hernia in a patient with clinical suspicion for hernia.[15]

Surgical Management

There is currently no medical recommendation about how to manage an inguinal hernia condition, due to the fact that until recently, elective surgery used to be recommended for all inguinal hernias. The reason for this recommendation is the feared risk of complications such as incarceration or strangulation.[16] However, in most cases, surgical repairs are not carried out to prevent strangulation, but because of patients' request, to relieve discomfort.[17] Watchful waiting therefore is a recommended reasonable option, especially for minimally symptomatic hernias, (Figure 1) due to the significant risk of chronic post herniorraphy pain (>10%), and the low risk of incarceration (<0.2% per year).[16]

Most inguinal hernia repairs can be performed safely, accurately and cost-effectively using local anesthesia, through an open anterior approach. Hernia recurrence rates of less than 4% have been reported for herniorrhaphies performed without prosthetic mesh by skilled surgeons.[18] Hernia repair using prosthetic mesh would be a good choice in the patient with a direct hernia or in the older patient with a longstanding hernia and attenuated fascia. Recurrent hernias repaired with classical herniorrhaphy not utilizing mesh have a reported recurrence rate of approximately 23% at three years.[19] For this reason, recurrent hernias are best managed with open anterior or posterior mesh repair and laparoscopic repair.



Source Simons M. P, et al. 2009[20]

Figure 1: Flow diagram for the treatment of inguinal hernia in adults

Open and Laparoscopic Repair for Emergency Hernias – Technical Advantages

The difference between laparoscopic and open repair for emergency hernia surgery is not only about the size of the wound and wound related trauma. The surgical steps and sequence of events are different such that it has major contribution to the clinical outcome. The surgical steps sequence in open surgery is different from laparoscopic approach, such as it contributes to the benefit of laparoscopic approach.[21]

Sequence of surgical steps in open surgery: In open surgery, after skin incision over the hernia site and identify the hernia sac, the sac is opened with or without widening of the hernia neck, allowing the release of the strangulated content. The content is then assessed for its viability. The next step is the decision for the need of bowel resection and if laparotomy is required. Both bowel resection and laparotomy are the major contributors for increased morbidity and mortality on emergency hernia surgery. If the assessment is inadequate through the hernia wound, laparotomy should be performed. Regarding bowel resection, the classical teaching is to use a warm saline pad to re-warm the strangulated bowel for 5 to 10 min to see the response. Since this is emergency condition and time is essence, it is very difficult for the surgeon to idle for 10–20 min trying to make a return on the bowel condition, so most of the time, surgeon would just proceed for bowel resection. For some cases the bowel ischemia may be potentially reversible.[21]

Sequence of surgical steps in laparoscopic surgery: In laparoscopic approach, after identifying the hernia, the

strangulated content is reduced. Initial assessment of the strangulated bowel is performed. Unless there is gangrenous perforation which requires control of the perforation first, the surgeon will proceed to hernia repair. After the reduction of the incarcerated or strangulated content, accurate diagnosis on the involved hernia is performed, together with the assessment on any concomitant ipsilateral and contralateral hernia. The hernia repaired comes next. It usually occupies the next 45 to 60 min. After the hernia repair, the surgeon will then come back for reassessment of the strangulated segment of bowel. This allow ample time for the strangulated bowel to recover, and this in fact will avoid unnecessary laparotomy and bowel resection as most of the time the strangulated bowel can recovered if we allow enough time for them to revascularize.[21]

This is how the surgical steps sequence difference between open surgery versus laparoscopic surgery in emergency hernia influence on the rate of laparotomy and bowel resection.[21]

Selection of Patient and preoperative evaluation:

Patient selection and pre-operative planning is vital for every surgery to be successful. The surgeon, theatre personnel and the centre with available necessary equipment and instrument are all essential components for successful laparoscopic hernia repair, especially in emergency setting.

If laparoscopic repair is contemplated for a patient with strangulated hernia, a pre-operative diagnostic contrast CT scan of the abdomen is desirable. The reason behind is that, despite the benefit of laparoscopy which can accurately assess the strangulated organs, the site of hernia and presence of any concurrent hernia, it is difficult for laparoscopy to fully assess the whole length of the small bowel. Unlike in laparotomy which the surgeon can run through the whole length of small bowel from duodenojejunal flexure to terminal ileum, it is often difficult to do so in laparoscopy because of the limited working space and oedematous distended bowel. Given the accuracy of CT scan nowadays, a pre-operative CT scan can help us to detect any double pathology that might occasionally occur. It is most important to discuss with the radiologist pre-operatively about the actual site of bowel obstruction in patient presented clinically with strangulated hernia. In order to avoid patient presented with incarcerated hernia but with obstruction further down caused by pathology like adhesion, volvulus or tumour. In which case reducing and repair the hernia will not relief the obstruction. If a different site of obstruction other than the hernia is suspected on CT scan, this should be looked for specifically during laparoscopy, and consider converting to open approach if there is any doubt.

Diagnostic Laparoscopy in Emergency Hernia Repair

Diagnostic laparoscopy provides us a clear understanding of what is involved in the strangulated hernia sac. This can range from omentum, small bowel, large bowel, bladder or appendix in rare cases. This does not only allow us to understand more about the spectrum of strangulated hernia presentation, it also provides the opportunity to record this in the form of image or video of some rare conditions. Such imaging and videos would be extremely valuable for hernia disease management and can be used for future academic and teaching purpose.

Reduction of the Strangulated Content

This is the single most crucial step in emergency hernia surgery. It determines whether the case can be managed laparoscopically or not, in both hybrid and totally laparoscopic approach. The chance of irreducibility laparoscopically and require full laparotomy conversion is rare in all the clinical reports. Referring to the fact that emergency hernia patients have a spectrum of presentation, in large this is what is meant. Some patients presented with easily reducible incarcerated hernia, some presented with horribly tightly strangulated hernia. Some presented with strangulated omentum which can be sacrificed, some presented with small bowel, large bowel or bladder strangulation which make subsequent surgical management more challenging. This factor largely influences the surgical approach and outcome of the patient presented with emergency hernia conditions.

For reduction of the strangulated content, it is recommended to rely mainly on external compression for reduction using peritoneal laparoscopic guidance. With laparoscopy, it can be accurately determined the direction of external compression to reduce the hernia. The external compression can itself reduce the oedema of the strangulated content, together with the pneumoperitoneum which strength the abdominal wall under general anesthesia relaxation, such that most of the hernias can be reduced in this way. While using laparoscopic instrument to grasp the bowel has to be very careful to avoid tearing of the bowel loops. If laparoscopic grasping is needed, it is recommended to grasp the less important structures like omentum or peritoneal fat first. If further required, the distal collapsed bowel loop can be grasped gently while applying external pressure in the correct direction, the strangulated content should be reducible. In a study reported by Ferzli et al, special technique on widening of the hernia ring to allow reduction of strangulated content is mentioned.[22] This is however meant for TEP approach for the reduction of the strangulated content, not for peritoneal laparoscopic approach.

Once the strangulated content is uneventfully reduced, meaning that there is no injury to the content, the most difficult part of the surgery has been done and psychologically it was almost to the end of the operation already. Peritoneal laparoscopic reduction should allow safer reduction of the strangulated content. The surgeon has the time to decide on which method of hernia repair is to be used. It is therefore ultimately important to carefully execute the reduction of strangulated content without injury

to both the strangulated content and surrounding important structures. If the content cannot be reduced despite various methods, there are two options. One can sacrifice the strangulated short small bowel segment by using endo GIA to transect it completely and removed the strangulated stump and perform bowel anastomosis at the end of the operation, or convert to open repair. Fortunately, in majority of the cases the reduction of content can be achieved. In reported literatures, the chance of irreducibility intraoperatively requiring laparotomy is extremely rare. Also the chance of gangrenous bowel requiring resection is also low. This means in majority of the patients their strangulated hernia can be reduced uneventfully and does not require any resection.

Evidences

The evidence for elective laparoscopic groin hernia repair is well established. Compare to open repair, it has the advantages of accurate diagnosis of the involved hernia, detection of any concurrent ipsilateral and contralateral hernias, smaller wound with less pain, significant lower surgical site infection rate, faster recovery and superior mesh placement which allow coverage for all potential myopectineal orifices. However, there are only handfuls of literatures on the evidence of emergency laparoscopic groin hernia repairs.

In 2009, Deeba et al[23] reported in their systematic review on laparoscopic approach to incarcerated and strangulated inguinal hernia. Authors concluded that both transabdominal preperitoneal repair (TAPP) and totally extraperitoneal (TEP) were feasible with comparable overall rate of complications, hernia recurrence and hospital stay to those documented in open repair for strangulated hernia. The literatures analyzed in this systematic review were all case series.[22,24-29] One of the limitations of this systematic review was the wide variation on the operative approaches in these case series, such that it is difficult to comprehend their result collectively. Within these series, there are differences in the approach for reduction of the strangulated content, subsequent management of the gangrenous strangulated content and how they define open conversion. For example, in Ferzli et al. case series, they utilized TEP approach from the very beginning including the reduction of the strangulated content without any peritoneal laparoscopy. With this, one case resulted in injury to the caecum while opening up the sac. The relaxation incision described by Ferzli et al to aid the reduction of the strangulated content was meant to be used in the extra-peritoneal plane. They reported that there are three open conversions out of 11 cases. Yet one case involves resection of the omentum through an extended umbilical wound, another case involved small bowel resection because of gangrenous strangulated obturator hernia through an abdominal incision. However, in majority of other series, laparoscopic reduction of the strangulated content was usually performed trans-peritoneally. Also when bowel resection is required, extended subumbilical wound was not considered as open conversion. And in some series, gangrenous omentum resection could be done laparoscopically. Some series had also reported totally laparoscopic intra-corporeal bowel resection and anastomosis.[22]

In an another retrospective study reported by Song et al involving 27 patients having strangulated inguinal hernia, comparing on laparoscopic versus open tension-free repair.[30] Their findings revealed that laparoscopic group has shorter operative time; lower complication rates on seroma, haematoma, and wound infection; faster return of bowel function; and shorter hospital stay.

Furthermore, Yang et al reported a retrospective comparative study on open versus laparoscopic treatment for strangulated hernia, wherein total of 188 patients were included, of which 57 received laparoscopic and 131 with open repair. Bowel resection rate in laparoscopic group was 1.75% versus 7.63% in the open group. There was more surgical site infection in the open group (12 patients in open group versus 0 in laparoscopic group). Breakdown of the wound infection rate in open group showed groin wound infection rate was 6% and laparotomy wound infection rate was 21%. The hospital stay was longer in the open group.[31]

In an original research work on comparative study of open approach and laparoscopic surgery for emergent groin hernias reported by Kurumiya et al, wherein emergent surgery for a strangulated groin hernia was performed on 63 patients from January 2013 to December 2017. All laparoscopic surgeries were performed using the TAPP approach. The choice of whether to perform an open approach (open) or laparoscopic surgery with the TAPP approach was made by doctors who were familiar with both surgical techniques. The findings of this study revealed that the operation time of laparoscopic surgery with the TAPP approach was longer than the open surgical approach but with fewer complications and a shorter postoperative stay. This study demonstrated that laparoscopic surgery with the TAPP approach for strangulated inguinal hernias was comparable to the open surgical approach with regard to short-term outcomes. Hence authors have concluded that that laparoscopic surgery was a useful technique in emergent situations.[32]

Conclusions

In conclusion, laparoscopic approach for emergency hernias repair has its benefits in several areas. Apart from the benefits of minimal access surgery, its advantages which contribute to the improvement in clinical outcome *viz.* i. superior diagnostic value, ii. detection of concurrent disease and bilateral disease with mesh placement able to cover all potential hernia orifices, iii. superiority in pelvic floor hernia repair such as obturator hernias, iv. lowering the rate of laparotomy, v. lowering the rate of bowel resection, and vi. reduction in wound infection rate.

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