ABDOMINAL WALL RECONSTRUCTION

Decision Algorithms, Operative Principles and Posterior Component Techniques

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A Practical Surgical Handbook

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This handbook reflects the author’s surgical approach based on current evidence, international guidelines, and clinical experience.
It is intended for educational purposes and should not replace individualized clinical judgment.

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PREFACE

Abdominal wall reconstruction has evolved into a distinct and highly specialized field of modern surgery. What was once considered a straightforward closure of a fascial defect is now understood as a complex biomechanical and reconstructive challenge, requiring structured decision-making, anatomical precision, and long-term functional thinking.

The heterogeneity of abdominal wall defects—ranging from small primary umbilical hernias to large incisional hernias with loss of domain, stoma-related defects, and contaminated operative fields—demands more than a single technique. It requires an integrated framework that connects defect morphology, patient-specific mechanical risk, operative planes, and reconstructive principles into a coherent surgical strategy.

This handbook was created as a practical guide for everyday clinical use. Its purpose is to provide a clear algorithmic approach to abdominal wall reconstruction, emphasizing posterior component techniques, fascial closure whenever feasible, disciplined mesh overlap, and a minimal fixation philosophy aimed at reducing chronic pain and improving functional outcomes.

The content is designed to serve both as an educational foundation for trainees and as a standardized reference for surgical teams implementing consistent reconstructive pathways in clinical practice. Where high-level evidence and international guidelines provide strong recommendations, they are reflected directly. Where evidence remains limited, the text offers transparent, mechanically driven surgical reasoning based on contemporary reconstructive concepts.

Ultimately, the goal of this work is to support safe, durable, and reproducible abdominal wall reconstruction, integrating technical execution with long-term structural and functional success.

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LIST OF ABBREVIATIONS

AHS — Americas Hernia Society
BMI — Body Mass Index

CS — Component Separation

CT — Computed Tomography

EHS — European Hernia Society

eTEP — extended Totally Extraperitoneal
eTEP-RS — extended Totally Extraperitoneal Retrorectus Surgery

ECF — Enterocutaneous Fistula

GA — General Anesthesia

IPOM — Intraperitoneal Onlay Mesh

LoD — Loss of Domain

MIDLINE — Midline Abdominal Wall Defect

MRI — Magnetic Resonance Imaging

PP — Polypropylene (Mesh)

RS — Retrorectus Space

SSI — Surgical Site Infection

TAPP — TransAbdominal PrePeritoneal Repair

TAR — Transversus Abdominis Release

TARM — TransAbdominal RetroMuscular Repair

TEP — Totally Extraperitoneal Repair

VHWG — Ventral Hernia Working Group (Contamination Grading)

CHAPTER 1

Introduction: Modern Abdominal Wall Reconstruction

1.1. Abdominal Wall Hernias as a Reconstructive Disease

Abdominal wall hernias are among the most common conditions treated in general surgery. However, despite their frequency, the true complexity of abdominal wall reconstruction is often underestimated. Hernia surgery is no longer understood as a simple closure of a fascial gap. Instead, it represents a distinct reconstructive discipline focused on restoring structural integrity, function, and long-term durability of the abdominal wall.

A ventral or incisional hernia should not be viewed merely as a “hole in the fascia,” but rather as a manifestation of broader biomechanical failure, influenced by:

- collagen and tissue quality
- impaired wound healing
- chronic mechanical overload
- loss of midline tension balance
- progressive widening of the defect over time

As a result, the surgical goal extends beyond defect closure toward true anatomical and functional restoration.

1.2. The Evolution of Hernia Repair Concepts

Historically, hernia repair was dominated by suture-based techniques. While effective in selected cases, these repairs demonstrated significant recurrence rates, especially in the presence of:

- larger defects
- obesity
- increased intra-abdominal pressure
- postoperative tissue weakness
- recurrent hernias

The introduction of prosthetic mesh revolutionized outcomes by distributing forces across a larger area and reinforcing the abdominal wall beyond the defect margins.

More recently, the field has shifted further toward:

- posterior component techniques
- retromuscular reconstruction
- restoration of the linea alba
- avoidance of traumatic fixation

- biomechanically driven repair planning

This evolution reflects a transition from “hernia closure” to “abdominal wall reconstruction.”

1.3. The Central Objectives of Reconstruction

Modern abdominal wall reconstruction pursues several core objectives:

1. **Durable structural repair**
   Minimizing recurrence through adequate reinforcement.
2. **Functional restoration of the midline**
   Re-establishing the linea alba and dynamic abdominal wall mechanics.
3. **Optimization of mesh integration**
   Ensuring proper placement, overlap, and tissue incorporation.
4. **Reduction of wound complications**
   Particularly in obese or high-risk patients.
5. **Prevention of chronic pain**
   By minimizing fixation trauma and respecting neuroanatomy.

These objectives require a systematic reconstructive strategy rather than a technique-driven or defect-only approach.

1.4. Why Posterior Reconstruction Has Become Dominant

One of the most important developments in contemporary hernia surgery is the increasing preference for posterior abdominal wall planes, including:

- preperitoneal repairs
- retrorectus reconstruction
- TARM and eTEP-RS techniques
- TAR for large defects
- posterior parastomal reconstruction (Pauli concept)

Posterior repairs offer several critical advantages:

- mesh placement away from subcutaneous tissues
- reduced interface seroma risk
- excellent biomechanical reinforcement
- avoidance of intraperitoneal contact with bowel
- decreased reliance on fixation devices

These approaches represent the foundation of modern reconstructive algorithms.

1.5. The Need for Structured Decision Algorithms

The abdominal wall presents a wide spectrum of defects:

- small primary umbilical hernias
- medium incisional defects
- massive loss-of-domain hernias
- stoma-associated structural weakness
- contaminated reconstructions with enterocutaneous fistulas

No single procedure is appropriate for all patients.

Therefore, reconstruction must be algorithmic, based on:

- defect size thresholds
- mechanical risk and patient factors
- required mesh overlap
- achievable operative planes
- contamination and soft tissue status
- long-term functional goals

This handbook provides such a structured framework, integrating international guideline consistency with practical operative reasoning.

1.6. Scope and Purpose of This Handbook

The purpose of this text is to provide:

- clear decision pathways for all major abdominal wall defects
- operative step-by-step techniques for posterior reconstruction
- technical principles emphasizing overlap discipline and minimal fixation
- complication management based on mechanism, not routine
- implementation tools for departmental standardization

The content is designed for:

- surgical trainees developing reconstructive understanding
- experienced hernia surgeons seeking reproducible algorithms
- surgical teams implementing consistent abdominal wall pathways

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1.7. Conclusion

Abdominal wall reconstruction is a reconstructive discipline defined by anatomical restoration, biomechanical planning, and long-term functional success. Posterior component strategies, disciplined mesh principles, and algorithm-based decision-making have become the cornerstone of modern practice.

The next chapter introduces the fundamental operative principles that form the foundation of all subsequent techniques described in this handbook.

CHAPTER 2

Core Principles of Hernia Repair

2.1. Hernia Repair as Biomechanical Reconstruction

The modern understanding of hernia surgery is rooted in biomechanics. A hernia represents a failure of the abdominal wall as a load-bearing structure, not simply an isolated anatomical gap.

The abdominal wall must constantly withstand:

- respiratory motion
- coughing and Valsalva maneuvers
- posture changes
- physical activity
- chronic elevated intra-abdominal pressure

Therefore, hernia repair must restore the abdominal wall as a functional unit, capable of transmitting forces across a stable midline.

A successful reconstruction requires:

- anatomical continuity
- durable reinforcement
- correct load distribution
- preservation of abdominal wall dynamics

2.2. Fascial Closure as the Primary Goal

One of the central principles of abdominal wall reconstruction is:

> **Fascial closure should be achieved whenever feasible.**

Bridging repairs—where a mesh spans the defect without restoring fascial continuity—may provide temporary coverage but do not restore functional mechanics.

Consequences of non-closure include:

- loss of midline tension balance
- bulging and reduced abdominal wall function
- increased seroma risk
- higher recurrence rates in the long term

Therefore, closure of the linea alba remains the foundation of reconstruction.

Exception:
Bridging may be acceptable only as an extreme salvage or palliative solution when closure is

impossible and patient physiology prohibits escalation.

2.3. Posterior Plane Dominance

Modern abdominal wall reconstruction increasingly favors posterior anatomical planes, including:

- preperitoneal space
- retrorectus space (Rives–Stoppa plane)
- posterior component separation
- TAR plane expansion
- posterior parastomal conduit reconstruction

These planes provide several advantages:

- strong fascial boundaries
- excellent tissue incorporation
- reduced mesh exposure to subcutaneous tissue
- separation of mesh from intra-abdominal organs
- lower wound complication risk compared with anterior onlay repairs

Posterior placement is therefore not simply a technical preference, but a quality marker of reconstruction.

2.4. Mesh-Based Reinforcement as Standard

Suture-only repair is associated with significantly higher recurrence rates, particularly when any of the following apply:

- defect size exceeds 1 cm
- tissue quality is poor
- the patient is physically active
- obesity or chronic coughing is present
- the hernia is incisional or recurrent

For this reason:

> **Mesh reinforcement is considered the default strategy in abdominal wall reconstruction.**

Suture repair may be selectively considered only for very small defects (<1 cm) under low mechanical risk conditions.

2.5. Overlap Discipline: The 3 cm vs 5 cm Rule

Mesh reinforcement is not defined solely by the presence of an implant, but by the quality of its integration.

One of the most critical determinants of durability is overlap.

This handbook applies two practical thresholds:

- **≥3 cm overlap**
  Primary small umbilical and epigastric hernias
- **≥5 cm overlap**
  Large defects, incisional hernias, recurrent repairs

These thresholds provide a simple and reproducible rule for surgical planning:

- Small primary defects require proportional reinforcement
- Large or weakened defects require maximal structural anchoring

Overlap cannot be replaced by fixation.

2.6. Mesh Position Matters More Than Mesh Type

Although mesh material choice is important, the anatomical plane of placement is often more influential than the implant itself.

Preferred positions include:

- preperitoneal
- retrorectus
- TAR-expanded posterior planes

These locations provide:

- vascularized tissue coverage
- reduced infection risk
- minimized bowel contact
- improved biomechanical performance

Intraperitoneal placement should be avoided when posterior reconstruction is achievable.

2.7. Minimal Fixation Philosophy

A defining operative principle in contemporary reconstruction is:

> **Mesh fixation should be avoided whenever possible.**

Traumatic fixation with tackers or transfascial sutures contributes to:

- chronic neuralgia
- postoperative pain syndromes
- localized ischemia
- increased foreign body reaction

In posterior repairs, mesh stability is achieved through:

- correct anatomical containment
- adequate overlap
- fascial closure
- tissue compression between layers

Fixation is reserved only for exceptional circumstances where anatomical stability cannot be ensured.

2.8. Special Considerations: Stoma and Conduit Geometry

A permanent stoma represents a structural defect of the abdominal wall even in the absence of a clinically apparent parastomal hernia.

In reconstructions involving:

- midline incisional defects
- permanent end stomas

posterior conduit reinforcement principles (Pauli concept) may be required to:

- protect the stoma site
- ensure continuous overlap geometry
- prevent future parastomal failure

Thus, reconstruction must consider the entire abdominal wall unit, not only the primary defect.

2.9. Contamination Does Not Eliminate Reconstruction

Complex abdominal wall cases may involve:

- enterocutaneous fistulas
- chronic contamination
- prior infection
- stoma-related bacterial exposure

The modern approach is not to avoid mesh indefinitely, but to manage timing and plane selection.

Key principle:

> **The question is not "mesh or no mesh," but rather "single-stage or staged reconstruction."**

Definitive repair still relies on durable synthetic reinforcement when the field is controlled.

2.10. Complication Prevention as a Structural Concept

Postoperative complications often reflect geometric and mechanical factors.

Examples:

- Seroma is frequently a consequence of dead space or sac cavity persistence
- Chronic pain often reflects fixation trauma
- Recurrence results from inadequate overlap or insufficient plane choice

Thus, complication prevention is embedded in operative design, not postoperative reaction.

2.11. Summary of Core Principles

All subsequent chapters and operative techniques in this handbook are based on five foundational rules:

1. **Fascial closure whenever feasible**
2. **Posterior plane reconstruction as preferred strategy**
3. **Mesh-based repair as the standard**
4. **Overlap discipline: 3 cm vs 5 cm**
5. **Minimal fixation to reduce chronic pain**

These principles define reconstruction quality and guide technique selection across all defect types.

CHAPTER 3

Decision-Making Framework and Global Classification

3.1. The Need for an Algorithmic Approach

Abdominal wall defects represent one of the most heterogeneous surgical disease groups. Unlike many operations with a single dominant technique, hernia reconstruction requires individualized planning.

Defects vary widely according to:

- anatomical location,
- size and geometry,
- tissue quality,
- contamination status,
- recurrence history,
- patient-specific biomechanical demands.

As a result:

> No single repair technique is universally appropriate.

A structured decision-making framework ensures consistency, durability, and reproducibility across surgical practice.

3.2. The Five-Axis Classification Concept

All abdominal wall reconstructions in this handbook are based on five fundamental classification axes:

1. **Defect Location**
2. **Defect Size Thresholds**
3. **Primary vs Incisional vs Recurrent Pathology**
4. **Field Condition (Clean vs Contaminated)**
5. **Special Populations and Modifying Factors**

This approach supports algorithm-based technique selection rather than preference-driven variation.

3.3. Axis I — Defect Location

The first and most immediate determinant in abdominal wall reconstruction is the anatomical region involved. Hernia location defines:

- the reconstructive unit,
- the achievable operative planes,
- mesh geometry and overlap feasibility,
- fixation constraints,
- and the mechanical environment of the defect.

Location is therefore not simply descriptive — it is fundamentally decision-making.

A. Inguinal Hernias

Groin hernias represent a distinct anatomical and biomechanical entity involving the myopectineal orifice.

Key considerations include:

- anterior vs posterior groin pathology,
- primary vs recurrent disease,
- suitability for laparoscopic posterior repair.

Standard strategy:

- **laparoscopic TAPP repair** as the default technique,
- anterior repair (Lichtenstein) reserved for selected exceptions.

B. Primary Midline Hernias

Primary midline hernias include:

- umbilical hernias,
- epigastric hernias,
- defects associated with linea alba weakness.

These are typically localized failures of the midline fascia, often occurring in otherwise intact abdominal walls.

Management depends strongly on defect width:

- small (<3 cm) → preperitoneal reinforcement,
- larger (>4 cm) → posterior retromuscular reconstruction.

C. Incisional Midline Hernias

Incisional hernias result from postoperative failure of fascial healing and represent a broader zone of tissue weakness.

They are characterized by:

- impaired collagen integrity,

- progressive enlargement over time,
- higher recurrence risk,
- need for reconstruction rather than simple closure.

Standard approaches include:

- TARM/eTEP-RS for moderate defects,
- TAR-based reconstruction for large defects and LoD.

D. Parastomal and Stoma-Associated Defects

Stoma-related defects involve conduit geometry and structural interruption of the abdominal wall.

Key principles:

- the stoma site represents a permanent weak point,
- overlap is geometrically constrained,
- posterior conduit reinforcement is often required.

Standard strategy:

- posterior reconstruction using **Pauli repair principles**,
- applied both therapeutically (parastomal hernia) and prophylactically (permanent stoma with midline reconstruction).

E. Complex Abdominal Wall Failure

Complex abdominal wall failure includes cases with:

- loss of domain,
- multiple previous repairs,
- chronic fistulas or contamination,
- combined midline and lateral defects.

These cases require individualized escalation strategies, often combining:

- TAR,
- stoma-related reinforcement,
- staged contamination control,
- advanced soft tissue management.

F. Anatomically Difficult Hernia Zones (Complex Locations)

Not all ventral hernias occur in standard midline positions. Certain anatomical regions represent high-complexity zones where overlap, plane development, and reconstruction mechanics are constrained.

These include:

1. Lateral Abdominal Wall Hernias

- flank and semilunar line defects
- limited retrorectus continuity
- proximity to neurovascular bundles
- higher bulging risk

2. Subcostal Hernias

- near costal margin and diaphragm
- restricted superior overlap
- significant respiratory boundary forces

3. Suprapubic Hernias

- inferior overlap limited by pubic bone
- require dissection into Retzius space
- mesh anchoring often necessary at Cooper's ligament

4. Subxiphoid Hernias

- restricted cranial overlap at the sternum
- constant motion zone
- frequent recurrence after patch repairs

5. Other Rare Complex Sites

- lumbar hernias
- traumatic abdominal wall defects
- open abdomen sequelae

In such zones, recurrence is often driven by geometry rather than defect size alone.

3.4. Axis II — Defect Size Thresholds

Defect width is one of the most practical escalation parameters.

Umbilical/Epigastric Thresholds

Width	Recommended Strategy
<1 cm	Selective suture repair if recurrence risk is low
1–3 cm	Mesh repair mandatory, overlap ≥3 cm
3–4 cm	Grey zone — individualized approach

Width	Recommended Strategy
>4 cm	Posterior retromuscular repair (TARM/eTEP-RS)
>10–12 cm	Open TAR ± adjuncts

Incisional Thresholds

Width	Reconstruction Level
5–8 cm	TARM / eTEP-RS standard
>10–12 cm	TAR-based reconstruction
LoD present	TAR + adjunct planning

Defect size defines required mesh width and whether retrorectus space is sufficient.

3.5. Axis III — Primary vs Incisional vs Recurrent Hernias

Hernia origin has major implications.

Primary Hernias

- localized fascial failure
- generally better tissue environment

Incisional Hernias

- broad healing failure zone
- progressive enlargement
- higher recurrence risk

Recurrent Hernias

- altered planes and scar tissue
- mandate for posterior or alternative-plane repair

Key principle:

> Recurrence requires a change of operative plane whenever feasible.

3.6. Axis IV — Field Condition: Clean vs Contaminated

Operative field condition determines timing and staging.

Clean Field

- standard posterior reconstruction
- polypropylene mesh as default

Controlled Contamination

- stable fistula
- no sepsis or abscess
- single-stage reconstruction possible with full posterior barrier

Uncontrolled Contamination

- active infection
- abscess or severe soft tissue compromise

→ staged approach required

Key principle:

> Definitive reconstruction still relies on durable mesh once the field is controlled.

3.7. Axis V — Special Modifying Factors

Certain populations modify algorithm thresholds:

Women of Childbearing Age

- staged suture repair or pregnancy-compatible reinforcement

Obesity

- favors minimally invasive posterior approaches
- lap TAPP umbilical if open plane is unreliable

Diastasis Recti

- requires linea alba restoration and extended reinforcement

Permanent Stoma

- structural weak point even without parastomal hernia
- Pauli conduit principles applied to ensure adequate overlap

Loss of Domain

- may require TAR and adjunct measures (botulinum)

3.8. Global Reconstruction Decision Tree (Conceptual Overview)

Algorithmic sequence:

1. Identify location
2. Measure defect width
3. Define pathology (primary/incisional/recurrent)
4. Assess contamination
5. Apply modifiers (stoma, obesity, pregnancy, diastasis)
6. Select reconstruction level
7. Apply core principles: closure, overlap, posterior plane, minimal fixation

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3.9. Technique Escalation Ladder

Reconstruction follows an escalation logic:

- small primary defect → open preperitoneal mesh
- obesity or technical limitation → lap TAPP umbilical
- defect >4 cm or incisional weakness → TARM/eTEP-RS
- defect >10–12 cm or LoD → Open TAR
- permanent stoma → posterior conduit principles (Pauli)

Escalation is driven by overlap feasibility, not by label alone.

3.10. Summary

Abdominal wall reconstruction is best performed within a structured framework based on:

- location,
- size thresholds,
- pathology type,
- field condition,
- special modifiers.

This classification supports consistent decision-making and forms the foundation for all region-specific algorithms presented in the next chapters.

CHAPTER 4

Inguinal Hernias

4.1. Introduction

Inguinal hernias represent the most common form of abdominal wall herniation. Although anatomically distinct from ventral and incisional defects, groin hernias follow the same fundamental reconstructive principles:

- durable reinforcement,
- avoidance of tension,
- optimal plane selection,
- and minimization of chronic pain.

The inguinal region is defined by the **myopectineal orifice**, a biomechanical weak point through which all groin hernias emerge. Modern groin surgery has evolved toward posterior reinforcement techniques, with laparoscopic repair now widely considered the preferred standard for most patients.

4.2. Anatomy and Hernia Classification

Inguinal hernias occur through weakness in the groin barrier and may present as:

- **Indirect (lateral)** — through the internal ring
- **Direct (medial)** — through posterior wall failure
- **Femoral** — below the inguinal ligament
- **Combined defects** — involving multiple zones

From a reconstructive standpoint, the goal is not simply reduction of the sac, but reinforcement of the entire posterior groin weakness.

4.3. European Hernia Society (EHS) Classification

The European Hernia Society (EHS) classification provides a standardized anatomical framework based on **defect location and size**.

Hernias are categorized as:

- **L (Lateral)** — indirect inguinal hernia
- **M (Medial)** — direct inguinal hernia
- **F (Femoral)** — femoral hernia

Each type is graded by defect width:

- **Grade 1** — <1.5 cm
- **Grade 2** — 1.5–3 cm
- **Grade 3** — >3 cm

Examples:

- **L1** — small indirect hernia
- **M3** — large direct hernia
- **F2** — moderate femoral defect

This classification is clinically important because large medial defects (M3) behave as broad posterior wall failures and carry higher recurrence potential.

4.4. Standard Strategy: Posterior Laparoscopic Repair

The default technique in this handbook is:

> **Laparoscopic TAPP repair as first-line management for most inguinal hernias.**

TAPP provides:

- complete coverage of the myopectineal orifice,
- access to the posterior plane,
- low recurrence rates,
- faster functional recovery,
- reduced risk of chronic anterior groin pain.

In addition, laparoscopy allows identification of:

- bilateral defects,
- occult femoral hernias,
- combined pathology.

4.5. Operative Principles of Groin Reconstruction

All inguinal repairs should follow essential reconstructive principles:

1. **Wide posterior coverage** of the myopectineal orifice
2. **Adequate overlap** beyond all weakness zones
3. **Flat mesh placement without folding**
4. **Minimal traumatic fixation whenever possible**
5. **Protection of neurovascular structures**

Mesh fixation is generally avoided, particularly in pain-sensitive regions.

4.6. Mesh Fixation Strategy and Cooper's Ligament

In most routine laparoscopic inguinal repairs, mesh fixation is unnecessary when:

- overlap is adequate,
- placement is flat,
- the plane is correct.

However, fixation may be justified in selected high-risk defects.

Fixation is considered in:

- **large medial defects (M3)**
- **large lateral defects (L3)**
- combined wide posterior wall collapse
- femoral hernias with inferior displacement risk

Preferred anchoring structure:

- **Cooper's ligament**, providing a safe and mechanically stable fixation point.

Key principle:

> Fixation may be selectively required for stability in large grade 3 defects, particularly inferiorly at Cooper's ligament, but it should remain minimal and strategic.

Fixation must never substitute for correct plane dissection or sufficient overlap.

4.7. Indications for Anterior Repair (Lichtenstein)

Although laparoscopic posterior repair is standard, anterior repair remains appropriate in selected situations.

Open Lichtenstein repair is reserved for:

- **giant scrotal hernias** requiring scrotoplasty or extensive anterior dissection
- patients **not eligible for general anesthesia**
- selected elderly patients with large medial collapse (**M3 defects**)
- situations where laparoscopy is not feasible or safe

These indications reflect anatomical or physiological constraints rather than routine preference.

4.8. Giant Scrotal Hernias

Massive inguinoscrotal hernias present unique challenges:

- loss of domain within the scrotum
- complex sac dissection
- need for skin management

- potential bowel adhesions

In these cases, open anterior repair is often the most practical approach.

Reconstruction remains mesh-based, with emphasis on definitive reinforcement.

4.9. Repair in Patients Unfit for General Anesthesia

Patients with severe cardiopulmonary disease may not tolerate general anesthesia.

In this context:

- open anterior mesh repair under regional or local anesthesia remains a valuable option.

The goal is safe reinforcement with minimal physiological burden.

4.10. Management of Recurrent Inguinal Hernias (Plane-Switch Principle)

Recurrence mandates a change in operative plane.

Recurrence after anterior repair (e.g., Lichtenstein)

→ treat posteriorly:

- **laparoscopic TAPP repair**

This avoids scarred anterior tissues and reduces nerve injury risk.

Recurrence after posterior repair (TAPP/TEP)

→ treat anteriorly:

- **open Lichtenstein repair**

Re-entry into the posterior space carries increased risk due to fibrosis, mesh incorporation, and vascular injury potential.

Key rule:

> **Anterior recurrence → posterior repair**
> **Posterior recurrence → anterior repair**

This plane-switch strategy is fundamental in recurrent groin hernia management.

4.11. Large Defects and EHS Grade 3 Hernias

Large defects such as:

- **M3** (large direct hernia)
- **L3** (large indirect hernia)

carry increased recurrence risk due to:

- broad posterior wall collapse

- higher mesh displacement forces
- inferior weakness near the femoral canal

In such cases:

- limited fixation at Cooper's ligament is acceptable
- extensive tack fixation should still be avoided
- overlap and correct posterior plane remain primary determinants of durability

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4.12. Chronic Pain Prevention

Chronic postoperative groin pain is one of the most significant long-term complications.

Major contributors include:

- tack fixation near nerves
- transfascial sutures
- excessive dissection
- mesh folding or contraction

Therefore:

- fixation is minimized,
- neuroanatomical zones are respected,
- anatomical containment is prioritized.

4.13. Summary

Inguinal hernia repair within this handbook follows a consistent reconstructive strategy:

- **TAPP as the default posterior approach**
- **Lichtenstein reserved for specific exceptions**
- **Plane-switch principle for recurrences**
- **Selective Cooper ligament fixation in large grade 3 defects (M3/L3)**
- **Minimal fixation philosophy to prevent chronic pain**

This establishes groin reconstruction as anatomically consistent with broader abdominal wall reconstruction principles.

CHAPTER 5

Umbilical and Epigastric Hernias

5.1. Introduction

Umbilical and epigastric hernias represent the most common primary midline abdominal wall defects. Although often considered "minor" hernias, their recurrence potential and biomechanical implications are frequently underestimated, particularly in physically active patients, obese individuals, and those with underlying linea alba weakness.

Modern management is based on the principle that:

> Primary midline hernias are structural defects of the linea alba and should be treated with durable reinforcement rather than simple closure.

International guidelines increasingly support mesh-based repair even for relatively small symptomatic defects, particularly when defect size exceeds 1 cm.

This chapter provides a size-based and mechanically driven strategy for umbilical and epigastric hernias.

5.2. Anatomical and Biomechanical Considerations

The umbilicus represents a congenital weak point of the midline fascia. Herniation may involve:

- preperitoneal fat
- peritoneal sac
- omentum
- bowel in larger defects

Umbilical defects should not be evaluated solely by diameter, but also by:

- tissue quality of the linea alba
- associated diastasis recti
- mechanical loading demands
- recurrence history
- feasibility of flat mesh placement

These factors determine escalation beyond simple local repair.

5.3. Defect Size Thresholds: Decision Framework

Umbilical and epigastric hernias are managed according to four practical width categories:

Defect Width	Reconstruction Strategy
<1 cm	Selective suture repair if recurrence risk is low
1–3 cm	Mesh repair mandatory, overlap ≥3 cm
3–4 cm	Grey zone — individualized technique selection
>4 cm	Posterior retromuscular reconstruction (TARM/eTEP-RS)

Defect width drives mesh size requirements and determines whether anterior preperitoneal space is sufficient.

5.4. Defects <1 cm: Selective Suture Repair

Very small umbilical defects may be considered for suture-only repair under strict conditions.

Suture repair is acceptable only when:

- defect is <1 cm
- recurrence risk is low
- tissue quality is good
- mechanical load is minimal
- the repair is performed as a temporary or staged strategy (e.g., women of childbearing age)

However, mesh reinforcement is still preferred even in small defects when:

- the patient is physically active
- obesity is present
- chronic cough or increased intra-abdominal pressure exists
- tissue weakness or early recurrence risk is evident

Key principle:

> Small defect size does not automatically justify suture repair if biomechanical risk is high.

5.5. Defects 1–3 cm: Mesh Repair as Standard

For symptomatic umbilical and epigastric hernias measuring 1–3 cm:

> Mesh reinforcement is mandatory.

Standard technique:

- **open preperitoneal flat mesh repair**
- small periumbilical incision
- polypropylene mesh
- overlap **≥3 cm** in all directions
- minimal or no fixation

This approach provides durable reinforcement while avoiding unnecessary escalation.

Importantly, this remains the default even in:

- obesity class I
- physically demanding professions
- active athletic patients

5.6. Laparoscopic TAPP Umbilical: Indications

Laparoscopic posterior repair (TAPP umbilical) is not routine for all small primary defects, but is preferred in selected situations.

Indications include:

1. **Recurrence after anterior repair**
   - posterior plane change is mandatory
2. **Obesity with high wound complication risk**
   - avoidance of periumbilical soft tissue morbidity
3. **Inability to achieve reliable flat preperitoneal mesh placement open**
   - difficult anatomy
   - scarred umbilicus
   - high risk of mesh folding or inadequate overlap

Key principle:

> If flat mesh placement cannot be guaranteed through a limited anterior approach, laparoscopic posterior repair becomes preferable.

5.7. Defects 3–4 cm: The Grey Zone

Defects between 3 and 4 cm represent a transitional category requiring individualized decision-making.

Factors guiding escalation include:

- quality of linea alba
- presence of diastasis recti
- obesity and wound risk
- ability to achieve adequate overlap open
- surgeon assessment of mechanical failure potential

Possible strategies:

- extended open preperitoneal repair
- laparoscopic TAPP umbilical
- early posterior retromuscular reconstruction (TARM/eTEP-RS)

This zone should be approached with biomechanical caution rather than rigid technique rules.

5.8. Defects >4 cm: Posterior Retromuscular Reconstruction

Umbilical hernias larger than 4 cm behave biomechanically as incisional-type defects and require posterior reconstruction principles.

Standard strategy:

- **TARM or eTEP-RS repair**
- fascial closure as primary goal
- polypropylene mesh reinforcement
- overlap **≥5 cm**
- minimal fixation

This approach is applied:

- regardless of BMI
- in both primary and recurrent large umbilical hernias

Key concept:

> Hernias >4 cm should be treated as abdominal wall reconstruction, not as local patch repairs.

5.9. Recurrent Umbilical Hernias

Recurrence mandates a change of plane whenever feasible.

Standard rule:

- recurrence after anterior repair → posterior approach

Preferred technique:

- **laparoscopic TAPP umbilical**
  or
- posterior retromuscular reconstruction if defect size requires it

Anterior re-entry increases risk of scar complications and inadequate reinforcement.

5.10. Mesh Fixation Strategy

Mesh fixation is generally avoided in umbilical reconstruction.

Stability is achieved through:

- correct anatomical plane
- adequate overlap
- closure of fascial layers

- tissue containment

Fixation is reserved only for rare cases where:

- mesh cannot remain flat
- geometry is unstable
- overlap is limited by boundary constraints

Key principle:

> The right plane is the best fixation.

5.11. Summary

Umbilical and epigastric hernias require a structured, size-based reconstructive strategy:

- **<1 cm:** selective suture repair only under low-risk conditions
- **1–3 cm:** mesh repair mandatory (open preperitoneal, overlap ≥3 cm)
- **Lap TAPP umbilical:** recurrence, obesity, or unreliable open plane
- **3–4 cm:** individualized grey zone
- **>4 cm:** posterior retromuscular reconstruction (TARM/eTEP-RS, overlap ≥5 cm)
- fixation minimized to prevent chronic pain

This chapter establishes primary midline hernia repair as a biomechanical reinforcement strategy rather than simple defect closure.

CHAPTER 6

Women of Childbearing Age

6.1. Introduction

Umbilical and midline hernias in women of childbearing age require special consideration, as pregnancy represents a unique biomechanical and physiological condition affecting the abdominal wall.

Pregnancy involves:

- progressive elevation of intra-abdominal pressure,
- stretching of the linea alba,
- widening of rectus separation,
- significant changes in abdominal wall geometry.

Therefore, hernia repair strategies in this population must balance:

- symptom control,
- recurrence risk,
- implant durability,
- and future gestational expansion.

Unlike standard adult reconstruction, a life-stage approach is often most appropriate.

6.2. Pregnancy as a Major Mechanical Modifier

Pregnancy is not simply a recurrence risk factor — it is a predictable future mechanical stress event.

Key implications include:

- progressive abdominal wall stretching,
- altered midline tension distribution,
- changes in defect geometry over time,
- increased likelihood of recurrence if definitive repair is performed too early.

Therefore:

> In women planning pregnancy, timing is often as important as technique.

6.3. Indications for Repair Before Pregnancy

Repair prior to future pregnancy is indicated when:

- the hernia is symptomatic and limits daily activity,
- pain or discomfort is progressive,
- incarceration risk is present,
- defect enlargement is clinically evident.

Very small, minimally symptomatic defects may be observed until completion of pregnancies.

6.4. Life-Stage Strategy: Temporary Repair vs Definitive Reconstruction

In women planning future pregnancy, the objective is often to:

- relieve symptoms safely now,
- avoid overly rigid definitive constructs before gestation,
- perform durable mesh-based reconstruction after completion of childbearing.

Thus, management is frequently staged:

1. temporary symptom-oriented repair before pregnancy
2. definitive reconstruction after the last pregnancy

6.5. Symptomatic 1–3 cm Umbilical and Linea Alba Hernias

In the general population, mesh reinforcement is standard for defects >1 cm.
However, in women of childbearing age, the strategy differs.

For symptomatic primary midline hernias in the **1–3 cm range**, the preferred approach is:

> **Suture repair as a staged solution, with definitive reconstruction after completion of pregnancies.**

The rationale is practical and biomechanical:

- pregnancy will impose unavoidable mechanical overload,
- abdominal wall geometry will change substantially,
- definitive mesh repair is best performed after reproductive completion,
- a temporary suture repair often provides sufficient symptom relief until that time.

Therefore, for many symptomatic small midline hernias in this group:

- repair is performed now with sutures,
- definitive mesh reinforcement is postponed.

6.6. Defects <1 cm

Very small umbilical defects (<1 cm) are particularly suitable for:

- observation if minimally symptomatic, or

- selective suture repair when symptomatic.

Recurrence risk is generally low in this subgroup, and a staged strategy is natural.

6.7. When Mesh Repair Is Necessary Before Pregnancy

Mesh reinforcement before pregnancy is reserved for cases where suture repair is expected to fail early.

Mesh may be justified when:

- tissue quality is poor,
- the patient is highly physically active,
- obesity or chronically increased intra-abdominal pressure is present,
- early recurrence risk with sutures is clearly high,
- the defect demonstrates mechanical instability even prior to pregnancy.

Key principle:

> Mesh is used before pregnancy only when suture repair would predictably result in early recurrence before gestation.

6.8. Umbilical Hernias in Planned Pregnancy: Practical Summary

Defect Size	Preferred Strategy
<1 cm	Observation or suture repair if symptomatic
1–3 cm symptomatic	Suture repair as staged management
Mesh before pregnancy	Only if sutures carry unacceptable early recurrence risk
Definitive repair	Mesh-based reconstruction after last pregnancy

Pregnancy should be treated as a planned future stress test of the abdominal wall.

6.9. Diastasis Recti in Young Women

Diastasis recti frequently coexists with small midline hernias.

In such cases, isolated patch repair may be insufficient because:

- the underlying disease is linea alba failure,
- recurrence risk persists along the weakened midline.

Definitive postpartum management may require:

- linea alba plication,
- extended preperitoneal or retromuscular reinforcement,
- functional restoration rather than focal closure.

6.10. Definitive Reconstruction After Completion of Childbearing

After the final pregnancy, definitive abdominal wall reconstruction is preferred.

This typically includes:

- fascial closure,
- preperitoneal or retromuscular mesh placement,
- overlap-based reinforcement,
- extended repair when diastasis is present.

This timing provides the most stable biomechanical environment for long-term durability.

6.11. Summary

Hernia repair in women of childbearing age requires life-stage planning.

Core principles include:

- pregnancy is a major mechanical modifier,
- symptomatic 1–3 cm umbilical and linea alba hernias are preferably managed with suture repair as a staged approach,
- definitive mesh-based reconstruction is performed after completion of pregnancies,
- mesh before pregnancy is reserved only for clearly high-risk defects where sutures would fail early,
- postpartum reconstruction offers optimal long-term durability,
- diastasis recti often requires extended midline restoration.

CHAPTER 7

Diastasis Recti with Midline Defects

7.1. Introduction

Diastasis recti is increasingly recognized as an important component of midline abdominal wall disease. Although not a true hernia by definition, rectus diastasis frequently coexists with:

- umbilical hernias,
- epigastric defects,
- generalized linea alba weakness,
- midline bulging and functional impairment.

In such cases, isolated closure of a small hernia defect may not address the underlying pathology. Instead, the hernia represents a focal manifestation of a broader structural failure.

Modern midline reconstruction therefore requires attention to both:

- the defect itself,
- and the condition of the linea alba as a functional unit.

7.2. Definition and Clinical Significance

Rectus diastasis is defined as:

> A widening of the linea alba with separation of the rectus muscles, without a true fascial defect.

Its clinical relevance is substantial because it alters abdominal wall mechanics:

- reduced midline tension transmission,
- bulging during exertion,
- impaired core function,
- increased stress on adjacent fascial weak points.

When combined with a hernia, diastasis becomes a major recurrence modifier.

7.3. Hernia with Diastasis: A Different Disease Entity

Umbilical hernia plus diastasis is not simply a small hernia.

It represents:

- midline fascial insufficiency,
- broader biomechanical instability,

- increased likelihood of recurrence if treated focally.

Key concept:

> A hernia within diastasis is part of linea alba disease, not an isolated hole.

Therefore, repair strategy must address the entire midline rather than patching the umbilical defect alone.

7.4. Indications for Reconstruction

Midline reconstruction in the setting of diastasis should be considered when:

- a symptomatic hernia coexists with diastasis,
- significant midline bulging is present,
- functional impairment is reported,
- tissue quality suggests progressive failure,
- recurrence risk with isolated repair is high.

Asymptomatic diastasis without hernia does not require surgical correction. However, when operative treatment is undertaken, the author favors plication combined with mesh reinforcement rather than plication alone, due to long-term biomechanical durability.

7.5. Diastasis Recti Without Hernia: Plication Alone vs Reinforced Reconstruction

Although rectus diastasis is not a true hernia, it represents structural insufficiency of the linea alba and impaired midline force transmission.

When surgical correction is performed, plication alone may be associated with:

- gradual stretching over time,
- recurrent bulging,
- incomplete functional restoration.

Therefore, in the author's reconstructive philosophy:

> Durable correction of rectus diastasis is best achieved through linea alba plication combined with posterior mesh reinforcement, even when no true hernia defect is present.

Mesh reinforcement should be placed in a posterior plane whenever feasible, providing long-term stability of the reconstructed midline unit.

7.6. Core Surgical Objective: Linea Alba Restoration

The primary reconstructive goal is:

> Restoration of the linea alba as a continuous functional structure.

This requires:

- approximation of the rectus muscles,
- plication of the midline,
- reinforcement of the reconstructed linea with mesh support.

Midline closure in this setting is reconstructive and functional, not cosmetic.

7.7. Preferred Repair Planes

Optimal reinforcement planes include:

- **preperitoneal** (for limited primary disease),
- **retromuscular** (for broader weakness and extended reconstruction).

Posterior planes provide:

- strong tissue coverage,
- reduced mesh–subcutaneous interface,
- lower seroma and wound morbidity.

Anterior onlay positioning carries higher interface seroma risk and is avoided when possible.

7.8. Mesh Geometry and Width Requirements

In diastasis reconstruction, mesh must reinforce the entire weakened midline rather than only the hernia opening.

A practical standard is:

- mesh width **8–10 cm** across the midline,
- extended longitudinal coverage along the diastatic segment.

Key principle:

> The repair is defined by disease length, not defect diameter.

7.9. Operative Strategy

A typical reconstruction includes:

1. reduction of hernia contents,
2. development of a posterior plane,
3. continuous midline plication (linea alba closure),
4. placement of a flat polypropylene mesh,
5. minimal or no fixation,

6. dead-space aware closure.

The objective is a stable functional midline rather than a focal patch repair.

7.10. Minimally Invasive Midline Plication and Mesh Reinforcement

In patients with diastasis recti and associated midline defects, minimally invasive reconstruction combining:

- linea alba plication,
- wide posterior mesh reinforcement,

represents an ideal biomechanical solution.

Laparoscopic TAPP Repair with Plication

A laparoscopic TAPP-based approach allows:

- restoration of the linea alba,
- broad preperitoneal mesh placement,
- avoidance of large anterior incisions,
- reduction of wound morbidity.

For this reason:

> Laparoscopic TAPP repair with plication may be considered the preferred conceptual strategy.

However, the technique is technically demanding and requires:

- advanced plane development,
- precise intracorporeal suturing,
- long-segment closure under tension control,
- reliable mesh deployment over a broad midline surface.

Thus, its application is limited to surgeons with advanced abdominal wall reconstructive expertise.

Retromuscular Reconstruction (eTEP-RS) as Second Choice

When laparoscopic TAPP plication is not feasible or technically unsafe, posterior retromuscular reconstruction provides an excellent alternative.

eTEP-RS offers:

- reproducible retromuscular anatomy,
- safe extended mesh placement,
- robust midline reinforcement.

Therefore:

Retromuscular reconstruction via eTEP-RS represents the practical second-line strategy for diastasis-associated midline defects.

Robotic TAPP + Plication: Highly Promising but System-Limited

Robotic platforms significantly facilitate:

- long midline suturing,
- precise linea alba reconstruction,
- complex preperitoneal dissection.

Robotic TAPP repair with plication and wide mesh reinforcement is widely regarded as a highly promising future standard in diastasis reconstruction.

However, in many healthcare systems—including the Polish public sector—routine robotic access remains unrealistic due to:

- limited availability,
- cost constraints,
- logistical barriers.

Therefore, current practice must remain grounded in techniques reproducible within standard laparoscopic and open frameworks.

7.11. Postoperative Considerations

Patients undergoing diastasis-associated reconstruction should be counseled regarding:

- gradual return to core loading,
- avoidance of early high-pressure exertion,
- realistic expectations of bulge resolution,
- functional emphasis of the repair.

Durability is improved through extended reinforcement rather than focal closure.

When diastasis correction is performed, reinforced plication is preferred over plication alone for durability.

7.12. Summary

Diastasis recti combined with midline hernias represents a structural disease of the linea alba.

Key principles include:

- isolated patch repair is often insufficient,
- linea alba restoration is the primary reconstructive objective,
- extended mesh reinforcement (8–10 cm width) stabilizes the midline,

- laparoscopic TAPP with plication is conceptually preferred but technically challenging,
- eTEP-RS provides a highly effective second-line posterior option,
- robotic TAPP + plication is very promising but currently system-limited in public practice,
- minimal fixation supports long-term comfort and pain prevention.

CHAPTER 8

Incisional Midline Hernias: Technique Selection

8.1. Introduction

Incisional midline hernias represent the most complex and clinically significant group of ventral abdominal wall defects. Unlike primary umbilical or epigastric hernias, incisional hernias arise from postoperative failure of fascial healing and involve a broad zone of tissue weakness.

They are characterized by:

- impaired collagen integrity,
- progressive enlargement over time,
- higher recurrence rates,
- frequent association with loss of domain,
- increased wound morbidity.

Therefore:

> Incisional hernia repair is abdominal wall reconstruction, not defect closure.

This chapter provides a structured framework for technique selection based on defect width, overlap requirements, sac morphology, patient habitus, and physiologic reserve.

8.2. Incisional Hernia as Structural Disease

An incisional hernia is not simply a postoperative opening. It represents a complex failure of the abdominal wall unit involving:

- scar tissue with reduced strength,
- altered force transmission,
- muscle lateralization,
- progressive widening of the midline,
- impaired functional mechanics.

Durable repair requires:

- restoration of the linea alba,
- wide reinforcement beyond the scar zone,
- posterior plane reconstruction whenever feasible.

8.3. Core Decision Parameters

Technique selection depends on:

1. **Defect width (cm)**
2. **Ability to achieve fascial closure**
3. **Mesh width and overlap geometry**
4. **Hernia sac size and redundancy**
5. **Presence of loss of domain**
6. **Soft tissue condition and wound risk**
7. **Stoma-related modifiers**
8. **Contamination or fistulas**
9. **Physiologic reserve (fit vs fragile patient)**

The central question is always:

> Can retromuscular reconstruction provide sufficient overlap and closure, or is TAR escalation required?

8.4. Defect Size Thresholds and Escalation Strategy

A practical escalation ladder is applied:

Defect Width	Preferred Reconstruction Strategy
≤5 cm	Selected retromuscular or preperitoneal reconstruction
6–8 cm	**TARM / eTEP-RS standard**
>10–12 cm	**Open TAR escalation**
Loss of domain present	TAR + adjunct planning

The transition from retrorectus-only repair to TAR is largely defined by overlap feasibility.

8.5. Moderate Incisional Defects (6–8 cm)

Moderate defects are ideal candidates for posterior retromuscular reconstruction.

Preferred approaches include:

- **TARM**
- **eTEP-RS**

Rationale:

- sufficient retrorectus width for mesh deployment (often 16–20 cm),
- closure achievable without release,
- predictable anatomy,
- reduced wound complications compared with open anterior repairs.

In obese patients, minimally invasive posterior reconstruction is particularly valuable due to reduced SSI risk.

8.6. Large Incisional Defects (>10–12 cm)

Large defects frequently exceed the capacity of standard retrorectus repair to provide:

- adequate mesh width,
- ≥5 cm overlap,
- tension-free fascial closure.

In such cases:

> Open TAR becomes the definitive reconstruction strategy.

Typical features include:

- wide fascial separation,
- large hernia sac with adhesions,
- significant closure tension,
- frequent loss of domain.

The objective is maximal medialization of the abdominal wall unit.

8.7. Loss of Domain and Giant Hernias

Loss of domain represents displacement of abdominal contents into the hernia sac, leading to:

- reduced abdominal cavity capacity,
- respiratory compromise risk,
- high closure tension.

These cases require:

- CT-based volumetric planning,
- consideration of botulinum toxin when closure tension is expected,
- TAR-based reconstruction as standard escalation.

Bridging repairs should be avoided whenever possible.

8.8. Hernia Sac Size and Redundancy: Open vs Minimally Invasive Selection

Defect width alone is insufficient. Hernia sac morphology strongly influences the optimal operative approach.

8.8.1. Large Hernia Sac

A large redundant sac often implies:

- major dead space potential,
- bowel or omental adhesions,
- stretched skin and soft tissue excess,
- increased seroma risk.

Preferred strategy:

- **open reconstruction**, or
- **hybrid approach** (lap adhesiolysis + open reconstruction)

particularly when:

- safe adhesiolysis is required,
- **sac reduction or resection** is necessary,
- **skin flap or pannus management** is needed to optimize dead-space control.

Key concept:

> Large sac defects frequently require open or hybrid reconstruction for definitive soft-tissue and cavity management.

8.8.2. Small Hernia Sac

Smaller sacs generally indicate:

- limited redundancy,
- reduced dead space,
- less need for skin management.

Preferred strategy:

- **minimally invasive posterior reconstruction**, including:
  - TARM
  - eTEP-RS
  - eTEP-TAR / posterior release variants when required for overlap

Key principle:

> Small sac defects favor laparoscopic posterior reconstruction when overlap geometry permits.

8.9. Patient Habitus: Obesity vs Cachexia

Obesity

Obesity increases:

- wound complication risk,
- surgical site infection,
- subcutaneous dead space morbidity.

Therefore, whenever feasible:

> Minimally invasive posterior reconstruction is preferred in obese patients.

TARM/eTEP approaches reduce soft tissue trauma and improve wound outcomes.

Cachectic or Underweight Patients

In underweight patients:

- soft tissue coverage is limited,
- tissues may be fragile,
- prolonged complex pneumoperitoneum may not always be ideal.

Practical tendency:

- bias toward open reconstruction when direct control is needed for safety, adhesiolysis, or soft tissue stability.

8.10. Physiologic Reserve: Fragile vs Fit Reconstruction

Elderly or Comorbid Patients

In fragile patients, the priority is a durable repair with minimal physiologic burden.

Preferred strategy:

- **retromuscular reconstruction (RS) without TAR**, if overlap and closure are achievable.

Practical rule:

> If adequate overlap can be achieved in retrorectus space, avoid escalation to TAR in high-risk patients.

Young, Fit Patients

In physiologically robust patients, definitive maximal reconstruction is appropriate when geometry requires it.

Preferred strategy:

- TAR-based reconstruction for large defects,

- broader component release when needed for closure.

Adjuncts:

- **botulinum toxin** may be used more readily to optimize closure conditions.

Practical rule:

> Fit patients benefit from definitive TAR and adjuncts when required for tension-free restoration.

8.11. Soft Tissue and Skin Redundancy

Large incisional hernias often coexist with:

- poor skin quality,
- redundant pannus,
- wide subcutaneous dead space.

Open reconstruction allows:

- controlled adhesiolysis,
- tailored sac and skin management,
- definitive midline restoration.

Soft tissue handling is a major determinant of postoperative morbidity.

8.12. Stoma and Conduit Modifiers

A permanent stoma transforms midline reconstruction strategy.

Even without a parastomal hernia:

- overlap geometry becomes constrained,
- the stoma remains a structural weak point.

Therefore:

> Midline incisional reconstruction in the presence of a permanent stoma should incorporate posterior conduit reinforcement principles (Pauli concept).

This ensures:

- protection of the stoma site,
- continuous overlap,
- prevention of future parastomal failure.

8.13. Contamination and Enterocutaneous Fistulas

Incisional hernias may coexist with:

- chronic fistulas,
- controlled contamination,
- prior wound infection.

Technique selection is influenced by:

- field control,
- staging strategy,
- feasibility of posterior barrier reconstruction.

Definitive repair remains mesh-based, but timing may be staged when contamination is uncontrolled.

8.14. Mesh Fixation Strategy

Across all incisional reconstructions:

- fixation is minimized,
- stability is achieved through posterior containment and overlap.

Fixation must not compensate for inadequate dissection or insufficient mesh width.

8.15. Summary

Incisional midline hernias require structured escalation and individualized modifiers:

- **6–8 cm:** TARM/eTEP-RS standard
- **>10–12 cm or LoD:** Open TAR definitive strategy
- overlap ≥5 cm guides mesh geometry
- **large sac/redundancy:** open or hybrid with sac resection and soft tissue management
- **small sac:** minimally invasive posterior reconstruction
- obesity favors minimally invasive approaches
- cachectic phenotype may favor open control
- elderly/comorbid patients → RS without TAR if feasible
- young/fit patients → TAR + botulinum when needed
- permanent stoma requires conduit-protective reinforcement
- contamination affects timing, not the need for durable mesh repair

The next chapters provide detailed operative step-by-step descriptions of posterior reconstruction techniques.

CHAPTER 9

TARM and eTEP-RS

Posterior Retromuscular Reconstruction for Mid-Size Incisional and Large Primary Midline Defects

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9.1. Introduction

Posterior retromuscular reconstruction has become a cornerstone of modern abdominal wall surgery. Techniques such as:

- **TARM** (TransAbdominal RetroMuscular repair)
- **eTEP-RS** (extended Totally Extraperitoneal RetroRectus Surgery)

provide durable reinforcement while preserving abdominal wall biomechanics.

These approaches allow:

- restoration of the linea alba,
- wide mesh deployment in a protected plane,
- avoidance of intraperitoneal mesh contact,
- reduced wound morbidity compared with open anterior repairs.

In mid-size incisional hernias and large primary defects, they represent the standard reconstructive level before escalation to TAR.

9.2. Indications

Posterior retromuscular reconstruction is preferred for:

- incisional midline hernias **6–8 cm**
- large umbilical hernias **>4 cm**
- selected borderline defects (3–4 cm) with poor tissue quality
- recurrent midline hernias requiring posterior plane change
- obesity where minimally invasive posterior repair reduces SSI risk
- cases requiring overlap ≥5 cm without full TAR release

9.3. Objectives of Repair

Every TARM/eTEP-RS repair is defined by three mandatory goals:

1. **Fascial closure and linea alba restoration**

2. **Wide mesh overlap (≥5 cm)**
3. **Minimal or no mesh fixation**

The repair is reconstructive rather than patch-based.

9.4. Plane Anatomy: The Retrorectus Space

The retrorectus (Rives–Stoppa) plane is located between:

- rectus abdominis muscle anteriorly
- posterior rectus sheath posteriorly

This space provides:

- excellent vascularized tissue coverage,
- biomechanically optimal reinforcement,
- isolation of mesh from subcutaneous tissues and bowel.

Lateral boundary:

- linea semilunaris
  Posterior continuation:
- TAR plane when release is required

9.5. Technique Selection: TARM vs eTEP-RS

Both techniques achieve the same reconstructive endpoint.

TARM

- transabdominal entry
- retrorectus dissection from within the peritoneal cavity
- useful when abdominal access is required

eTEP-RS

- direct extraperitoneal entry
- avoids intraperitoneal violation
- facilitates extended posterior dissection

Choice depends on surgeon preference and anatomy, but principles remain identical.

9.6. Preoperative Planning

Key steps include:

- CT evaluation of defect width and sac volume

- calculation of required mesh width
    - defect + 2 × overlap
- assessment of closure feasibility without TAR
- planning of port positions outside midline

Standard mesh requirement:

- defect 6 cm → mesh width ~16–18 cm

9.7. Patient Positioning and Setup

- supine position
- arms alongside body
- slight reverse Trendelenburg
- prophylactic antibiotics
- careful trocar placement lateral to rectus margins

9.8. Operative Technique: Step-by-Step

Step 1 — Access and Entry

TARM

- laparoscopic entry into abdominal cavity
- initial inspection and adhesiolysis if needed

eTEP-RS

- balloon or blunt entry into retrorectus space
- expansion before full insufflation

Key principle:

> The goal is controlled development of the posterior plane.

Step 2 — Opening the Posterior Rectus Sheath

- incision of posterior sheath medial to rectus muscle
- entry into retrorectus space
- identification of correct avascular plane

Step 3 — Retromuscular Dissection

- blunt and sharp dissection behind rectus muscle
- extension laterally toward linea semilunaris
- preservation of epigastric vessels

Adequate lateral dissection is essential for mesh width.

Pitfall:

- insufficient lateral space → mesh folding and recurrence risk

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Step 4 — Bilateral Plane Connection

- development of both retrorectus compartments
- crossover in the midline
- creation of a single wide retromuscular chamber

Step 5 — Hernia Reduction and Sac Management

- reduction of hernia contents
- selective sac reduction if large
- dead space awareness for seroma prevention

Step 6 — Posterior Layer Closure

- closure of posterior sheath/peritoneum
- creation of complete barrier separating mesh from bowel

Absolute rule:

> Polypropylene mesh requires a secure posterior barrier.

Step 7 — Fascial Closure (Linea Alba Restoration)

- continuous midline closure of anterior fascia
- restoration of abdominal wall continuity
- closure without excessive tension

Bridging is avoided whenever possible.

Step 8 — Mesh Deployment

- flat polypropylene mesh placed in retrorectus space
- overlap ≥5 cm in all directions
- mesh lies “carpet-like” without folding

Step 9 — Fixation Strategy

Default:

- **no fixation**

Stability is achieved through:

- correct plane containment
- overlap discipline
- fascial closure compressing the mesh

Fixation only if anatomy prevents stable positioning.

Step 10 — Completion and Closure

- hemostasis confirmation
- drain only if large dead space exists
- port closure standard
- early mobilization pathway

9.9. Pearls and Pitfalls

✅Pearls

- retrorectus plane provides ideal biomechanical repair
- overlap determines durability more than fixation
- minimal fixation reduces chronic pain
- obesity favors minimally invasive posterior reconstruction

Pitfalls

- insufficient lateral dissection
- incomplete posterior closure
- mesh folding due to narrow chamber
- underestimation of sac-related dead space

9.10. Complications

Common issues include:

- seroma (mechanism-dependent)
- retrorectus hematoma
- posterior layer breakdown
- recurrence due to inadequate overlap

Chronic pain is minimized through avoidance of traumatic fixation.

9.11. Summary

TARM and eTEP-RS represent the standard posterior reconstruction techniques for mid-size incisional and large primary midline hernias.

Key principles include:

- fascial closure as primary goal
- wide retromuscular mesh overlap (≥5 cm)
- posterior barrier integrity
- minimal fixation philosophy
- escalation to TAR only when overlap or closure cannot be achieved

CHAPTER 10

Open TAR (Transversus Abdominis Release)

Definitive Reconstruction for Large Midline Defects and Loss of Domain

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10.1. Introduction

Open TAR (Transversus Abdominis Release) represents the most powerful posterior component separation technique in abdominal wall reconstruction. It is the definitive escalation step for large incisional hernias that exceed the capacity of standard retrorectus repair.

TAR allows:

- major medialization of the abdominal wall unit,
- creation of an extensive posterior plane,
- placement of very large mesh constructs,
- tension-free restoration of the linea alba.

In contemporary reconstruction, TAR is not an "advanced option," but the logical progression when retrorectus overlap and closure cannot otherwise be achieved.

10.2. Indications

Open TAR is indicated when:

- defect width exceeds **10–12 cm**,
- retrorectus space cannot provide adequate overlap,
- closure tension is excessive without release,
- loss of domain is present,
- a definitive reconstruction is required in a large complex hernia.

Typical scenarios include:

- massive incisional hernias with adhesions,
- large sacs with skin redundancy,
- recurrent failed repairs,
- combined midline failure requiring maximal reinforcement.

10.3. Objectives of TAR Reconstruction

Every TAR procedure must achieve three reconstructive goals:

1. **Tension-free fascial closure**
2. **Maximum mesh overlap (≥5 cm)**
3. **Wide posterior reinforcement with minimal fixation**

TAR is performed to expand the reconstructive plane, not to replace fundamental principles.

10.4. Anatomical Basis of TAR

The TAR release involves division of the transversus abdominis muscle medial to the linea semilunaris, allowing entry into the lateral extraperitoneal plane.

This creates:

- a massive posterior compartment,
- extended lateral overlap capacity,
- abdominal wall medial advancement.

TAR effectively transforms the abdominal wall into a fully reconstructable unit even in giant defects.

10.5. Preoperative Planning

Large hernias require structured planning:

- CT evaluation of defect width and loss of domain
- calculation of required mesh dimensions
    - defect + 2 × overlap
- evaluation of sac volume and adhesions
- assessment of closure feasibility
- consideration of adjuncts such as botulinum toxin

A common geometric threshold:

- defect 12 cm → mesh width ≥22 cm

10.6. Role of Botulinum Toxin

Botulinum toxin is considered when:

- closure tension remains high,
- loss of domain limits medialization,
- TAR is expected to require maximal release.

Botulinum is an adjunct, not a routine stage, and is used selectively to improve closure mechanics.

Fit patients may benefit from adjunct optimization more readily than fragile patients.

10.7. Patient Selection: Fit vs Fragile

Elderly or comorbid patients

- TAR should be avoided if retrorectus repair provides sufficient overlap
- reconstruction burden should be minimized

Younger, fit patients

- TAR offers maximal durability when geometry requires it
- definitive repair is prioritized

10.8. Operative Technique: Step-by-Step

Step 1 — Exposure and Adhesiolysis

- midline laparotomy or tailored incision
- controlled opening of the hernia sac
- adhesiolysis under direct vision

Large sacs often require sac reduction or resection for dead space control.

Step 2 — Entry Into Retrorectus Space

- incision of posterior rectus sheath
- development of retrorectus plane bilaterally
- extension laterally toward semilunar line

At this stage, the operation mirrors retromuscular reconstruction.

Step 3 — Identification of the TAR Plane

- locate the medial edge of the transversus abdominis muscle
- incise the posterior lamella medial to the semilunar line

This is the critical release step.

Pitfall:

- insufficient release → inadequate medialization
- excessive depth → peritoneal injury

Step 4 — Lateral Plane Expansion

- develop the wide extraperitoneal space laterally
- create maximal compartment for mesh deployment

The TAR plane enables mesh widths frequently exceeding 25–30 cm.

Step 5 — Posterior Layer Closure

- closure of posterior sheath/peritoneum
- complete barrier between bowel and polypropylene mesh

This is mandatory for safe synthetic reinforcement.

Step 6 — Mesh Placement

- large polypropylene mesh placed in the posterior plane
- overlap ≥5 cm in all directions
- mesh lies flat without folding

Typical constructs:

- 30 × 20 cm or larger

Step 7 — Fascial Closure

- anterior fascia closed continuously
- linea alba restored as functional midline unit
- closure without excessive tension

This is the defining endpoint of reconstruction.

Step 8 — Dead Space and Soft Tissue Management

Large TAR reconstructions often involve:

- sac resection
- quilting sutures
- selective drains
- skin redundancy adjustment

These measures reduce seroma and wound complications.

Step 9 — Fixation Strategy

Fixation is minimized.

Mesh stability is achieved through:

- plane containment
- overlap
- closure compression

Fixation is reserved only when geometry is unstable.

Step 10 — Completion

- hemostasis confirmation
- layered closure
- postoperative mobilization and respiratory support

10.9. Pearls and Pitfalls

✅ Pearls

- TAR is an overlap-driven escalation
- maximal plane development ensures durability
- botulinum improves closure in selected LoD cases
- definitive reconstruction is achieved in one operation

Pitfalls

- insufficient lateral dissection
- incomplete posterior barrier
- small mesh construct in a giant defect
- excessive anterior skin undermining increasing SSI risk

10.10. Complications

Key complication domains:

- wound morbidity (SSI, skin necrosis)
- seroma due to dead space
- hematoma in large planes
- recurrence from inadequate overlap
- pulmonary compromise in LoD closure

Complication prevention is primarily geometric and plane-based.

10.11. Summary

Open TAR is the definitive posterior reconstruction strategy for:

- defects >10–12 cm,
- loss of domain,
- giant incisional hernias requiring maximal overlap.

Core principles remain unchanged:

- fascial closure whenever feasible
- overlap ≥5 cm
- posterior plane dominance
- minimal fixation
- sac and soft tissue management as key adjuncts

The next section applies posterior reconstruction to the stoma-bearing abdominal wall, beginning with parastomal hernias and Pauli repair principles.

CHAPTER 11

Parastomal Hernias and the Pauli Repair Concept

Posterior Conduit Reconstruction and Lateralization Strategy

11.1. Introduction

Parastomal hernias represent one of the most challenging forms of abdominal wall failure. Unlike standard ventral or incisional defects, a parastomal hernia is not simply a localized gap in fascia. It is the mechanical consequence of a permanent conduit traversing the abdominal wall.

The defining characteristic is:

> The stoma itself is a structural interruption of the abdominal wall unit.

Therefore, durable repair must address not only the defect, but also the geometry and mechanics of the stomal conduit.

Traditional approaches based on simple defect coverage have yielded high recurrence rates. Modern posterior reconstruction principles have led to conduit-based strategies, most notably the **Pauli repair concept**.

11.2. Why Parastomal Hernias Behave Differently

Parastomal hernias are driven by unique biomechanical factors:

- the conduit acts as a persistent weak point,
- intra-abdominal pressure is continuously transmitted around the stoma,
- overlap geometry is constrained by the conduit itself,
- keyhole failures are common due to mesh aperture stress.

Therefore, parastomal reconstruction must be viewed as a distinct branch of abdominal wall reconstruction rather than a standard ventral hernia repair.

11.3. Principles of Posterior Conduit Reconstruction

The Pauli repair concept is based on three core principles:

1. **Posterior plane reinforcement**
2. **Conduit lateralization**
3. **Wide mesh overlap without keyhole failure**

The objective is not to patch the defect, but to reconstruct the conduit interface biomechanically.

11.4. Indications

Posterior conduit-based repair is preferred for:

- symptomatic parastomal hernias,
- progressive bulging or appliance dysfunction,
- pain or discomfort,
- incarceration risk,
- parastomal hernia combined with midline weakness,
- permanent end stomas requiring definitive abdominal wall stabilization.

The indication is symptom-driven rather than purely size-driven.

11.5. Laparoscopic Posterior Pauli Repair as Standard Approach

For isolated parastomal hernias without major midline reconstruction requirements, the preferred strategy is:

> **Laparoscopic posterior Pauli repair**

This approach provides:

- access to posterior planes,
- reduced wound morbidity,
- effective conduit lateralization,
- wide overlap potential.

It represents a definitive repair rather than salvage.

11.6. The Key Step: Conduit Lateralization

The defining feature of Pauli repair is lateralization of the stomal conduit.

This achieves:

- alteration of conduit exit geometry,
- reduction of direct axial force transmission,
- elimination of a straight-through recurrence vector.

Key principle:

> Without conduit lateralization, the conduit remains the primary recurrence pathway.

This separates Pauli repair fundamentally from keyhole-based techniques.

11.7. Mesh Strategy: Dual Reinforcement Concept

Posterior conduit reconstruction requires recognition that the stoma zone and the abdominal wall represent two distinct reinforcement targets:

1. **The stomal conduit interface**, where bowel contact must be protected
2. **The abdominal wall unit**, which requires wide structural overlap

For this reason, a dual-mesh reinforcement concept may be applied.

11.7.1. Conduit Protection Mesh (Localized Coated Segment)

Directly beneath the conduit, a relatively small **coated mesh component** may be used to:

- prevent erosion,
- reduce the risk of bowel contact with polypropylene,
- reinforce the immediate conduit interface.

This mesh is not intended as the primary structural implant, but as a protective barrier.

11.7.2. Abdominal Wall Reinforcement Mesh (Large Polypropylene Construct)

The definitive reconstruction of the abdominal wall is achieved through:

- a large flat **polypropylene mesh**,
- wide overlap beyond all weakness zones,
- posterior plane containment.

Key principle:

> The conduit is protected locally, while the abdominal wall is reinforced globally with an adequate polypropylene construct.

11.8. Stoma Aperture Control ("Hole Reduction")

A critical technical step is control of the stomal defect diameter.

Rather than leaving a wide fascial gap, the conduit aperture should be narrowed to a controlled size, typically:

- approximately **3 cm**, allowing safe conduit passage without excessive weakness.

Aperture reduction contributes to:

- improved load distribution,
- reduced recurrence vector,
- stabilization of the conduit exit.

11.9. Posterior Barrier Integrity and Defect Closure

Durable reconstruction depends not only on mesh placement, but also on restoration of tissue layers.

Key requirements include:

- closure of posterior layers whenever feasible,
- complete separation of bowel from polypropylene mesh,
- restoration of abdominal wall continuity in combined defects.

Polypropylene reinforcement requires a secure posterior barrier.

11.10. Fixation Philosophy

Fixation is minimized.

Mesh stability is achieved through:

- correct posterior plane containment,
- overlap discipline,
- closure compression.

Traumatic fixation is avoided due to chronic pain risk and conduit-related sensitivity.

11.11. Open Pauli Repair: Complex and Combined Reconstructions

Open posterior conduit reconstruction is indicated when parastomal hernia occurs in combination with:

- large midline incisional hernia,
- giant sac and adhesions requiring open control,
- loss of domain,
- soft tissue redundancy requiring reduction.

In such cases, Pauli repair becomes part of definitive abdominal wall restoration, often combined with TAR.

11.12. Approach Selection: Laparoscopic, Open, Robotic

Laparoscopic Approach

Preferred for isolated parastomal hernias.

Advantages:

- reduced wound morbidity,
- effective posterior plane development,
- conduit lateralization under direct visualization.

Open Approach

Required when parastomal hernia occurs with:

- large incisional hernia,
- extensive adhesions,
- loss of domain,
- need for sac resection and soft tissue management.

Open reconstruction enables controlled definitive repair.

Robotic Approach

Robotic posterior conduit reconstruction is highly promising due to:

- superior suturing capability,
- precise aperture control,
- advanced posterior plane dissection.

However, routine access remains system-limited in many public healthcare settings.

11.13. Permanent Stoma as a Structural Modifier

A permanent end stoma represents structural weakness even before a parastomal hernia develops.

Therefore:

> Posterior conduit reinforcement principles may be applied prophylactically during midline reconstruction in stoma-bearing patients.

The rationale is:

- protection of the stoma site,
- achievement of continuous mesh overlap,
- prevention of future parastomal failure.

Overlap geometry is often the primary driver of this decision.

11.14. Pearls and Pitfalls

✅Pearls

- parastomal hernia is conduit-driven failure, not isolated defect
- posterior plane repair reduces recurrence mechanisms
- conduit lateralization is the biomechanical core
- dual-mesh strategy protects bowel and reinforces globally
- aperture reduction to ~3 cm stabilizes the exit

- fixation should remain minimal

Pitfalls

- treating parastomal hernia with simple keyhole patch
- inadequate posterior barrier
- insufficient overlap around conduit zone
- excessive fixation causing pain or ischemia

11.15. Summary

Parastomal hernia reconstruction requires a conduit-based posterior strategy.

The Pauli repair concept provides:

- posterior plane reinforcement,
- conduit lateralization,
- dual-mesh reinforcement (coated conduit protection + large PP overlap),
- controlled aperture reduction,
- minimal fixation philosophy,
- applicability in laparoscopic, open, and robotic platforms.

This establishes parastomal repair as a specialized domain of abdominal wall reconstruction and provides a durable framework for stoma-bearing patients.

CHAPTER 12

Permanent Stoma with Midline Incisional Hernia

Protective Conduit Reinforcement and Overlap-Driven Reconstruction

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12.1. Introduction

Patients with a permanent end stoma frequently develop complex abdominal wall pathology beyond the stoma itself. One of the most important clinical constellations is:

- a midline incisional hernia
- in the presence of a permanent stoma
- with or without a clinically apparent parastomal hernia

In such patients, the abdominal wall cannot be treated as a simple midline defect because:

> The stoma represents a permanent structural interruption that limits mesh geometry and creates a predictable future weak point.

Therefore, midline reconstruction must incorporate conduit-protective principles to achieve a truly definitive repair.

12.2. Permanent Stoma as an Abdominal Wall Defect

Even when no parastomal hernia is present, a stoma conduit constitutes:

- loss of fascial continuity,
- chronic pressure transmission zone,
- overlap limitation point,
- future recurrence pathway.

Thus:

> A permanent stoma should be understood as a pre-existing defect of the abdominal wall unit.

Midline reconstruction that ignores the stoma zone risks failure at the conduit interface over time.

12.3. Why Standard Midline Repair Is Insufficient

A conventional TAR or retrorectus repair focused only on the midline may leave:

- inadequate mesh overlap near the stoma,
- an unprotected conduit aperture,

- discontinuity of reinforcement geometry.

This creates a structural vulnerability where:

- forces redirect toward the stoma site,
- parastomal herniation becomes the next mechanical failure point.

Therefore, overlap-driven repair requires inclusion of the stoma region.

12.4. Indications for Conduit-Protective Reconstruction

Posterior conduit reinforcement principles should be applied when:

- midline incisional hernia requires definitive reconstruction
- a permanent end stoma is present
- continuity restoration of the GI tract is not planned
- a single definitive abdominal wall repair is intended

This is true:

- even before a parastomal hernia develops.

Key principle:

> The presence of a permanent stoma shifts reconstruction from midline-only repair to whole-unit abdominal wall restoration.

12.5. Surgical Objective

Reconstruction must achieve two simultaneous goals:

1. **Definitive midline restoration**
    - closure of linea alba
    - posterior mesh reinforcement with ≥5 cm overlap
2. **Protection of the stoma conduit zone**
    - stabilization of the conduit exit
    - prevention of future parastomal eruption
    - continuous mesh geometry

This combined strategy produces a unified abdominal wall construct.

12.6. Pauli Principles as Mandatory Integration

In this setting, conduit-protective reconstruction is performed using Pauli-based principles:

- posterior plane reinforcement
- conduit lateralization when necessary

- controlled aperture geometry
- avoidance of keyhole stress failure

Thus:

> Midline incisional reconstruction with permanent stoma should incorporate posterior conduit reinforcement as an obligatory component.

This is primarily an overlap-driven decision, not merely hernia-driven.

12.7. Mesh Strategy: Local Conduit Protection + Global Abdominal Wall Reinforcement

A dual-reinforcement strategy is applied:

1. Conduit Protection Mesh

A smaller coated mesh component may be placed beneath the conduit to:

- prevent bowel erosion
- protect the immediate stomal interface
- reduce conduit-related stress points

2. Definitive Abdominal Wall Mesh

A large polypropylene mesh provides:

- full midline reinforcement
- wide overlap ≥5 cm
- integration within posterior planes
- durable unit reconstruction

Key concept:

> The conduit is protected locally, while the abdominal wall is reinforced globally.

12.8. Aperture Control

The stomal opening should not remain excessively wide.

Controlled reduction of the conduit aperture is performed to approximately:

- **3 cm**

This allows safe conduit passage while reducing the structural weakness radius.

Aperture control contributes to:

- improved load distribution
- reduced recurrence vector
- stabilization of the exit zone

12.9. Approach Selection: Laparoscopic vs Open vs Robotic

Laparoscopic Approach

Feasible when:

- midline defect is moderate
- sac volume is limited
- extensive adhesiolysis is not required

Allows posterior conduit reinforcement with reduced wound morbidity.

Open Approach

Preferred when:

- midline defect is large (>10–12 cm)
- giant sac and adhesions are present
- TAR escalation is required
- soft tissue management is necessary

Open TAR combined with posterior conduit reinforcement provides definitive reconstruction.

Robotic Approach

Robotic reconstruction is particularly promising because it facilitates:

- long midline closure
- precise conduit aperture control
- advanced posterior plane work

However, routine use remains limited in many public healthcare systems.

12.10. Patient Selection: Fit vs Fragile

Elderly / Comorbid Patients

If adequate overlap can be achieved without full TAR escalation, a retrorectus reconstruction combined with conduit protection may represent the best compromise.

Younger / Fit Patients

Definitive TAR-based reconstruction with full conduit integration may provide maximal long-term durability.

Adjuncts such as botulinum toxin may be considered more readily when closure tension is expected.

12.11. Summary

Permanent stoma combined with midline incisional hernia represents a unique reconstructive category.

Key principles include:

- a stoma is a structural abdominal wall defect even without herniation
- midline-only repair risks future conduit failure
- posterior conduit reinforcement principles should be integrated obligatorily
- dual mesh strategy protects bowel locally and reinforces abdominal wall globally
- aperture reduction to ~3 cm stabilizes the conduit exit
- open TAR + conduit reinforcement is definitive for large defects
- robotic platforms are highly promising but system-limited

This chapter establishes the concept of whole-unit abdominal wall reconstruction in stoma-bearing patients.

CHAPTER 13

Reconstruction in Contaminated Fields and Enterocutaneous Fistulas

Single-Stage vs Staged Repair and Definitive Synthetic Reinforcement

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13.1. Introduction

Abdominal wall reconstruction in the presence of contamination remains one of the most debated areas in hernia surgery. Historically, synthetic mesh implantation in contaminated fields was considered contraindicated due to the fear of infection and explantation.

However, contemporary reconstructive evidence increasingly supports a more nuanced view:

- contamination does not automatically preclude durable mesh-based reconstruction
- the critical determinant is field control and plane selection
- posterior extraperitoneal reinforcement provides biologically favorable conditions

Therefore, modern strategy is not defined by avoidance of mesh, but by:

> appropriate staging, controlled reconstruction planes, and definitive reinforcement timing.

This chapter outlines an evidence-consistent and mechanically driven approach to contaminated abdominal wall reconstruction.

13.2. Fundamental Principle

The central concept is:

> Mesh avoidance is not a strategy. Field control is the strategy.

Definitive abdominal wall repair requires reinforcement. The clinical decision is whether reconstruction can be performed safely in a single stage or must be staged.

13.3. Definitions: Controlled vs Uncontrolled Contamination

Not all contamination is equivalent. A practical classification includes:

Controlled Contamination

Features:

- chronic stable enterocutaneous fistula

- no sepsis
- no active abscess
- predictable bowel resection possible
- soft tissues are not severely infected

This represents a reconstructive field where definitive repair may be possible in one operation.

Uncontrolled Contamination

Features:

- active intra-abdominal abscess
- severe soft tissue infection
- ongoing sepsis or physiologic instability
- uncontrolled enteric spillage
- necrotic or compromised skin

This represents a field requiring staged management.

13.4. Goals of Reconstruction in Contamination

The reconstructive objectives remain the same, but require stricter prerequisites:

1. elimination of the contamination source
2. restoration of fascial continuity
3. creation of a complete posterior barrier
4. mesh reinforcement in a protected plane
5. avoidance of chronic recurrence through durable material choice

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13.5. Single-Stage Reconstruction Strategy

Single-stage repair is preferred when contamination is controlled.

13.5.1. Indications

A one-stage approach is appropriate when:

- fistula is small and stable
- contamination is low-grade
- bowel resection can be performed safely
- no major soft tissue infection exists
- posterior reconstruction planes can be restored

13.5.2. Operative Concept

A single-stage operation includes:

1. excision of the enterocutaneous fistula
2. bowel resection and anastomosis or controlled stoma creation
3. posterior abdominal wall reconstruction
4. polypropylene mesh reinforcement in extraperitoneal plane

Key requirement:

> Polypropylene mesh is acceptable only when bowel is fully separated by a secure posterior barrier.

13.5.3. Why Synthetic Mesh Remains Definitive

Synthetic polypropylene mesh provides:

- superior biomechanical durability
- lowest recurrence rates
- predictable tissue integration

Biologic materials have not consistently demonstrated equivalent long-term structural performance.

Therefore:

> Definitive reconstruction remains mesh-based even in previously contaminated disease, once field conditions are controlled.

13.6. Staged Reconstruction Strategy

Staging is required when contamination is uncontrolled.

13.6.1. Indications

A staged approach is preferred when:

- active abscess is present
- soft tissue infection is severe
- sepsis or physiologic instability exists
- bowel cannot be safely reconstructed immediately

13.6.2. Stage 1 — Source Control

The first operation focuses on:

- fistula control or diversion
- abscess drainage
- soft tissue stabilization
- patient physiologic recovery

Temporary closure or bridging may be necessary as an interim measure, but is not definitive reconstruction.

13.6.3. Stage 2 — Definitive Reconstruction

Once the field is clean and stabilized:

- fascial closure is restored
- posterior plane reconstruction is performed
- polypropylene mesh reinforcement becomes the definitive strategy

Key concept:

> Staging changes timing, not the reconstructive endpoint.

13.7. Mesh Position in Contaminated Reconstruction

Mesh placement is critical.

Preferred locations:

- retrorectus
- preperitoneal
- TAR-expanded posterior planes

Avoided:

- intraperitoneal bridging implants in contaminated settings

Posterior extraperitoneal placement provides:

- vascularized tissue coverage
- reduced infection risk
- improved salvage potential if complications occur

13.8. Fixation Strategy

Fixation is minimized.

Rationale:

- fixation increases tissue trauma
- creates focal ischemia
- may increase infection susceptibility
- contributes to chronic pain

Stability is provided by:

- plane containment
- overlap discipline
- fascial closure

13.9. Outcomes and Risk Balance

Key outcome domains include:

- surgical site infection
- mesh infection requiring removal
- recurrence
- seroma formation
- long-term functional stability

Recurrence risk is dramatically higher when mesh is omitted. Therefore, durable reinforcement remains the endpoint once field control is achieved.

13.10. Pearls and Pitfalls

✅Pearls

- contamination is graded, not absolute
- controlled fistulas may be repaired definitively in one stage
- synthetic mesh is safe when posterior barrier is complete
- staging is timing strategy, not mesh avoidance
- posterior plane reduces infection risk

Pitfalls

- polypropylene mesh without secure bowel separation
- underestimating soft tissue infection
- premature definitive reconstruction in active sepsis
- insufficient overlap due to fear of contamination

13.11. Summary

Reconstruction in contaminated fields follows a controlled, algorithmic strategy:

- controlled contamination → single-stage repair with posterior synthetic reinforcement
- uncontrolled contamination → staged source control followed by definitive reconstruction
- polypropylene mesh remains the durable endpoint once separation and field control are achieved
- posterior extraperitoneal planes are essential
- fixation is minimized

This approach integrates modern evidence with biome understanding and long-term durability priorities.

CHAPTER 14

Seroma and Postoperative Fluid Collections

A Mechanism-Based Spectrum Approach

14.1. Introduction

Seroma formation is one of the most frequent postoperative events following abdominal wall reconstruction. Traditionally, seroma has been treated as a single complication — a nonspecific accumulation of fluid after surgery.

However, reconstructive experience demonstrates that postoperative fluid collections represent a spectrum of distinct anatomical and mechanical mechanisms rather than one uniform entity.

In modern abdominal wall surgery:

> Seroma is not merely "fluid after surgery" — it is a structural consequence of reconstruction geometry.

Understanding the mechanism is essential for both prevention and management.

14.2. Fundamental Principle

The key concept is:

> Postoperative fluid collections differ by origin, anatomy, and mechanical context, and therefore require mechanism-specific strategy.

Routine drainage or puncture is rarely appropriate without mechanistic interpretation.

14.3. Mechanism-Based Spectrum Classification

Postoperative fluid collections after hernia reconstruction can be classified into five dominant mechanisms:

Type 1 — Hematoma-Dominant Fluid Collection

Mechanism

Bleeding within the dissected plane produces serosanguinous accumulation.

Typical Settings

- large retrorectus dissections

- TAR-plane expansion
- inadequate hemostasis or coagulopathy

Management

- prevention through meticulous hemostasis
- intervention only if symptomatic or infected

Type 2 — Interface Seroma (Mesh–Subcutaneous Contact)

Mechanism

Seroma generated by contact between mesh and subcutaneous tissue when fascial separation is incomplete.

Occurs when:

- mesh is too superficial (onlay)
- fascia is not closed
- mesh lies directly beneath subcutis

Key preventive concept:

> Fascial closure and posterior mesh placement are anti-seroma strategies.

Type 3 — Sac-Cavity Seroma (Persistent Hernia Sac Space)

Mechanism

A residual hernia sac cavity remains after reduction of contents and fills with serous fluid.

Typical in:

- umbilical hernias with large sacs
- incisional hernias with unresected sac
- minimally invasive repairs without sac management

Prevention:

- selective sac reduction, invagination, or resection when feasible

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Type 4 — Post-Sac Resection Dead-Space Seroma

Mechanism

After sac excision, a large dead space remains, producing fluid accumulation.

This represents a paradox:

- sac removal eliminates cavity recurrence
- but creates dead space requiring mechanical control

Prevention:

- quilting sutures
- selective drains in open surgery
- soft tissue management

Type 5 — Lymphocele / Lymphatic Fluid Collection

Mechanism

Disruption of lymphatic channels during extensive dissection.

More common in:

- groin surgery
- parastomal reconstruction
- large component separations

Management:

- observation in most cases
- intervention only if symptomatic or persistent

14.4. Influence of Reconstruction Technique

Seroma risk depends strongly on operative geometry:

Posterior Repairs (TARM/eTEP/TAR)

- reduced interface seroma
- increased risk of dead-space collections in large sacs

Onlay Repairs

- highest interface seroma risk

Bridging Repairs

- chronic seroma potential due to persistent cavity and lack of closure

Thus:

> Seroma is primarily determined by plane, sac geometry, and dead-space control.

14.5. Preventive Checklist

Every reconstruction should include explicit seroma-prevention decisions:

✅Was the sac reduced or resected appropriately?
✅Is residual cavity present?
✅Is dead space controlled mechanically?
✅Is mesh separated from subcutis?
✅Are quilting sutures required?
✅Is a drain truly justified?

14.6. Operative Strategies for Prevention

Key intraoperative strategies include:

1. **Fascial closure whenever feasible**
2. **Posterior plane mesh placement**
3. **Selective hernia sac management**
4. **Mechanical dead-space control (quilting)**
5. **Drain use only when anatomically justified**
6. **Avoidance of unnecessary fixation trauma**

14.6A. Drains: Selective Use, Not Routine

Drain placement should never be routine in abdominal wall reconstruction. Drains do not prevent seroma mechanistically; they only evacuate fluid temporarily and may increase infection risk when overused.

Therefore:

> Drains are not a standard element of reconstruction and should be reserved for clearly defined high-risk geometry.

Indications for drains include:

- **large subcutaneous dead space**, especially after open sac resection
- **obesity with high SSI risk**, where fluid accumulation threatens wound healing
- **large posterior planes in open TAR**, creating extensive potential space
- situations where quilting cannot adequately eliminate cavity volume

Important limitations:

- drains are primarily considered in **open approaches**
- minimally invasive posterior repairs rarely require drainage

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14.6B. Hernia Sac Management: Resection, Invagination, or Sac Drainage

The hernia sac is a dominant driver of postoperative cavity seroma.

Preferred strategies:

1. **Selective sac resection** when redundancy is significant
2. **Sac invagination or reduction** to eliminate residual space

When sac elimination is not feasible due to adhesions or safety concerns:

- **sac drainage may be considered** as a controlled compromise

Key principle:

> Sac management is a seroma-prevention step, not merely a cosmetic step.

14.7. Management Algorithm

Asymptomatic Seroma

- observation
- reassurance
- no routine aspiration

Most seromas resolve spontaneously.

Symptomatic or Tense Collection

- ultrasound-guided aspiration
- strict aseptic technique
- avoid repeated punctures whenever possible

Suspicion of Infection

- aspiration for culture
- antibiotics based on findings
- evaluation of mesh involvement

Chronic Persistent Seroma

- rare consideration of surgical intervention
- capsule excision only exceptionally

14.7A. Aspiration Timing and Surveillance Strategy

Fluid collections should not be punctured routinely in the early postoperative period.

A practical strategy includes:

- observation during the first postoperative week
- first aspiration considered **after ~7 days** if the collection is:
    - tense
    - symptomatic
    - limiting mobility
    - clinically concerning

After the first puncture, further management is individualized.

Important rule:

> Repeated aspirations require special caution, strict asepsis, and particularly close supervision due to the risk of mesh infection.

Thus:

- seroma management requires **careful follow-up**, not automatic drainage.

14.8. Pearls and Pitfalls

✅Pearls

- not all fluid collections are the same
- mechanism recognition prevents overtreatment
- posterior reconstruction prevents interface seroma
- sac management reduces cavity-driven seroma
- drains are selective tools, not standards
- aspiration after 1 week is a practical threshold

Pitfalls

- routine drains without anatomical indication
- repeated punctures increasing infection risk
- ignoring sac cavity as primary mechanism
- superficial mesh placement generating chronic interface seroma

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14.9. Summary

Postoperative fluid collections represent a spectrum of distinct mechanisms:

- hematoma

- interface seroma
- sac-cavity seroma
- dead-space seroma
- lymphocele

Seroma prevention is primarily structural:

- posterior plane dominance
- fascial closure
- sac elimination or reduction
- dead-space control
- selective drain use only in open high-risk cases
- minimal fixation

Management must be individualized:

- most resolve spontaneously
- aspiration considered after ~7 days when symptomatic
- repeated punctures require particularly careful supervision

Mechanism-based interpretation remains essential for safe postoperative care.

CHAPTER 15

Mesh Fixation and Chronic Pain Prevention

“The Plane Is the Fixation” Principle

15.1. Introduction

Chronic postoperative pain remains one of the most significant long-term complications in hernia surgery. While recurrence prevention has historically been the dominant objective, modern abdominal wall reconstruction must balance durability with functional comfort.

A central contributor to chronic pain is:

- traumatic mesh fixation,
- nerve irritation or entrapment,
- excessive foreign body reaction in pain-sensitive zones.

Therefore, contemporary reconstruction increasingly adopts the principle that:

> Mesh fixation should be minimized whenever anatomical containment and overlap provide stability.

This chapter outlines fixation strategy as a biomechanical and pain-prevention concept rather than a routine technical step.

15.2. Why Fixation Matters

Fixation methods such as:

- tackers
- transfascial sutures
- staples
- rigid anchoring systems

can contribute to chronic pain through:

- direct nerve trauma
- ischemia of fascial tissue
- inflammatory reaction around fixation points
- scar tethering and restricted motion

Pain is particularly relevant in:

- inguinal nerve zones
- costal margin and subxiphoid regions

- lateral abdominal wall
- suprapubic fixation near bone

Thus, fixation is not benign.

15.3. The Modern Stability Concept

Mesh stability is achieved through three dominant factors:

1. **Correct anatomical plane**
2. **Adequate overlap geometry**
3. **Fascial closure compressing the mesh**

Fixation is secondary.

This establishes the reconstructive rule:

> The right plane is the best fixation.

15.4. Posterior Reconstruction as Pain-Prevention Strategy

Posterior planes (preperitoneal, retrorectus, TAR-plane) provide natural anatomical containment.

Advantages include:

- mesh is sandwiched between fascial layers
- external fixation becomes unnecessary
- reduced contact with cutaneous nerves
- less subcutaneous inflammation

Therefore:

> Posterior reconstruction is inherently a minimal-fixation approach.

15.5. Fixation Strategy by Region

Umbilical and Epigastric Hernias

- fixation avoided
- overlap and preperitoneal plane provide stability

Retromuscular Repairs (TARM/eTEP-RS)

- fixation generally unnecessary
- compartment containment is sufficient

TAR Reconstructions

- fixation minimized
- large mesh constructs stabilized by plane geometry

Parastomal Repairs

- fixation avoided near conduit sensitivity
- stability achieved through compartment design

15.6. When Fixation Is Justified

Although minimal fixation is preferred, selective fixation may be required when:

- overlap is limited by anatomical boundaries
- mesh cannot lie flat without migration risk
- inferior anchoring is necessary (e.g., suprapubic defects)
- very large grade defects require stabilization in groin surgery

Examples include:

- Cooper ligament fixation in large M3/L3 inguinal hernias
- pubic anchoring in suprapubic reconstructions
- selected lateral boundary constraints

Key rule:

> Fixation is justified only when anatomy prevents stable containment.

15.7. Fixation vs Overlap: The Critical Distinction

Fixation cannot compensate for inadequate overlap.

Recurrence is most often caused by:

- insufficient mesh width
- poor plane development
- folding or inadequate compartment creation

Not by absence of fixation.

Thus:

> Overlap prevents recurrence. Fixation only stabilizes placement.

15.8. Chronic Pain Prevention Checklist

Every reconstruction should include:

✅Posterior plane whenever feasible
✅Minimal traumatic fixation
✅Avoidance of nerve-rich zones
✅Flat mesh placement without folds
✅Adequate overlap (3 cm vs 5 cm rule)
✅Strategic fixation only when unavoidable

Pain prevention is embedded in operative design.

15.9. Pearls and Pitfalls

✅Pearls

- fixation is not routine
- plane + overlap provide true stability
- posterior reconstruction reduces pain risk
- selective fixation is anatomical, not habitual

Pitfalls

- excessive tack fixation
- fixation in nerve danger zones
- using fixation instead of adequate overlap
- anchoring without plane containment

15.10. Summary

Mesh fixation is one of the most modifiable contributors to chronic postoperative pain.

Modern reconstruction follows the principle:

- fixation minimized
- stability achieved through posterior containment and overlap
- selective fixation reserved for anatomical boundary constraints
- chronic pain prevention begins with operative geometry

This chapter establishes minimal fixation as a marker of reconstructive quality rather than omission of security.

CHAPTER 16

Operative Checklists and Departmental Standards

Implementing Reproducible Abdominal Wall Reconstruction Pathways

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16.1. Introduction

Abdominal wall reconstruction is not only a technical endeavor but also a system-based discipline. Durable outcomes depend on:

- consistent decision-making,
- standardized operative execution,
- structured postoperative pathways,
- team familiarity with reconstructive principles.

Variation in technique selection and intraoperative priorities is one of the leading causes of inconsistent outcomes across surgical departments.

Therefore:

> Reconstruction quality improves when surgery becomes algorithmic, reproducible, and auditable.

This chapter provides practical tools for departmental implementation.

16.2. The Concept of Reconstruction Quality Control

A successful reconstruction is defined by objective structural criteria rather than subjective impression.

Key quality markers include:

- fascial closure achieved
- correct posterior plane used
- overlap discipline respected
- minimal fixation applied
- sac and dead space managed
- conduit zone protected when stoma present

These markers form the basis of reconstructive standardization.

16.3. Preoperative Planning Checklist

Every abdominal wall reconstruction should include the following documented elements:

✅ **Defect classification**

- location (midline, lateral, parastomal, complex zone)

✅ **Defect width measurement**

- CT-based or intraoperative confirmation

✅ **Overlap calculation**

- ≥3 cm for small primary
- ≥5 cm for large/incisional/recurrent

✅ **Sac morphology assessment**

- small vs large redundant sac
- need for sac resection or invagination

✅ **Patient phenotype**

- obesity vs cachexia
- wound risk assessment

✅ **Physiologic reserve**

- fit vs fragile
- TAR escalation appropriateness

✅ **Stoma modifier**

- conduit present?
- need for Pauli integration?

✅ **Contamination status**

- controlled vs uncontrolled
- single-stage vs staged strategy

16.4. Intraoperative Reconstruction Checklist

The surgeon should confirm key reconstructive milestones:

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1. Plane Achievement

- preperitoneal
- retrorectus
- TAR-expanded posterior
- posterior conduit plane

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2. Posterior Barrier Integrity

- bowel fully separated from polypropylene mesh
- posterior layer closed when required

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3. Fascial Closure

- linea alba restored whenever feasible
- bridging avoided except salvage

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4. Mesh Geometry

- correct size selected
- flat deployment
- overlap achieved in all directions

---

5. Fixation Strategy

- no fixation as default
- selective fixation only for boundary constraints

---

6. Sac and Dead Space Management

- sac resection or invagination considered
- quilting if needed
- drains only in open high-risk dead space

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7. Stoma Conduit Control

- aperture reduced to ~3 cm
- conduit protected locally
- abdominal wall reinforced globally

16.5. Postoperative Pathway Standards

Standard postoperative care should be protocol-based.

Key elements include:

- early mobilization

- respiratory physiotherapy in LoD/TAR patients
- abdominal binder support when appropriate
- wound surveillance in obese/high-risk patients
- structured seroma monitoring (not routine aspiration)

Fluid collections require:

- observation first
- aspiration after ~7 days only if symptomatic
- strict supervision if repeated punctures occur

16.6. Departmental Training Levels

Reconstruction techniques should be tiered:

Level 1 (Core)

- open preperitoneal umbilical repair
- standard TAPP inguinal

Level 2 (Intermediate)

- TARM
- eTEP-RS

Level 3 (Advanced)

- Open TAR
- Pauli conduit reconstruction
- contaminated-field reconstruction

Complex zones (subcostal, suprapubic, lateral) require advanced expertise.

16.7. Standardized Operative Reporting Template

Every reconstruction should document:

- defect width and classification
- technique performed
- closure achieved (yes/no)
- mesh size and material
- overlap achieved
- fixation used (yes/no, where)
- sac management

- drains placed (indication)
- stoma integration if present

This allows audit, learning, and publication-quality datasets.

16.8. Continuous Quality Improvement

A departmental reconstruction program should include:

- recurrence tracking
- seroma and SSI surveillance
- chronic pain follow-up
- technique-based outcome stratification

Monthly review of complex cases builds consistency.

16.9. Summary

Abdominal wall reconstruction outcomes improve when surgery is standardized.

Key departmental principles include:

- algorithm-based technique selection
- documented overlap discipline
- posterior plane dominance
- minimal fixation philosophy
- mechanism-based complication management
- structured training escalation
- operative reporting for audit and research

This chapter establishes reconstruction as a reproducible departmental system, not isolated surgeon technique.

CHAPTER 17

Positioning Within EHS/AHS Guidelines

Consistency, Extensions, and Controversies in Modern Abdominal Wall Reconstruction

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17.1. Introduction

Modern abdominal wall reconstruction is increasingly shaped by international consensus guidelines, most notably those from:

- the **European Hernia Society (EHS)**
- the **Americas Hernia Society (AHS)**

These guidelines provide evidence-based recommendations regarding:

- defect size thresholds,
- mesh reinforcement,
- preferred anatomical planes,
- recurrence prevention,
- chronic pain reduction.

However, abdominal wall reconstruction remains a field where:

- evidence is strong for common primary defects,
- moderate for incisional disease,
- weak or evolving for complex reconstructions such as:
    - parastomal repair,
    - contaminated fields,
    - loss-of-domain repair,
    - robotic posterior reconstruction.

Therefore:

> A contemporary reconstructive handbook must both align with guidelines and transparently extend beyond them where evidence remains incomplete.

This chapter positions the abdominal wall reconstruction algorithm presented in this handbook within the current EHS/AHS guideline landscape, including areas of controversy.

17.2. Guideline-Consistent Core Principles

The reconstructive philosophy of this handbook strongly aligns with established guideline foundations.

These shared principles form the evidence-supported base of modern hernia surgery:

Mesh as Standard Reinforcement

Both EHS and AHS emphasize that mesh reinforcement reduces recurrence for most abdominal wall defects, particularly when defect width exceeds 1 cm.

This handbook similarly treats mesh-based repair as the default reconstructive strategy, except for selected life-stage situations.

Posterior Plane Preference

Guidelines increasingly favor posterior mesh positioning:

- preperitoneal
- retrorectus
- extraperitoneal TAR-expanded planes

while discouraging superficial onlay or intraperitoneal bridging when posterior reconstruction is achievable.

Posterior dominance is therefore both guideline-consistent and biomechanically optimal.

Fascial Closure Whenever Feasible

International consensus supports restoration of abdominal wall continuity as superior to bridging repairs whenever closure is possible.

This handbook adopts fascial closure as the primary reconstructive objective.

Overlap Discipline

Guidelines consistently emphasize that recurrence prevention depends heavily on mesh overlap geometry.

The practical overlap thresholds applied throughout this handbook:

- **≥3 cm** for small primary hernias
- **≥5 cm** for large, incisional, or recurrent defects

reflect biomechanical guideline logic.

Minimal Fixation to Reduce Chronic Pain

Fixation trauma is recognized as a contributor to chronic pain, especially in groin surgery.

This handbook extends minimal fixation philosophy broadly across abdominal wall reconstruction:

Stability should derive from plane containment and overlap, not traumatic anchoring.

17.3. One-Page Alignment Overview

Domain	Author's Algorithm	Guideline-Supported Elements	Controversial / Weak Evidence Zone
Primary umbilical/epigastric	Open preperitoneal mesh; lap if obese/complex; suture only selected	Mesh reduces recurrence; preperitoneal placement favored	Smallest defects (<1 cm), fixation necessity weak
Diastasis + hernia	Plication + extended mesh (TAPP preferred but hard; eTEP-RS second)	Mesh suggested when diastasis + hernia coexist	Optimal approach and mesh geometry still low-evidence
Inguinal	TAPP default; Lichtenstein exceptions; fixation only for M3/L3	Endoscopic repair reduces chronic pain; fixation recommended in large M3	Exact fixation thresholds debated
Incisional midline	TARM/eTEP-RS moderate; TAR for large/LoD; botulin selectively	Posterior reconstruction increasingly favored	TAR/LoD often beyond strict guideline scope
Parastomal/stoma	Pauli-first; dual mesh; aperture control ~3 cm	Prevention supported; repair evidence limited	Optimal repair technique not guideline-settled
Contamination/fistula	PP mesh in controlled fields; staged only if uncontrolled	Posterior planes reduce infection risk	Synthetic mesh in contamination remains debated

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17.4. Primary Umbilical and Epigastric Hernias (EHS/AHS 2020)

The joint EHS/AHS guideline provides one of the strongest evidence bases in ventral hernia surgery.

Guideline Size Classes

- small: 0–1 cm
- medium: >1–4 cm
- large: >4 cm

Comparative Table

Topic	Author's Pathway	EHS/AHS Guideline Position	Alignment
Mesh threshold	Mesh default for >1 cm	Mesh recommended to reduce recurrence	High
Suture repair	Only highly selected (<1 cm or staged pregnancy strategy)	Suture may be considered <1 cm in shared decision-making	Moderate
Overlap	≥3 cm primary; ≥5 cm incisional/recurrent	3 cm overlap suggested for 1–4 cm defects	High
Laparoscopy	Preferred in obesity or difficult open plane	Lap considered for obese/high wound-risk/large defects	High
Fixation	Avoid whenever plane allows	Evidence insufficient in open repairs; fixation suggested mainly in IPOM	Partial

Controversy

Guidelines strongly favor mesh for ≥1 cm, but also acknowledge limited evidence regarding:

- smallest defects
- fixation requirements
- optimal laparoscopic method for small hernias

17.5. Women of Childbearing Age: A Deliberate Divergence

One of the clearest intentional divergences in this handbook is the management of symptomatic 1–3 cm hernias in women planning pregnancy.

Author's Strategy

> Symptomatic 1–3 cm primary midline hernias are preferably treated with suture repair as a staged solution, with definitive mesh reconstruction after the last pregnancy.

Guideline Position

Guidelines generally recommend mesh for defects ≥1 cm but provide no strong pregnancy-specific algorithm.

Interpretation

This is an example where:

- physiology (future gestational expansion)
- life-stage planning
- mechanical inevitability of pregnancy stress

justify a pragmatic staged pathway beyond rigid guideline thresholds.

17.6. Rectus Diastasis With Concomitant Hernia (EHS 2021)

EHS diastasis guidance recognizes that diastasis plus hernia represents midline structural disease.

Topic	Author's Algorithm	EHS Position	Alignment
Diastasis alone	Plication + extended mesh reinforcement	Plication suggested	High
Diastasis + hernia	Plication + extended mesh reinforcement	Mesh suggested when hernia present	High
Preferred platform	Lap TAPP+plication ideal but difficult; eTEP-RS second; robotic promising	Platform not strongly defined (low evidence)	Expert extension

Robotic reconstruction is widely promising, but system-limited in many public settings.

17.7. Inguinal Hernias: Fixation Controversy and EHS Classification

Groin hernia guidelines (HerniaSurge/EHS) support:

- laparo-endoscopic posterior repair
- reduced chronic pain risk
- selective fixation in large medial defects

Fixation Rule

Fixation is recommended for:

- **large direct hernias (M3)**
- selected large lateral defects (L3)

This handbook aligns by:

- avoiding fixation routinely,
- using Cooper ligament fixation selectively in M3/L3.

Recurrence principle remains guideline-consistent:

> Posterior recurrence → anterior Lichtenstein
> Anterior recurrence → posterior lap repair

17.8. Incisional Hernias and TAR: Beyond Guideline Scope

EHS incisional hernia guidelines (2023) provide strong foundational principles but are limited in scope for:

- giant defects
- loss of domain
- full TAR-based reconstructions

Therefore, TAR-based algorithms represent an area where:

- evidence exists,
- practice is evolving,
- guidelines remain conservative or incomplete.

This handbook positions TAR as an overlap-driven escalation when retrorectus repair becomes geometrically insufficient.

17.9. Parastomal Hernias: Evidence Gap and Expert Mechanical Strategy

EHS guidelines strongly support prophylactic mesh in end colostomy formation.

However, for established parastomal hernia repair, the guideline emphasizes:

- high recurrence variability
- insufficient comparative evidence

Author's Contribution

This handbook presents:

- Pauli-first posterior conduit reconstruction
- conduit lateralization
- dual mesh strategy (local coated + large PP)
- aperture reduction to ~3 cm

These are evidence-informed but not yet universally mandated by guidelines.

This is an emerging reconstructive frontier.

17.10. Contaminated Fields: The Debate Over Synthetic Mesh

Guidelines remain cautious regarding synthetic mesh in contamination, but modern evidence increasingly shows:

- biologic superiority is unproven
- posterior extraperitoneal polypropylene can be safe in controlled conditions
- staging is required only in uncontrolled infection/sepsis

Thus:

> The handbook adopts a controlled vs uncontrolled contamination algorithm rather than mesh avoidance.

This remains one of the most controversial areas in abdominal wall reconstruction.

17.11. Summary: Evidence-Based Foundation With Transparent Extensions

The Author's abdominal wall reconstruction algorithm is strongly aligned with EHS/AHS guideline foundations:

- mesh reinforcement as standard
- posterior plane dominance
- fascial closure whenever feasible
- overlap discipline
- minimal fixation philosophy

It deliberately extends beyond guidelines in selected complex zones:

- staged strategy in pregnancy planning
- Pauli-first conduit reconstruction
- overlap-driven stoma protection
- controlled contamination with definitive synthetic reinforcement
- robotic future pathways

This approach reflects abdominal wall reconstruction as both:

- an evidence-based discipline, and
- a biomechanically reasoned expert reconstructive practice.

CHAPTER 18

From Handbook to Publication and Departmental Implementation

Building a Reconstructive Program, Registry, and Academic Output

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18.1. Introduction

A surgical handbook becomes valuable only when it leaves the page and enters practice. Abdominal wall reconstruction is not defined solely by operative technique, but by:

- reproducible decision-making,
- departmental standardization,
- outcome tracking,
- continuous refinement,
- academic dissemination.

The strategies presented in this book are intended not only as an individual algorithm, but as the foundation of a structured reconstructive program.

Therefore:

> The final step of reconstruction is implementation.

18.2. Reconstruction as a Departmental Discipline

Complex hernia surgery cannot rely on isolated surgeon intuition. Durability improves when teams operate within a shared framework:

- agreed defect classification
- consistent overlap discipline
- standardized posterior plane selection
- fixation avoidance principles
- uniform complication management

A department that reconstructs systematically becomes:

- safer,
- more reproducible,
- academically productive.

18.3. Institutional Hernia Pathways

Implementation begins by defining operative levels within the department:

Level	Procedures	Departmental Target
Core	Umbilical preperitoneal mesh, standard TAPP inguinal	Universal competence
Intermediate	TARM, eTEP-RS	Specialized team members
Advanced	Open TAR, Pauli repair, contaminated reconstruction	Dedicated reconstruction unit

This tiering prevents:

- uncontrolled escalation,
- inappropriate technique application,
- inconsistent outcomes.

18.4. The Abdominal Wall Reconstruction Registry

A reconstructive program should produce structured data.

Every repair should be entered into a registry including:

- defect location and width
- sac size category (small vs large)
- technique performed
- closure achieved (yes/no)
- mesh type and dimensions
- overlap achieved
- fixation used (yes/no)
- drains placed (indication-based)
- early complications
- recurrence and chronic pain follow-up

Such a registry enables:

- quality control
- internal audit
- research publication
- guideline contribution

18.5. Standardized Operative Reporting for Publication

To convert practice into publishable material, operative notes must include reconstructive variables rather than generic descriptions.

Minimum reporting elements:

1. Defect classification (EHS)
2. Defect width in cm
3. Technique category (TARM, TAR, Pauli, etc.)
4. Fascial closure performed
5. Mesh plane and size
6. Overlap achieved
7. Fixation strategy
8. Sac management
9. Drain policy and rationale
10. Follow-up protocol

Without these details, reconstruction cannot be academically analyzed.

18.6. Structured Follow-Up and Outcome Definitions

A reconstructive unit should define follow-up points:

- 30 days (wound, seroma, SSI)
- 6 months (bulge, function, chronic pain)
- 1 year (recurrence assessment)
- long-term (durability)

Outcomes should include:

- recurrence
- seroma mechanism type
- mesh infection
- chronic pain score
- patient functional recovery

This elevates reconstruction beyond “technical success.”

18.7. From Algorithm to Research Paper

This handbook naturally generates multiple publishable directions:

Paper 1 — Departmental Algorithm

- overlap-driven posterior reconstruction pathway
- escalation rules (RS → TAR)

Paper 2 — Mechanism-Based Seroma Spectrum

- sac-cavity vs interface vs dead-space seromas

- management outcomes

Paper 3 — Pauli-First Conduit Reconstruction

- dual mesh strategy
- aperture control
- midline + stoma unified reconstruction

Paper 4 — Diastasis as Linea Alba Disease

- reinforced plication philosophy
- lap vs eTEP vs robotic feasibility

Thus:

> A handbook becomes an academic portfolio.

18.8. Educational Value for the Surgical Team

Beyond publication, standardized reconstruction improves:

- resident teaching
- scrub nurse familiarity
- anesthetic planning in LoD cases
- complication anticipation
- interdisciplinary confidence

A department becomes known for:

- definitive repairs
- reduced recurrence
- reconstructive leadership.

18.9. Future Directions

The future of abdominal wall reconstruction will be shaped by:

- robotic posterior suturing
- extended minimally invasive TAR variants
- better functional outcome metrics
- AI-supported planning and mesh geometry prediction
- high-volume registry-driven guideline refinement

This handbook provides a foundation, not an endpoint.

18.10. Final Summary

Abdominal wall reconstruction is a discipline of:

- biomechanics,
- posterior anatomy,
- overlap geometry,
- minimal fixation,
- algorithmic escalation.

The transition from handbook to impact requires:

- departmental implementation,
- registry-based auditing,
- structured reporting,
- academic dissemination.

The ultimate goal is not merely hernia repair, but:

> restoration of a durable, functional abdominal wall unit.