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Current Trends in the Treatment of Giant Postoperative Hernias

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Abstract The article presents the research data of the last 15 years on the surgical treatment of giant postoperative hernias of the anterior abdominal wall. The latest achievements of laparoscopic and robotic surgery in this direction, as well as modifications of open methods with separation of the components of the transverse abdominal muscle are indicated. The authors described both the advantages and disadvantages of each of the methods. Unresolved problems are identified, ways to improve the results of surgical treatment of this complex pathology are outlined.

Keywords Surgical treatment, Laparoscopic, Abdominal wall, Open methods

1. Introduction

The frequency of ventral hernias can reach 13% after operations on the abdominal wall [21,23]. Risk factors that increase the likelihood of developing these hernias are wound infection, male gender, obesity, abdominal distension, the underlying disease process, and sometimes poor surgical suture [19,32]. Incisional hernia is associated with significant complications such as pain, ileus, strangulation, and ischemia of the hernia contents. Despite improvements in recovery methods, there is still significant morbidity and even mortality [9]. Surgery is the only plasty [17], open plasty with or without mesh, laparoscopic or robotic plasty with mesh are available.

Abdominal wall hernia repair is one of the most common operations performed by modern surgeons. Treatment of patients with incisional hernias can be extremely challenging due to a number of factors including obesity, previous hernia repair, previous mesh placement, and other variables. The management of patients with incisional hernias has changed significantly over the past 20 years due to both technological advances and improvements in surgical approaches. Modification of risk factors prior to surgery, such as smoking cessation and weight loss, mesh selection appropriate to hernia type and planned mesh placement, and wide mesh coverage beyond the margins of the hernia defect are key factors for a successful outcome. In these patients, new techniques are increasingly being used, such as transabdominal release and separation of components with mesh placement retrorectally and robotic approaches to the abdominal wall hernia.

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Approximately 350,000 ventral hernia repairs are performed annually in the United States. While most are primary umbilical or epigastric hernias, approximately 150,000 are incisional hernias. This places a significant burden on the healthcare system. Also, the results are less than ideal: the reoperation rate is 12.3% after 5 years and up to 23% after 10 years [12].

In the United Kingdom, more than 120,000 laparotomies are performed each year, followed by over 7,000 incisional hernias. This is close to 6%, but the actual incidence of incisional hernia may be higher as this figure does not include patients who choose not to consider surgery or do not attend for personal or medical reasons [25]. Considering this morbidity, and the morbidity and mortality associated with the condition and methods of repair [31], it is clear that the choice of the ideal repair technique is critical.

In the past, many incisional hernias were performed as primary sutures. A landmark prospective randomized controlled trial reported by Burger in 2004 evaluated the outcome of incisional hernia repair with primary suture and mesh [5]. There were 97 patients in the suture group and 84 patients in the mesh group. The recurrence rate at 10 years was 67% in the suture group compared to 32% in the mesh group. In univariate analysis, risk factors for recurrence included previous abdominal aortic aneurysm repair and wound infection. It should be noted that in this study, recurrences occurred up to 10 years after surgery, including mesh repair. The conclusions from this study were that mesh should be used in the vast majority of patients undergoing incisional hernia repair today.

Some early evidence has shown that laparoscopic incisional hernia repair has a number of disadvantages: longer operative time, costs associated with the provision of equipment, and the use of specialized instruments and mesh. However, a number of studies have shown that, in experienced hands, laparoscopic correction takes as long as open correction [13,33]. Cost-effectiveness analysis also showed that the cost of laparoscopic incisional hernia repair is comparable to open incisional hernia repair, even without taking into account patient benefits such as early discharge from the hospital and early return to work [8].

Laparoscopic incisional hernia repair was first described by Le Blanc and Booth in 1993 [15]. They demonstrated the advantage of laparoscopic hernia repair, showing better results and a lower complication rate compared to the open method [16]. Currently, only a massive tissue defect with a complete loss of the muscular structure of the abdomen is considered unsuitable for laparoscopic access [20].

Despite the improvement in hernioplasty over the past two decades in terms of general technique, the results, according to many experts, remain unsatisfactory. Incisional hernias sutured with a primary suture have a recurrence rate of 12% to 54% [32,35], while the recurrence rate of mesh repair can be as high as 36% [3,37]. In addition, the introduction of a foreign body such as prolene mesh can lead to serious adverse effects such as pain, infection, fistula, intestinal injury, and intestinal adhesions [22]. New models of mesh products have evolved over time, with more emphasis on performance to avoid the aforementioned complications. Laparoscopic repair has been recognized as a reliable alternative to open hernia repair and has been widely practiced ever since.

The laparoscopic approach involves a minimal access technique with multiple incisions for the use of laparoscopic instruments. The technique does not involve the restoration of a fascial defect; rather, the defect is closed with mesh, with or without reduction of the hernial sac. Careful and meticulous dissection is fundamental to a safe operation with fewer complications such as seroma, infection, bleeding, and bowel injury. Some reports report improved outcomes in laparoscopic incisional hernia repair, with a very low recurrence rate of 4.3% and fewer wound complications compared to the open technique [28,30].

There is insufficient evidence to support the superiority of one plastic technique over another. The efficiency and effectiveness of laparoscopic plasty compared to the open technique are insufficient. It is still unclear whether one repair technique is superior to another [34], and whether one repair technique is more appropriate for certain types of hernia than another is not known. The Society of Digestive Surgery Clinical Guideline (SSAT 2005) has shown that hernias smaller than 3 cm can be repaired in the first place without the use of a prosthetic mesh, as well as any hernias that require extensive tissue dissection, such as separation of components. This technique is then suitable for open repair, but any other types of hernia that do not fall under the above category may be considered for laparoscopic repair where possible [36]. Therefore, for the success of the repair, it is necessary to be guided by recommendations that take into account the individual circumstances of each hernia and plan in advance the best method of repair. In addition, currently available evidence considers the best method of recovery with varying outcomes such as recurrence rates, associated costs, postoperative complications, and long-term outcomes [11,18,27].

Sajid 2009 demonstrated that laparoscopic incisional hernia repair is an acceptable surgical approach. The recurrence rate was the same as with the open technique, but with a shorter hospital stay and better pain tolerance. While the short-term results of both methods were promising, the study was unable to comment on long-term results similar to those of the 2011 Cochrane Review [24].

In recent years, there has been an increase in the number of biological meshes available for repair of abdominal wall hernias. Biological meshes usually consist of human, porcine or bovine derived materials. They undergo a process in which the material is decellularized and further processed. The rationale for using biological meshes is that they can act as a scaffold for native tissue ingrowth. In addition, there are absorbable synthetic meshes that have properties similar to those of biological meshes, but with theoretically less risk because they are not derived from animals or humans.

The choice of mesh for ventral hernia depends on a variety of factors, including both the properties of the mesh and its location, such as whether it will be placed intraperitoneally, preperitoneally, or retrorectally. The guiding principle is that placement of an uncoated polypropylene mesh intraperitoneally should be avoided, where it may be in direct contact with internal organs. In addition, the type of hernia defect is another factor, such as whether the wound is clean versus clean, contaminated or contaminated, and whether the repair is bridged or supported. In general, lightweight or biological meshes for defect closure should be avoided due to an increased recurrence rate [7].

CapitanoS. (2017) considers that, in open surgery, extraperitoneal mesh implantation in the sublayer is usually preferable to intraperitoneal mesh placement, following the same principles as in the "giant visceral sac replacement" described for inguinal hernia repair [6]. Miserez and Penninckx in 2002 described endoscopic total preperitoneal ventral hernia repair in a small group of 15 patients. After CO_2 insufflation, 3 trocars were introduced into the Retzius space after determining the correct retromuscular plane along the semilunar line. Blunt incision to midline. Above the arcuate line, the linea alba is dissected to expose the contralateral posterior sheath of the rectus abdominis muscle, and the dissection is carried out laterally to the contralateral semilunar line. The hernial sac is reduced, the defect of the posterior sheath of the rectus abdominis muscle and peritoneum is sutured with a continuous suture. The composite mesh was applied without fixation. The operation time was 150 minutes without blood loss. Interruption of anesthesia was on the first postoperative day and discharge on the second postoperative day. A week after the operation, an ultrasound examination was performed to determine the presence of a seroma. Although this approach will not become the gold standard, it certainly contains some innovative elements such as no mesh exposure with the abdomen and improved comfort without a fixation system.

The open retrorectal approach to incisional hernia was first developed and popularized by Rives and Stoppa. With this access, the posterior sheath of the rectus abdominis muscle is separated from the midline and rectus muscles and widely dissected to the lateral edge of the rectus muscle. This technique is relatively simple, avoids the formation of skin flaps, and can close the midline in many hernias. It also allows the use of less expensive nets such as uncoated polypropylene and eliminates the need for more expensive barrier type nets. The disadvantage of this approach is that narrow or atrophied rectus muscles limit mesh overlap and are difficult to perform if the posterior rectal space has been compromised previously. In addition, large median hernias may not heal without increased tension.

The procedure for separating the components of the transverse abdominal muscle is based on the principle of increasing the circumference of the abdominal wall by moving the muscle layers to cover the fascial defect. This approach allows reconstruction of the midline and a more functional result of the abdominal wall and can be used for large and complex hernias. It also avoids the formation of large muscle flaps that accompany the release of the external component and allows the mesh to be placed widely even to the psoas muscles. In this approach, the mesh is positioned between the posterior sheath of the rectus abdominis and rectus muscles, as well as the anterior sheath, similar to the Rives-Stoppa approach, except that the mesh extends much wider [14].

Separation of the components of the transversus abdominis muscle TAR

The main steps in this technique are:

1. Incise the posterior sheath and develop a retrorectal plane.
2. Cross the posterior sheath of the rectus abdominis and the transversus abdominis on one or both sides.
3. If necessary, turn the plane laterally to the lumbar muscles.
4. Midline advancement and closure of the posterior sheath with a continuous absorbable suture.
5. Widely place the mesh with minimal fixation of the seams.
6. Close the front shell [4].

Disadvantages of the open technique for splitting the posterior TAR component is that the neurovascular supply to the abdominal wall can be compromised unless care is taken to avoid perforation of the neurovascular vessels of the rectus abdominis that passes through the transversus abdominis. In addition, it is more technical than other methods and may lead to dissection in the wrong plane.

Recently, the largest series of separation of posterior components by the TAR procedure was reported: 428 consecutive TAR procedures were performed, 26 of which were clean and 8% were infected wounds. The hernias were large, with an average width of 15.2 cm and an area of 606 cm^2. The outcomes showed an incidence of events in the surgical area of 18.7% and infection of the surgical area of 9.1%. However, there was no mesh explantation in this series. With a mean follow-up of 31.5 months with a minimum follow-up of 1 year, 347 patients had a recurrence rate of only 3.7% [26].

There is growing interest in the use of robotic surgery for abdominal hernia repair. Initially, the robotic approach was used for primary abdominal wall hernias and uncomplicated incisional hernias, largely mimicking the standard laparoscopic approach, potentially reducing postoperative pain and length of hospital stay [29]. However, methods for robotic execution of TAR have recently been developed. The advantage of the robot in this case is the wrist-based instrumentation, which allows suturing upward towards the abdominal wall, which is very difficult to do with conventional laparoscopic instruments. Thus, this approach transforms a procedure that is usually performed open into a minimally invasive approach. In this approach, the robotic ports are placed laterally and the retrorectal plane is developed on the contralateral side, and TAR is performed on that side. The ports are then placed on the opposite side and the mesh is inserted. On this side, the mesh is fixed with 2-3 sutures to the lateral abdominal wall. The robot is then deployed to the opposite side, returning to the original access side, and the retrorectal space and TAR procedure are performed on that side. The posterior sheath of the rectus abdominis muscle is then sutured in the midline with a barbed suture. Then the anterior fascia of the rectus abdominis muscle is also sutured with a barbed suture. Finally, the mesh is unfolded across the abdomen and secured on the opposite side. The drain can be left in to prevent fluid accumulation, similar to how it is done in an open way.

WarrenJA, (2017) compared the results of laparoscopic and robotic repair of retromuscular ventral hernia. There were 103 patients in the laparoscopic group versus 53 in the robotic group [38]. Hernia width was similar between groups (6.9 vs. 6.5 cm). The rate of fascia closure was 96% in the robot group compared to 50.5% in the laparoscopy group. Mesh insertion was extraperitoneal in 96% of cases with the robotic method compared to 9.7% with laparoscopic intervention. Operation time was twice as long in the robotic group (245 verses 122 min). The rate of surgical site infection was similar (1 vs 3.8%), but the median hospital stay was only 1 day in the robotic group compared to 2 days in the laparoscopic group. Costs, however, were 50% higher in the robotic group. This area continues to evolve and requires further study to determine the indications and benefits of robotic abdominal wall hernioplasty.

Some groups also use robotic laparoscopic inguinal hernia repair with a transabdominal preperitoneal (TAPP) laparoscopic approach [1,10,39]. The main advantage of this approach is the ease of sewing the mesh in place and thus avoiding the use of a fastening device. To date, there have been no differences in pain, complication rates, and hernia recurrence, although the cost may be slightly higher than conventional laparoscopic repair.

2. Results

Patients with contaminated or purely contaminated wounds, such as the presence of an enterocutaneous fistula after hernia repair, represent a difficult patient group to manage. Evidence has recently emerged that many of these patients can be reconstructed with synthetic mesh and avoid the risk of a two-stage procedure or more. If a permanent synthetic mesh is to be used in this situation, this should preferably be done retrorectally and the mesh should be a lightweight polypropylene mesh. In this situation, PTFE meshes should be avoided due to the high infection rate. A recent meta-analysis of the literature did not reveal the advantages of a biological mesh over a synthetic one in the repair of potentially contaminated hernias [2].

Thus, hernia of the abdominal wall is a common problem in surgical practice with numerous repair options, both in terms of technique and mesh selection. Increasingly, open approaches with posterior component separation with transverse abdominal release and retrorectal mesh placement are being used for patients with complex hernias. Robotic techniques may allow these procedures to be performed laparoscopically in selected patients, although results to date are limited.

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