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An Overview on Hernial Repair

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Abstract:

Background: Inguinal hernia repair is one of the most frequently performed surgical procedures worldwide. The use of prosthetic mesh has significantly reduced recurrence rates; however, the optimal method of mesh fixation remains controversial due to its association with postoperative complications such as chronic pain, seroma, and infection. Both open and laparoscopic techniques are widely used, each with distinct advantages. Open Lichtenstein repair is favored for its simplicity and cost-effectiveness, while laparoscopic approaches, particularly the transabdominal preperitoneal (TAPP) technique, offer reduced postoperative pain and faster recovery. Various fixation methods, including sutures, tackers, and glue, have been developed to achieve an optimal balance between secure mesh placement and minimizing tissue trauma.

Keywords: Inguinal hernia, mesh fixation, Lichtenstein repair, laparoscopic hernia repair, TAPP, sutures, tackers, postoperative pain, recurrence

Introduction:

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 (**1**).

The introduction of synthetic meshes, and their proper fixation has reduced recurrence rates to below 5%. Consequently, 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, to avoid recurrence and the risk of tissue trauma and nerve entrapment, leading to chronic pain (**2**)

Open technique:

Groin hernioplasty is the most common operation in general surgery. Due to its lower costs, shorter operating times, and reduced complication risks, the open Lichtenstein technique is performed more frequently. Lichtenstein hernia repair, in fact, is simple, safe, and easy to learn, with very good results in terms of morbidity and a very low recurrence rate. Both sutures (absorbable and nonabsorbable) and glues (fibrin and cyanoacrylic) can be used to seal the mesh to the abdominal wall. According to standard operating technique, once the mesh is placed and adjusted, the upper edge is kept in place with two or three sutures, one to the rectus sheath and the others to the internal oblique aponeurosis (**1**).

Laparoscopic Technique:

Laparoscopic inguinal hernia repair has become a cornerstone of minimally invasive surgery, offering advantages such as reduced postoperative pain, faster recovery, and lower recurrence rates compared to open techniques in certain cases (**3**).

The Transabdominal Preperitoneal (TAPP) approach is a minimally invasive laparoscopic technique for inguinal hernia repair that combines intraperitoneal access with preperitoneal mesh placement (**4**).

Access Involves entering the peritoneal cavity to access the preperitoneal space, allowing visualization of the hernia sac, myopectineal orifice (MPO), and abdominal cavity. Reinforces the posterior inguinal wall by placing a prosthetic mesh in the preperitoneal space, covering the MPO. The peritoneal flap is reapproximated after mesh placement to isolate the mesh from intra-abdominal contents (**5**).

Procedure

Supine position with slight Trendelenburg tilt to allow bowels to retract cephalad. Typically, three ports (umbilical camera port and two lateral working ports). Inspect the peritoneal cavity for contralateral hernias, adhesions, or other pathology. A semicircular incision is made in the peritoneum overlying the hernia site to create a peritoneal flap. This provides access to preperitoneal space (**6**).

Blunt and sharp dissection separates the peritoneum from the underlying structures (e.g., spermatic cord, transversus abdominis aponeurosis) to expose the MPO. The hernia sac is carefully reduced, and any adhesions are lysed (**7**).

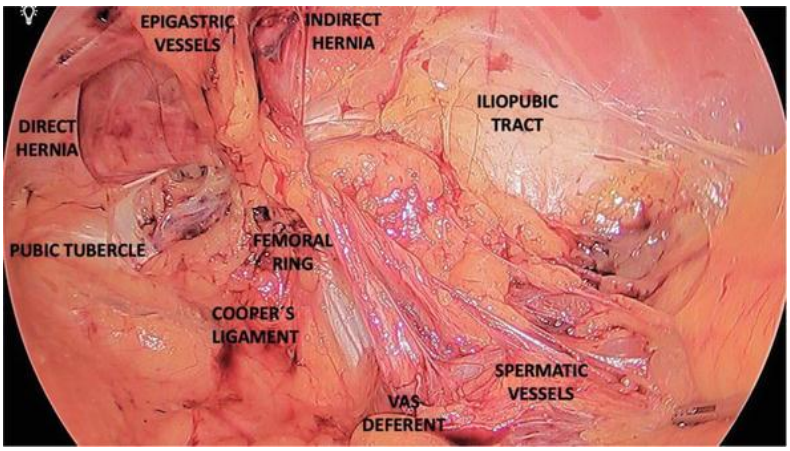

Figure 1: Complete inguinal dissection (**1**).

Mesh Placement: A polypropylene mesh (usually 10–15 cm in size) is inserted through the umbilical port and positioned to cover the MPO, medial to the epigastric vessels and lateral to the pubic tubercle (**8**).

Mesh Fixation: Options include tacks, sutures, or fibrin glue. Fixation ensures the mesh remains in place to prevent recurrence (**9**).

The peritoneal flap is closed with sutures, clips, or energy devices to separate the mesh from the abdominal cavity (**10**).

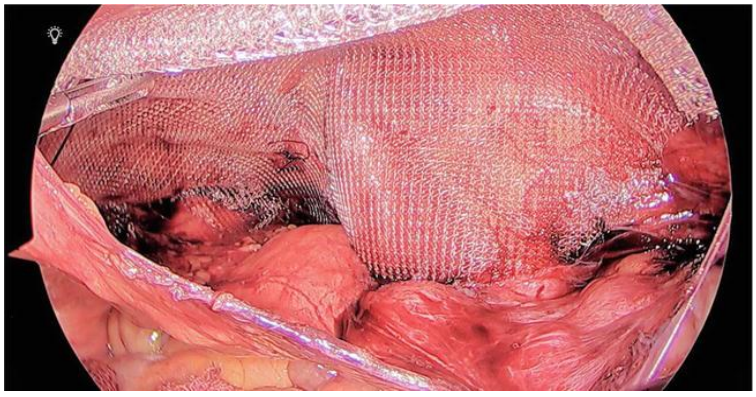

Figure 2: Mesh configuration (**1**).

Tacker Fixation

Mesh Placement: After reducing the hernia sac and dissecting the preperitoneal space, a synthetic mesh (≥10x12 cm) is positioned to cover the myopectineal orifice.

Types of Tacks: Absorbable (e.g., AbsorbaTack®) or non-absorbable (e.g., titanium helical tacks).

Placement: Tacks are spaced 1–1.5 cm apart along the mesh periphery, avoiding the "triangle of pain" (iliopubic tract, gonadal vessels) and "triangle of doom" (external iliac vessels)

Device Use: A laparoscopic tacker device is inserted through a 5 mm port, and tacks are deployed under direct vision (**1**).

Suture Fixation

Mesh Placement: Like tacker fixation, the mesh is positioned over the hernia defect.

Suturing Method: Absorbable (Vicryl), Non-absorbable (e.g., Prolene®) sutures.

Interrupted Sutures: 2–3 sutures are placed medially (rectus sheath) and laterally (Cooper's ligament) using intracorporeal knot-tying. **Running Sutures:** For peritoneal closure, a barbed suture (e.g., V-Loc™) may be used in a horizontal mattress pattern (**11**).

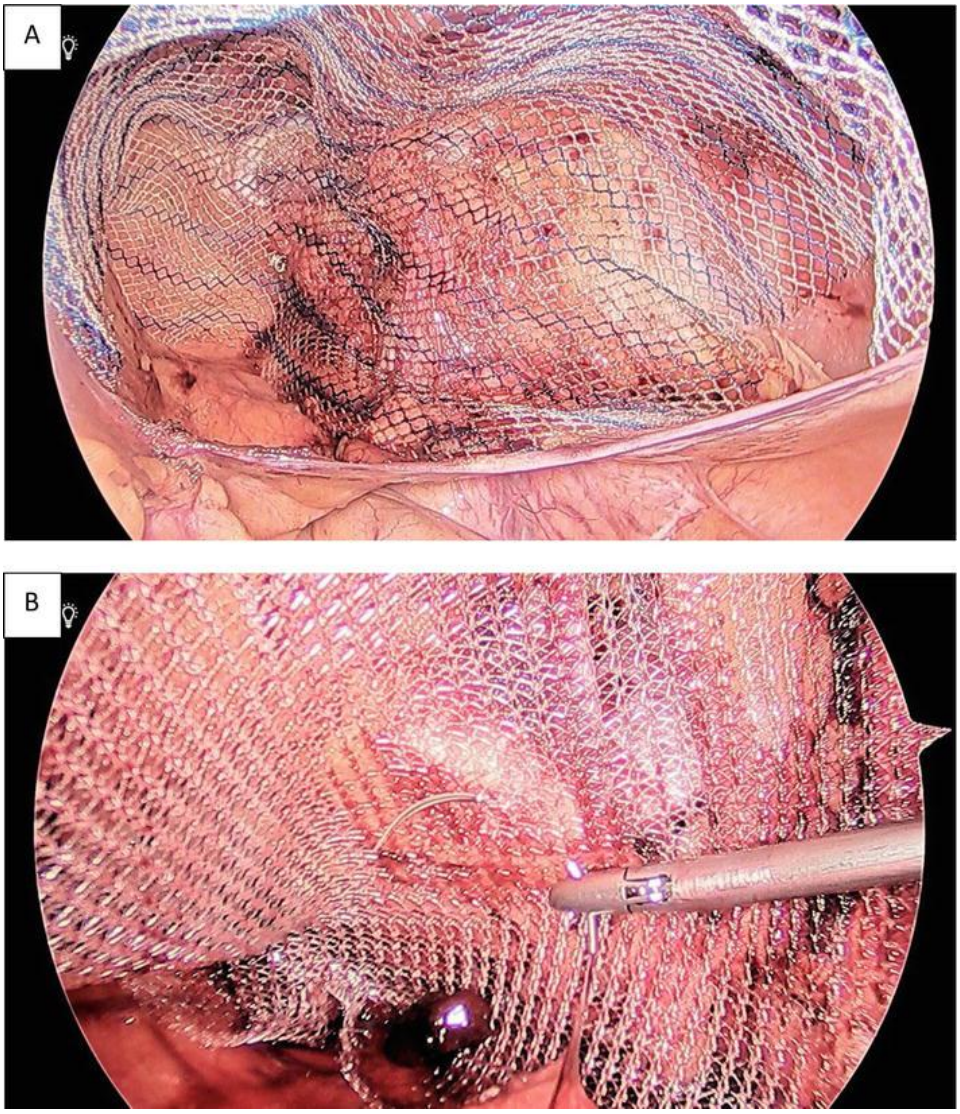

Figure 3: Fix mesh either with tackers (A) or stitches (B) (**1**).

References:

1. Burati, M., Scaini, A., Fumagalli, A., et al. (2019). Mesh Fixation Methods in Groin Hernia Surgery. Hernia Surgery [Working Title].
2. Wang See, C., Kim, T., and Zhu, D. (2020). Hernia Mesh and Hernia Repair: A Review. *Engineered Regeneration*, *1*, 19–33.
3. Xie, J., Koo, C., Lee, J., and Sugiyama, G. (2024). The evolution of minimally invasive inguinal hernia repairs. *Annals of Laparoscopic and Endoscopic Surgery*, *9*(0).
4. Xuan, N. T., and Son, N. H. (2020). Laparoscopic Transabdominal Preperitoneal Technique for Inguinal Hernia Repair in Adults. *Cureus*, *12*(6), e8692.
5. Lorenz, A., Augustin, C., Konschake, M., et al. (2022). The Preperitoneal Space in Hernia Repair. *Frontiers in Surgery*, *9*, 869731.
6. Skolimowska-Rzewuska, M., Romanczuk, M., Mitura, B., Wyrzykowska, D., and Mitura, K. (2022). Laparoscopic transabdominal preperitoneal repair (umbilical TAPP) versus open ventral patch repair for medium size umbilical hernias in overweight and obese patients. *Videosurgery and Other Miniinvasive Techniques*, *17*(1), 170.
7. Narayanan, S., and Davidov, T. (2018). Peritoneal pocket hernia: A distinct cause of early postoperative small bowel obstruction and strangulation: A report of two cases following robotic herniorrhaphy. *Journal of Minimal Access Surgery*, *14*(2). https://pmc.ncbi.nlm.nih.gov/articles/PMC5869977/
8. Ploneda-Valencia, F., Bautista-López, A., Navarro-Montes, A., et al.(2021). Minimally Invasive Surgery of the Groin: Inguinal Hernia Repair. *The Art and Science of Abdominal Hernia*.
9. Takegawa, Y., Tsutsumi, N., Yamanaka, K., and Koga, Y. (2024). Impact of different fibrin glue application methods on inguinal hernia mesh fixation capability. *Scientific Reports*, *14*(1), 1–6.
10. Trindade, E. N., Martins, E. F., and Trindade, M. R. M. (2022). Titanium clips for closure of the peritoneal flap during laparoscopic inguinal hernia repair. *Arquivos Brasileiros de Cirurgia Digestiva : ABCD*, *35*, e1676.
11. Mathes, T., Prediger, B., Walgenbach, M., and Siegel, R. (2021). Mesh fixation techniques in primary ventral or incisional hernia repair. *The Cochrane Database of Systematic Reviews*, *2021*(5), CD011563.