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An Overview on Laprascopic Fixation of Mesh

Ahmed M.A. Yehia, Amr Abdelbaset Abdelaziz, Mahmoud Mohamed Ahmed Amin Alshoubaky, Mohamed Mahmoud Almeniawy

General Surgery Department, Faculty of Medicine, Zagazig University, Egypt

***Corresponding author:** Mahmoud Mohamed Ahmed Amin Alshoubaky

Abstract:

Background: Laparoscopic inguinal hernia repair has become one of the most widely performed procedures in general surgery because of its advantages in reducing postoperative pain, shortening recovery time, and lowering recurrence rates. Mesh reinforcement is considered the standard technique for hernia repair; however, the method of mesh fixation remains controversial due to its impact on postoperative outcomes, particularly chronic groin pain, recurrence, inflammation, and mesh migration. Various fixation methods have been introduced, including sutures, tissue glues, self-fixating meshes, and absorbable or non-absorbable tacks. Tissue adhesives such as fibrin and cyanoacrylate glues provide atraumatic fixation with reduced risk of nerve entrapment, whereas tacks offer strong fixation strength but may increase postoperative morbidity through tissue injury and inflammatory reactions. Despite the availability of multiple fixation techniques, no consensus has yet been established regarding the optimal method for laparoscopic mesh fixation in inguinal hernia repair.

Keywords: Laparoscopic inguinal hernia repair; Mesh fixation; Tissue glue; Tacks; Fibrin glue; Cyanoacrylate glue; Chronic groin pain; Hernioplasty.

Introduction:

Abdominal wall hernia is a common clinical manifestation in general surgery, with a prevalence of 4% for people over 45 years of age and 1.7% for all ages. Seventy-five percent of abdominal wall hernias are inguinal hernias. While most inguinal hernias have a slow natural course and result in mild to moderate discomfort. However, occasionally they may cause severe complications such as bowel obstruction or strangulation. Inguinal hernia repair ranks among the most performed surgical procedure in general surgery, with up to 80,000 procedures per year in the UK alone, and over 20 million procedures worldwide **(1)**.

In the early 1990s, laparoscopic approaches to the inguinal canal emerged. However, the posterior anatomy of the groin remained poorly understood and the laparoscopic view of this region was virtually unknown to most surgeons. The adoption of laparoscopic technique without a firm anatomic understanding resulted in several intra- and postoperative complications including vascular, visceral, and nerve injuries as well as high recurrence rates **(2)**.

The basic anatomical principles of laparoscopic hernioplasty were first described by Spaw AT and Spaw LP in 1991 based on human cadaveric dissections**.** They coined the term “Triangle of Doom” delineating the region between the vas deferens and the spermatic vessels; however, he did not specifically consider the neuroanatomy of the preperitoneal space **(2)**.

Inguinal hernia repair with a mesh is the mostly common method through surgical procedure. Among the surgical risk factors are the type of mesh and its fixation technique. The current type of mesh including different materials and surgical options for mesh fixation include (but are not limited to) sutures, tacks or staples, self-fixing meshes and fibrin or other glues. Chronic groin pain is the one of the main problems after surgery, however, laparoscopic techniques have better results in chronic groin pain. Besides, there is a continuing increase in the number of laparoscopic procedures performed since their introduction using mesh in the late 1991 **(3).**

Different types of mesh fixation for laparoscopic repair of inguinal hernia:

Inguinal hernia repair is one of the most common procedures in surgical practice. In the surgical repair of groin hernia prosthetic meshes and their fixation have been subject to debate, In the last decades synthetic meshes have become crucial in surgical treatment of inguinal hernia. Once positioned meshes are designed to be integrated in local tissue by a fibrotic reaction that gradually incorporates them. Therefore, a good fixation is essential to secure the mesh in its correct position while the integration process occurs **(4).**

The synthetic meshes and their proper fixation has reduced recurrence rates to below 5%. As a consequence, the most frequent postoperative morbidities have become mesh migration, chronic pain, infection and seroma.

In surgical practice the main challenge in mesh fixation consists in finding a good balance between the strength of fixation, in order to avoid recurrence and the risk of tissue trauma and nerve entrapment which leading to chronic pain. At present various fixation techniques and materials have been developed, but no unanimous consent has been reached on the best method of fixation. The choice is still based on surgeon‘s preferences and experience, and much still depends on local habits and personal beliefs **(5).**

- **Tissue glues**

Tissue adhesives have been introduced in medical practice during the 1960s. Since then, they have been used in numerous procedures like skin closure, suture reinforcement, arteriovenous embolization, endoscopic treatment of ulcers, varices and fixation of meshes in abdominal wall defect repair **(6).**

Two types of tissue adhesive for mesh fixation are available in surgical practice:

- **Fibrin glues:**

It is made of four components: human purified fibrinogen, bovine atropine solution, human thrombin and calcium chloride. Alongside its hemostatic action, the fibrinogen component gives the product tensile strength and adhesive properties. It also promotes fibroblast proliferation. These are mixed at the time of fixation to duplicate the terminal coagulation reaction and generate polymerized fibrin. Once applied to the mesh 3 minutes may be required to complete the reaction **(7).**

- **Cyanoacrylic tissue glues:**

Cyanoacrylate tissue glues (synthetic or hybrid) provide rapid, strong adhesion to biological tissues, forming a tight seal within seconds on contact with blood or moisture. Glubran-2 has lower polymerization temperature than Histoacryl, leading to less toxicity and inflammation. There is no clear evidence favoring one glue over another for mesh fixation in inguinal hernia repair, but glue use is more expensive than sutures **(4).**

- **Tacks:**

Tack fixation has been performed since the introduction of laparoscopic inguinal and ventral hernia repair between the late 1980s and the early 1990s. In current practice three types of tacks are commonly used divided into two categories: absorbable and non-absorbable **(8)**.

A. Non absorbable tacks:

1. Helical titanium tacks:

It is a laparoscopic device, which places a helical coil into the fascia and muscle of the anterior abdominal wall. The tack itself has a helical shape measures 4 mm in length and 3 mm in width, and penetrates approximately 3–4 mm into these tissues. To be placed correctly tacks must be placed 1–1.5 cm apart along the periphery of the mesh **(9).**

2. Helical non titanium tacks:

These tacks are made of polyacetal, a molded, polymer-based material. It is a permanent hollow tack with non-traumatic tip, 6.7 mm long **(10).**

B. Absorbable tacks:

These tacks are made of polymers or copolymers (poly (D, L) lactide or glycolide-co-L-lactide). They measure between 6.4 and 6.7 mm and adsorb in 12–16 months.Overall, tacks provide an excellent fixation strength and they are also easy to apply. Nevertheless, their use is associated with significant morbidity. The penetration of the abdominal wall in fact may cause nerve and vessel entrapment. Also, tacks are themselves foreign bodies introduced in the abdomen, so they may cause inflammatory reactions. As a result, a significant number of patients suffer from pain and develop adhesion in the postoperative period. Moreover, cases of migration of titanium tacks have been described. At present absorbable tacks are connected to lower inflammation rates, adhesion formation and migration so the use of titanium tacks is no longer advisable (**4).**

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