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INGUINAL HERNIA:RECENT APPROACHES

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ABSTRACT

A hernia represents a pathological condition characterized by the protrusion of visceral structures through a congenital or acquired defect in the musculofascial layer intended to contain them. Most abdominal hernias involve the displacement of intra-abdominal organs or adipose tissue through regions of compromised myofascial integrity in the abdominal wall. Herniation may develop insidiously due to age-related cumulative structural degeneration of connective tissues or acutely secondary to traumatic injury, iatrogenic factors (e.g., post-surgical dehiscence), or congenital fascial defects such as patent processus vaginalis.An inguinal hernia, the most prevalent variant, occurs when abdominal contents—typically omentum or intestinal segments—herniate through a compromised region of the inguinal canal, often due to weakness in the transversalis fascia or conjoint tendon. Clinical manifestations may include a palpable, reducible mass in the inguinal region accompanied by discomfort exacerbated by Valsalva maneuvers (e.g., coughing, heavy lifting) due to transient increases in intra-abdominal pressure. While symptomatic presentations frequently involve localized pain or pressure, many hernias remain asymptomatic with incidental detection, underscoring the importance of vigilant physical examination for timely intervention. An inguinal hernia, while not inherently life-threatening, represents a persistent anatomical defect with negligible potential for spontaneous resolution1. Left unaddressed, it carries a risk of progression to complications such as incarceration or strangulation, wherein herniated viscera become entrapped within the fascial defect, precipitating vascular compromise, ischemic necrosis, and potential perforation—a surgical emergency. Consequently, symptomatic presentations (e.g., localized pain, progressive enlargement, or functional impairment) typically warrant elective herniorrhaphy to mitigate morbidity. This procedure, involving reinforcement of the inguinal floor with synthetic mesh or autologous tissue, ranks among the most frequently performed interventions in general surgery. Contemporary approaches prioritize minimally invasive techniques, such as laparoscopy, to reduce postoperative recovery time and recurrence rates, though open repair remains indicated in select cases. Abdominal wall hernias are common, with a prevalence of 1.7% for all ages and 4% for those aged over 45 years. Inguinal hernias account for 75% of abdominal wall hernias, with a lifetime risk of 27% in men and 3% in women2. In the past decade hernia surgery has been challenged by two new technologies: by laparoscopy, which has attempted to change the traditional open operative techniques, and by prosthetic mesh, which has achieved much lower recurrence rates. The demand by health care providers for increasingly efficient and cost-effective surgery has resulted in modifications to pathways of care to encourage more widespread adoption of day case, outpatient surgery, and local anaesthesia3.

HISTORY OF INGUINAL HERNIA SURGERY

The evolution of inguinal hernia repair has been profoundly shaped by pioneering innovations in surgical methodology. Edoardo Bassini revolutionized herniology in the late 19th century by introducing a groundbreaking anterior open technique that emphasized anatomical reconstruction of the myopectineal orifice, establishing a foundational paradigm for decades. His approach, with subsequent modifications, dominated surgical practice until the advent of posterior compartment-based strategies.In 1959, Lloyd M. Nyhus conceptualized the preperitoneal (posterior) approach, a transformative framework that enabled access to the retroinguinal space via an infraumbilical incision. This innovation laid the groundwork for transabdominal preperitoneal prosthetic mesh implantation (TAPP), first performed laparoscopically by M. Arregui in 1992 using polypropylene mesh to achieve tension-free fascial reinforcement. Concurrently, Irving Lichtenstein's seminal 1986 description of open anterior mesh hernioplasty redefined standards by eliminating tissue approximation under tension, a principle now synonymous with the Lichtenstein technique.The extraperitoneal approach gained further refinement through the contributions of Edward H. Phillips, who in 1993 formalized the terminology for retroperitoneal hernia repair. However, it was J. Dulucq who perfected the totally extraperitoneal (TEP) technique, leveraging laparoscopic precision to avoid peritoneal cavity entry. Presently, three tension-free methodologies—TAPP, TEP, and Lichtenstein—prevail as gold standards, complemented by the Shouldice procedure, which employs multilayered sutured reconstruction under tension for select cases. These advancements collectively epitomize the integration of prosthetic biomaterials and minimally invasive principles in modern herniorrhaphy.

Types of Hernia Can Be Seen Below-

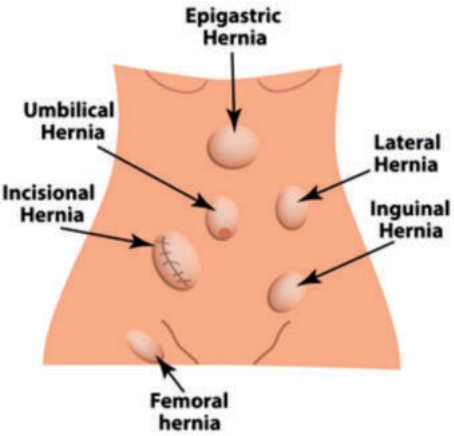

Fig.1.Types of Hernia

Recent Developments In Hernia Surgery

Open Hernia Repair or Open Herniorrhaphy:

Open hernia repair is conducted under general anesthesia, ensuring complete sedation. Preoperative prophylactic antibiotics are administered to mitigate infection risk. A strategic incision is made over the hernial site, followed by layered dissection through subcutaneous, fascial, and muscular planes to access the hernial sac.The sac is incised to inspect its contents—commonly omentum, bowel, or occasionally bladder components in pelvic hernias. Herniated viscera are meticulously reduced into the peritoneal cavity, and the sac is either excised or ligated. A synthetic mesh prosthesis is anchored over the fascial defect using non-absorbable sutures to reinforce the abdominal wall. Musculofascial layers are reapproximated with absorbable sutures, followed by subcutaneous closure. The dermal layer is secured with absorbable sutures, obviating the need for suture removal, and a sterile dressing is applied.

Postoperative Expectations

- Hospitalization: Typically entails a 24-hour observation period, though ambulatory discharge may be feasible for select patients meeting recovery criteria.
- Pain Management: Transient incisional discomfort emerges post-anesthesia, managed effectively with oral NSAIDs or opioid analgesics as indicated.
- Wound Care: Absorbable subcuticular sutures negate removal. A 7-day postoperative evaluation assesses for erythema, discharge, or dehiscence. Uncomplicated healing permits discontinuation of dressings.
- Activity Resumption: Gradual return to ambulation and light duties is encouraged within 4 weeks, with strict avoidance of heavy lifting (>10 lbs) or strenuous exertion during this period. Progressive resumption of physical labor is permitted after 4 weeks, contingent on patient tolerance.

Potential Complications

- Hemorrhage: Minor intraoperative bleeding is typical; clinically significant hematoma formation is rare (<1%).
- Surgical Site Infection (SSI): Superficial or deep incisional infections (2–5% incidence) necessitate culture-guided antibiotic therapy, with rare cases requiring debridement.
- Seroma: Localized fluid collections may develop subcutaneously, often resolving spontaneously. Symptomatic cases require ultrasound-guided aspiration.
- Chronic Post-Herniorrhaphy Pain (CPHP): Neuropathic pain persisting >6 weeks (5–10% incidence) may require multimodal analgesia, including gabapentinoids or targeted nerve blocks.
- Recurrence: Modern mesh-based techniques yield recurrence rates of 1–2%, predominantly linked to technical factors or patient comorbidities (e.g., obesity, smoking).

This procedural framework underscores adherence to tension-free principles, optimizing outcomes through anatomic reinforcement and evidence-based perioperative protocols.

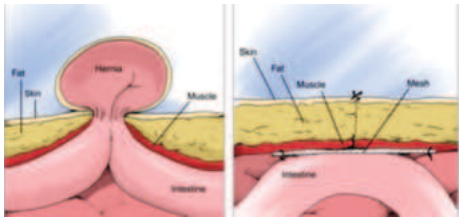

Fig.2- Courtesy-Dr.Andrew Kiu, Adelaide, Australia

Laparoscopic Approach or Totally Extraperitoneal (TEP) Hernia Repair:

The TEP approach represents the minimally invasive laparoscopic herniorrhaphy of choice, performed exclusively under general anesthesia. The procedure commences with a subumbilical incision (approximately 2 cm) to introduce a balloon dissection trocar into the preperitoneal plane. Controlled balloon inflation facilitates dissection of the avascular space between the transversalis fascia and parietal peritoneum, thereby creating an operative field distinct from the intraperitoneal viscera. Following balloon extraction, a blunt-tipped laparoscopic cannula is inserted, and carbon dioxide pneumoinsufflation (12–15 mmHg) is initiated to maintain spatial expansion for endoscopic visualization.Subsequent bilateral 5-mm trocar placements are made under direct laparoscopic guidance in the lower abdominal quadrants, permitting insertion of atraumatic graspers, dissectors, and mesh applicators. The hernial defect is meticulously reduced, with polypropylene mesh deployed in the preperitoneal space to reinforce the myopectineal orifice. Biomechanically, intra-abdominal hydrostatic pressure and myofascial contraction synergistically stabilize the prosthesis, achieving tension-free repair via a "underlay" technique. Closure involves aspiration of insufflated gas, infiltration of long-acting local anesthetic (e.g., bupivacaine) into the dissected space, and systematic trocar removal. The fascial layer at the umbilical incision is reapproximated with absorbable sutures, while dermal closures utilize subcuticular techniques.

Key Anatomical and Procedural Nuances:

- Avoidance of peritoneal breach preserves the integrity of the abdominal cavity, reducing visceral injury risk.
- Mesh fixation (e.g., fibrin sealant, absorbable tacks) may augment adherence in complex defects.
- Sterile technique and perioperative antimicrobial prophylaxis (e.g., cephalosporins) mitigate prosthetic infection risks.

Advantages of Laparoscopic Herniorrhaphy (Totally Extraperitoneal Approach):

1. Minimally Invasive Incisions: Subumbilical and bilateral paramedian incisions (≤5 mm) result in reduced cicatrization and expedited postoperative convalescence.
2. Enhanced Functional Recovery: Accelerated return to baseline activities compared to open herniorrhaphy, with activity restrictions limited only by subjective discomfort.
3. Biomechanical Superiority: Intra-abdominal positioning of polypropylene mesh provides preperitoneal reinforcement, leveraging intracoelomic pressure and myofascial tension for optimal stabilization—analogous to tension-free prosthetic bridging.
4. Reduced Neurovascular Trauma: Minimized dissection lowers iatrogenic injury to ilioinguinal, iliohypogastric, and genitofemoral nerves, as well as epigastric vasculature.
5. Analgesia Benefits: Diminished postoperative pain due to avoidance of extensive tissue disruption, managed effectively with multimodal analgesia.

Disadvantages of Laparoscopic Herniorrhaphy:

1. Anesthetic Requirements: Mandatory general endotracheal anesthesia, precluding use in high-risk cardiopulmonary cohorts.
2. Contraindications: Relative exclusion for patients with extensive hernial defects (e.g., scrotal involvement) or prior intra-abdominal interventions (e.g., laparotomy, pelvic surgery) due to peritoneal adhesions or limited working space.

Potential Perioperative Complications:

1. Anesthetic Morbidity: Rare hypersensitivity reactions (e.g., anaphylaxis) or hemodynamic collapse (e.g., asystole), mitigated by preprocedural optimization and vigilant intraoperative monitoring.
2. Hemorrhagic Events: Unintended injury to inferior epigastric, corona mortis, or aberrant obturator vessels may necessitate emergent conversion to laparotomy.
3. Prosthetic-Related Sequelae:

- Recurrence: Incidence <5%, attributable to inadequate

mesh overlap or fixation.
- Infection: Prosthetic mesh infection (<1%) despite perioperative antibiotic prophylaxis (e.g., cefazolin) and aseptic protocols; may require explantation and delayed repair.

4. Chronic Postoperative Pain: Neuropathic or myofascial etiology, managed via stepwise pharmacotherapy (NSAIDs, gabapentinoids) or interventional nerve blocks.

Technical Considerations:
- Balloon-Assisted Preperitoneal Dissection: Utilizes a dilatory balloon trocar for atraumatic creation of the Retzius space, avoiding peritoneal violation.
- Pneumoinsufflation: Carbon dioxide insufflation (12–15 mmHg) optimizes laparoscopic visualization and instrument maneuverability.

CONCLUSION

The totally extraperitoneal (TEP) herniorrhaphy stands as a preeminent minimally invasive modality for inguinal hernia repair, combining anatomical precision with biomechanical integrity. By leveraging preperitoneal dissection and intra-abdominal pressure dynamics, this technique achieves durable prosthetic reinforcement of the myopectineal orifice while circumventing peritoneal entry, thereby minimizing visceral trauma and postoperative morbidity. Its advantages—including reduced neurovascular injury, expedited convalescence, and superior mesh stabilization—position TEP as a preferred approach for uncomplicated hernias in suitable candidates. However, its reliance on general anesthesia, technical complexity in cases of extensive defects or prior abdominal surgery, and rare but consequential risks (e.g., mesh infection, recurrence) underscore the necessity for judicious patient selection and adherence to aseptic protocols.In contrast, open surgical approaches such as the Lichtenstein tension-free mesh repair, Shouldice tissue-based technique, or Stoppa preperitoneal mesh placement remain indispensable for patients with contraindications to laparoscopy, including large or incarcerated hernias, extensive adhesions, or cardio-pulmonary limitations precluding general anesthesia. Open methods offer direct visualization of the inguinal anatomy and are often preferred in resource-limited settings due to lower technical demands and cost.Hernias, regardless of repair strategy, carry inherent risks of complications such as bowel obstruction, strangulation, recurrence, and chronic groin pain secondary to nerve entrapment or inflammatory adhesions. Mesh-related complications, including seroma formation, fibrosis, or migration, further highlight the criticality of meticulous surgical technique and postoperative surveillance[4].Ultimately, the choice between laparoscopic (e.g., TEP) and open hernia repair hinges on patient-specific factors, hernia characteristics, and surgical expertise. Both modalities aim to restore abdominal wall integrity while mitigating complications, with evolving innovations in biomaterials and robotic-assisted systems poised to enhance precision and outcomes. A patient-centered, evidence-driven approach remains paramount in optimizing long-term success and quality of life in hernia management.

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