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CURRENT SOLUTIONS TO PROBLEMS IN THE TREATMENT OF GIANT POSTOPERATIVE HERNIAS

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Abstract:

The article presents the data of studies of the last 15 years on 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 transverse abdominal muscle components are indicated. The authors described both positive sides and disadvantages of each method. Unresolved problems are highlighted, ways to improve the results of surgical treatment of this complex pathology are outlined.

Keywords: giant postoperative hernias, laparoscopy, abdominal wall, nanotechnology

INTRODUCTION. The incidence of ventral hernias can be as high as 13% after abdominal wall surgery[21, 23]. Risk factors that increase the likelihood of developing these hernias are wound infection, male gender, obesity, abdominal bloating, underlying disease process and sometimes poor surgical suture[1,7,12]. Postoperative hernia is associated with significant complications such as pain, intestinal obstruction, strangulation and ischaemia of hernia contents. Despite improvements in repair techniques, there is still significant morbidity and even mortality [9]. Surgery is the only method of repair [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. Management of patients with postoperative hernias can be extremely challenging due to a number of factors including obesity, prior hernia repair, previous mesh placement, and other variables. The management of patients with postoperative hernias has changed significantly over the past 20 years due to both technological advances and improved surgical approaches. Modification of preoperative risk factors such as smoking cessation and weight loss, selection of mesh appropriate to the type of hernia and planned mesh placement, and wide mesh overlap beyond the edges of the hernia defect are key factors in successful outcome. Newer techniques such as transabdominal release and component separation with retrorectal mesh placement and robotic abdominal wall hernia accesses are increasingly being used in these patients.

Approximately 350000 ventral hernia repairs are performed annually in the United States. While the majority of these are primary umbilical or epigastric hernias, approximately 150000 are postoperative hernias. This places a significant burden on the health care system. Furthermore, the results are far from ideal, with a reoperation rate of 12.3% after 5 years and up to 23% after 10 years [12].

In the United Kingdom, over 120000 laparotomies are performed each year and subsequently over 7000 post-operative hernias are performed. This represents almost 6%, but the actual incidence of postoperative hernia may be higher as this figure does not take into account patients who chose not to consider surgery or did not attend for personal or medical reasons[2,5]. Given this morbidity and the morbidity and mortality associated with the condition and recovery techniques[3,11], it is clear that the choice of the ideal plastic surgery technique is critical.

In the past, many postoperative hernia repairs have been performed as primary sutures. A landmark prospective randomised controlled trial reported by Burger in 2004 evaluated the results of postoperative hernia repair with primary suture and mesh [5].There were 97 patients in the suture repair group and 84 patients in the mesh repair group. The recurrence rate after 10 years was 67% in the suture plasty group compared to 32% in the mesh plasty group. In univariate analysis, risk factors for recurrence included previous abdominal aortic aneurysm plasty and wound infection. Of note, in this study, recurrences appeared up to 10 years after surgery, including mesh plasty. The

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conclusions from this study were that mesh should be used in the vast majority of patients undergoing postoperative hernia repair today.

Some early data showed that laparoscopic post-operative hernia repair had a number of disadvantages: longer operative time, costs associated with the provision of equipment and the use of specialised instruments and mesh. However, a number of studies have shown that in experienced hands, laparoscopic correction takes the same amount of time as open correction[13, 23]. Cost-effectiveness analyses have also shown that the cost of laparoscopic postoperative hernia repair is comparable to open postoperative hernia repair, even without considering the benefits to patients, such as early hospital discharge and early return to work[8].

Laparoscopic postoperative 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 lower complication rates compared to the open method[16]. Currently, only massive tissue defect with complete loss of abdominal muscular structure is considered unsuitable for laparoscopic access [20].

Despite improvements in hernioplasty over the last two decades in terms of overall technique, the results remain unsatisfactory according to many specialists. Postoperative hernias sutured with primary sutures have recurrence rates ranging from 12% to 54%[12, 15], whereas the recurrence rate of mesh plasty can be as high as 36%[3, 17]. In addition, the insertion of a foreign body such as prolene mesh can lead to serious adverse effects such as pain, infection, fistula, intestinal damage and intestinal adhesions[22]. New models of mesh products have evolved over time, with more emphasis on manufacturing characteristics to avoid the aforementioned complications. Laparoscopic plasty was recognised as a reliable alternative to open hernia repair and has been widely practised ever since.

The laparoscopic approach involves a minimal access technique with multiple incisions for the use of laparoscopic instruments. The technique does not involve repair of the fascial defect; rather, the defect is closed with mesh with or without hernia sac reduction. Careful and meticulous dissection is fundamental for safe surgery with fewer complications such as seroma, infection, bleeding and bowel injury. Some reports have reported improved outcomes of laparoscopic postoperative hernia repair with a very low recurrence rate of 4.3% and fewer wound complications compared to open technique[2,8,10].

There is insufficient evidence to support the superiority of one method of plasty over the other. The effectiveness and efficiency of laparoscopic plasty compared to the open technique is insufficient. It is still unclear whether one plastic technique is superior to another[34], and it is unknown whether one plastic technique is more appropriate for certain types of hernia than another. Clinical guidelines from the Society for Surgery of the Digestive Tract (SSAT 2005) have shown that hernias less than 3 cm can be repaired first without the use of prosthetic mesh, as well as any hernia that requires extensive tissue dissection, such as component separation. This technique is then suitable for open plasty, but any other types of hernia that do not fall into the above category can be considered for laparoscopic plasty where possible[3,6]. Consequently, guidelines should be tailored to the individual circumstances of each hernia and the best method of plasty should be planned in advance for the success of plasty. In addition, current evidence considers the best method of repair with various outcomes such as recurrence rate, associated costs, postoperative complications and long-term results[11,18,21].

Sajid 2009 demonstrated that laparoscopic postoperative hernia repair is an acceptable method of surgical access. The recurrence rate was similar to open technique but with shorter hospital stay and better pain tolerance. Although the short-term results of both techniques were promising, the study could not comment on long-term outcomes similar to those of the 2011 Cochrane review[2,4].

In recent years, there has been an increase in the number of biological meshes available for abdominal wall hernia repair. Biological meshes are usually composed of materials derived from human, pig or cattle.They undergo a process where the material is decellularised and further processed.The rationale for the use of biological meshes is that they can act as a framework for ingrowth of native tissue. There are also resorbable synthetic meshes that have similar properties to biological meshes, but with theoretically less risk as they are not derived from animals or humans. The choice of mesh for ventral hernia depends on many 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 uncovered polypropylene mesh intraperitoneally, where it may be in direct contact with internal organs, should be avoided. 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 plasty is performed with a bridge or with support. In general, lightweight or biologic mesh should be avoided for

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defect closure because of the increased recurrence rate [7].

CapitanoS. (2017) believes that in open surgery, extraperitoneal mesh implantation into the sublayer is usually preferred over intraperitoneal placement, following the same principles as the "giant visceral sac prosthesis" described for inguinal hernia repair[6]. Miserez and Penninckx in 2002 described endoscopic total preperitoneal preperitoneal hernia repair in a small group of 15 patients. After CO2 insufflation, 3 trocars were inserted into Retzius' space after determining the correct retromuscular plane along the semilunar line. Blunt dissection up to the midline. Above the arcuate line, the white line of the abdomen is dissected to open the contralateral posterior vagina of the rectus abdominis muscle, and dissection is performed laterally to the contralateral semilunar line. The hernia sac is repositioned, and the defect of the posterior vagina of the rectus abdominis and peritoneum is sutured with continuous sutures. Composite mesh was applied without fixation. The operative time was 150 min without blood loss. Interruption of anaesthesia was on the first postoperative day and discharge on the second postoperative day. One week after surgery, ultrasonography was performed to determine the presence of seroma. Although this approach will not become the gold standard, it certainly contains some innovative elements such as no exposure of the mesh with abdominal exposure and improved comfort without a fixation system.

The open retrorectal approach to postoperative hernia repair was first developed and popularised by Rives and Stoppa. In this access, the posterior vagina of the rectus abdominis is separated from the midline and rectus muscles and widely dissected to the lateral edge of the rectus muscle. This method is relatively simple, avoids skin flap formation, and allows midline closure for many hernias. It also allows the use of less expensive mesh, such as uncoated polypropylene, and eliminates the need for more expensive barrier-type mesh. The disadvantage of this access is that tight or atrophied rectus muscles limit mesh overlap and it is difficult to perform if the posterior rectus abdominis has been previously compromised. In addition, large midline hernias may not fuse without increased tension. The transverse abdominal muscle component separation procedure is based on the principle of increasing the circumference of the abdominal wall by moving the muscle layers to overlap the fascial defect. This approach allows midline reconstruction and a more functional abdominal wall result and can be used for large and complex hernias. It also avoids the large muscle flaps that accompany the release of the external component and allows for wide mesh placement even up to the lumbar muscles. In this approach, the mesh is placed between the posterior sheath of the rectus abdominis and rectus abdominis muscles and the anterior sheath, similar to the Rives-Stoppa approach, except that the mesh extends much wider [14].

Separation of the components of the transverse abdominal muscle by TAR

The main steps of this technique are as follows:

1. Incise the posterior introducer and develop the retroperitoneal plane.
2. Transect the posterior vagina of the rectus abdominis and the transverse abdominal muscle on one or both sides.
3. Develop the plane laterally to the lumbar muscles if necessary.
4. Extend along the midline and close the posterior introducer with continuous absorbable suture.
5. Wide mesh placement with minimal suture fixation.
6. Close the anterior sheath [4].

The disadvantages of the open technique for dissection of the posterior component of the TAR are that the neurovascular blood supply to the abdominal wall can be compromised if care is not taken to avoid perforation of the neurovascular vessels of the rectus abdominis muscle, which passes through the transverse abdominal muscle. It is also more technically challenging than other techniques and may result in dissection in the wrong plane.

Recently, the largest series of posterior component dissection using 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 cm2. Outcomes showed a surgical site event rate of 18.7% and surgical site infection of 9.1%. However, there was no mesh explantation in this series. With a median follow-up period of 31.5 months with a minimum follow-up period of 1 year in 347 patients, the recurrence rate was only 3.7% [2,6].

There is increasing interest in the use of robotic surgery for abdominal hernia repair. Initially, robotic access was used for primary abdominal wall hernias and uncomplicated postoperative hernias, mainly mimicking standard laparoscopic access, potentially reducing postoperative pain and length of hospitalisation [29]. However, robotic techniques for performing TAR have recently been developed. The advantage of the robot in this case is the wrist instrumentation, which allows suturing upwards towards the abdominal wall, which is very difficult to do with conventional laparoscopic

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instruments. Thus, this approach turns 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 this side. The ports are then placed on the contralateral side and the mesh is inserted. On this side, the mesh is secured with 2-3 sutures to the lateral abdominal wall. The robot is then deployed on the opposite side, returning to the side of initial access, and a retrorectal space and TAR procedure is performed on this side. The posterior vagina of the rectus abdominis muscle is then sutured along the midline with barbed suture. Then the anterior fascia of the rectus abdominis muscle is also sutured with barbed suture. Finally, the mesh is unwrapped across the abdomen and secured on the opposite side. A drain can be left in place to prevent fluid accumulation, similar to the open approach.

WarrenJA, (2017) compared the results of laparoscopic and robotic retromuscular ventral hernia repair. 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 incidence of fascia closure was 96% in the robotic group compared to 50.5% in the laparoscopy group. Mesh placement was extraperitoneal in 96% of cases with the robotic method compared to 9.7% with laparoscopic intervention. The operative time was twice as long in the robotic group (245 verses 122 min). The incidence of surgical site infection was similar (1 vs 3.8%), but the median length of hospitalisation was only 1 day in the robotic group compared with 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 transabdominal anteroposterior (TAPP) laparoscopic access[1, 10, 39]. The main advantage of this approach is the facilitation of in situ mesh suturing and thus eliminating the use of a stapling device. To date, no differences in pain, complication rates and hernia recurrence have been noted, although the cost may be slightly higher than conventional laparoscopic plasty.

Patients with contaminated or purely contaminated wounds, such as the presence of an intestinal-cutaneous fistula after hernia repair, are a challenging group of patients to manage. There is recent evidence that many of these patients can be repaired with synthetic mesh and avoid the risk of a two-stage procedure or more. If 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. PTFE mesh should be avoided in this situation because of the high infection rate. A recent meta-analysis of the literature showed no advantage of biological mesh over synthetic mesh in the repair of potentially contaminated hernias [2].

CONCLUSIONS: In summary, abdominal wall hernia is a common problem in surgical practice with numerous plasticity 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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