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**Review Article**

# Reconstructing the Wall: A Modern Review of the Global Burden, Biological Basis, and Breakthroughs in Hernia Management

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## Abstract

Hernias remain one of the most frequently encountered surgical conditions worldwide, with more than 20 million hernia repairs performed annually. Inguinal hernias constitute nearly 75% of all abdominal wall hernias, with a significantly higher lifetime risk in men (27%) than in women (3%). Innovations in mesh technology, minimally invasive techniques, and enhanced recovery pathways have transformed outcomes, reducing recurrence rates from 20–30% in the pre-mesh era to approximately 1–5% with contemporary mesh-based repairs. Despite these advances, complications such as chronic postoperative pain still affect 10–12% of patients. This review synthesizes current evidence on the epidemiology, pathophysiology, risk factors, diagnostic strategies, and evolving surgical approaches in hernia management, highlighting global trends and future directions.

**Keywords:** Hernia, Abdominal wall defects, Mesh repair, Laparoscopic repair, TEP, TAPP, Surgical outcomes, Recurrence rates, minimally invasive surgery.



## INTRODUCTION

A hernia is defined as the abnormal protrusion of an organ or tissue through a weakened area in muscle or fascia. Hernias continue to pose a significant clinical and economic burden worldwide, with increasing prevalence driven by aging populations, obesity, and physically demanding occupations. Over the years, hernia repair has evolved from traditional tissue-based techniques to tension-free mesh repairs and advanced minimally invasive procedures. These innovations have notably improved patient recovery, reduced postoperative pain, and lowered recurrence rates.

### Epidemiology

- Globally, more than 20 million hernia surgeries are performed each year.
- Inguinal hernias represent nearly three-fourths of all abdominal wall hernias.
- Lifetime risk of inguinal hernia:
  - **Men:** 27%
  - **Women:** 3%
- Incisional hernias occur in 10–20% of abdominal surgeries, particularly after midline incisions.
- Emergency hernia surgeries are associated with 5–10% mortality, especially in elderly patients.

### Pathophysiology

Herniation results from an imbalance between abdominal wall strength and intra-abdominal pressure.

### Key Biological Mechanisms

- Impaired collagen cross-linking
- Altered collagen ratio (↑ Type III / ↓ Type I)
- Muscle degeneration and atrophy
- Connective tissue disorders
- Defective wound healing post-surgery (particularly in incisional hernias)

These abnormalities compromise abdominal wall integrity, increasing susceptibility to hernia formation.

### Risk Factors

#### 1. Patient-related Factors

- Advancing age
- Male sex
- Obesity and sedentary lifestyle
- Smoking (reduces collagen synthesis)
- Chronic cough (COPD), constipation, prostatism
- Connective tissue disorders
- Pregnancy and multiparity

**2. Surgery-related Factors (Incisional Hernia)**

- Emergency procedures
- Postoperative wound infection
- Midline incisions
- Inadequate suture technique
- Suboptimal closure of fascia

**Clinical Features**

- Visible or palpable swelling
- Dull ache, pain, or dragging sensation
- Symptoms worsen with coughing, lifting, or straining
- Irreducibility in complicated hernias

**Signs of Complications**

- **Incarceration**
- **Obstruction**
- **Strangulation** – severe pain, vomiting, tenderness, absent bowel sounds

**Diagnosis:** Diagnosis is primarily clinical.

**Adjunct Investigations**

- **Ultrasound:** Useful for small or occult hernias
- **CT scan:** Gold standard for complex, recurrent, or incisional hernias
- **MRI:** Preferred for pregnant women, athletes, or soft-tissue evaluation

**Types of Hernias**

1. **Inguinal Hernia** (Indirect, Direct) – Most common
2. **Femoral Hernia** – Higher risk of strangulation
3. **Umbilical & Paraumbilical Hernia** – Associated with obesity, pregnancy
4. **Incisional Hernia** – Post-surgical defect
5. **Ventral & Epigastric Hernias**
6. **Rare Hernias:** Spigelian, Obturator, Lumbar, Diaphragmatic

**Management**

**Conservative**

- Watchful waiting (mainly for minimally symptomatic inguinal hernias)
- Hernia belts or trusses (temporary support, not curative)

**Surgical Management (Definitive Treatment)**

**1. Open Hernia Repair**

- Lichtenstein tension-free mesh repair (gold standard)
- Bassini and Shouldice repairs (limited use today)

**2. Laparoscopic Repair**

- TAPP (Transabdominal Preperitoneal)
- TEP (Totally Extraperitoneal)

**Benefits:**

- Less postoperative pain
- Faster recovery and early return to work
- Reduced wound complications

**3. Robotic Hernia Repair**

- Increasing adoption in developed countries
- Offers enhanced visualization and precision
- High-cost limits widespread use

**4. Mesh Innovations**

- Lightweight and large-pore meshes
- Self-fixating meshes
- Biologic and absorbable meshes

Modern mesh techniques have reduced recurrence rates to 1–5%, compared with 20–30% in historical tissue repairs.

**Complications**

- Seroma
- Hematoma
- Wound infection
- Chronic groin pain (10–12%)
- Mesh infection (rare but serious)
- Recurrence (1–5% with modern methods)

**Recent Advances**

- Robotic-assisted ventral hernia repair
- 3D and anatomically contoured meshes
- Enhanced Recovery After Surgery (ERAS) protocols
- Dynamic abdominal wall imaging
- Component separation techniques for large or complex defects

## CONCLUSION

Hernias represent a substantial global health concern due to their high incidence, associated complications, and economic implications. The shift toward tension-free repairs, minimally invasive techniques, and advanced mesh technologies has dramatically improved outcomes. Optimal patient care requires early diagnosis, personalized surgical planning, and adherence to evidence-based guidelines. Ongoing research and technological innovation promise further refinement in hernia repair and postoperative recovery.

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