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Severity-Based Management of the Hernia Sac in Inguinal and Inguinoscrotal Hernias and the Limits of Non-Ligation Techniques (Including PIBR)

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Abstract

Background: *Adult inguinal hernia repair has progressively moved from sac-centered gestures toward parietal reinforcement. Yet the peritoneal sac continues to generate uncertainty, especially in advanced inguinoscrotal disease, where redundancy, fibrosis, persistent dead space, and loss-of-domain physiology complicate any simple rule of sac preservation or excision (Lichtenstein et al., 1989; Amid, 2004; Simons et al., 2009; HerniaSurge Group, 2018; Bencini, 2026).*

Methods:*This paper is a narrative review with concept-building intent. It integrates guideline documents, registry analyses, comparative studies on sac handling and postoperative morbidity, literature on scrotal and giant inguinoscrotal hernias, literature on loss of domain, and a small but historically relevant body of original surgical experience by the present author and collaborators in large abdominal wall defects and unusual inguinoscrotal masses (Simons et al., 2009; HerniaSurge Group, 2018; Bencini, 2026; Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).*

Results: *A severity-based framework is proposed in which the sac may be: (1) functionally secondary and suitable for non-ligation; (2) present but not the dominant operative target because the main problem is parietal reconstruction and control of residual cavity; (3) absent despite a clinically hernia-like mass; or (4) transformed into a pathological space-forming compartment that requires active management. In Class I–II hernias, non-ligation may be rational when reduction is feasible and parietal reinforcement is robust (Bencini, 2026; Chaouch et al., 2023; Delikoukos et al., 2007). In Class III–IV hernias, sac redundancy, fibrosis, pseudocavity formation, and loss-of-domain physiology may support sac-directed strategies such as fenestration, partial management, distal-sac preservation, or resection depending on anatomy and operative goals (Tran et al., 2023; Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025). Historical case material is consistent with the proposition that size alone does not mandate sac excision, but neither does it justify dogmatic sac preservation (Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).*

Conclusion: *The correct question is not whether the hernia sac should always be removed or always preserved. The correct question is what role the sac is actually playing in the individual case. Severity-based sac management may provide a more coherent framework than any binary doctrine and helps define the rational limits of pure non-ligation techniques, including Parietal Inguinal Box Repair (PIBR) (Bencini, 2026).*

Keywords: Inguinal Hernia; Scrotal Hernia; Hernia Sac; Non-Ligation; Seroma; Loss Of Domain; PIBR; Dead Space; Mesh Fixation.

Introduction

The evolution of groin hernia surgery has repeatedly shifted the surgeon's attention between two poles: the protruding content and the defective wall. Classical tissue repairs arose from a strong anatomical reading of the inguinal region. Modern prosthetic repairs, by contrast, made durable reinforcement easier, reproducible, and widely applicable. In that transition, operative attention often moved away from the peritoneal sac and toward the mechanics of the myopectineal region and the quality of the final reinforcement (Lichtenstein et al., 1989; Amid, 2004; Simons et al., 2009; HerniaSurge Group, 2018).

This shift was not merely technical. It was conceptual. Once recurrence began to be understood primarily as a failure of parietal resistance rather than as a failure of sac treatment, the sac became, in many ordinary hernias, a secondary structure.

In contemporary open and minimally invasive practice, many surgeons therefore accept some form of limited sac handling, particularly when dissection is difficult, risky, or unlikely to add durable value to the repair (Simons et al., 2009; HerniaSurge Group, 2018; Bencini, 2026; Chaouch et al., 2023; Daes, 2014; Savoie et al., 2014).

However, the sac never disappeared as a clinical problem. It remains relevant in at least four settings. First, the sac may influence postoperative pain through the extent of dissection and ligation that the surgeon performs (Delikoukos et al., 2007). Second, the sac may determine the magnitude of postoperative dead space and thereby influence seroma, pseudorecurrence, and prolonged scrotal swelling (Chaouch et al., 2023; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025). Third, in giant hernias, the sac may become part of a broader loss-of-domain physiology in which reintegration of chronic extra-abdominal content threatens respiratory or abdominal compartment tolerance (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Bencini et al., 1986). Fourth, not every large inguinoscrotal or groin mass is a true hernia at all, and therefore not every apparently "hernial sac problem" contains a sac to manage (Biondi & Bencini, 1988).

Parietal Inguinal Box Repair (PIBR) was proposed as an anatomy-driven open anterior technique in which the sac is reduced without ligation, resection, or formal sac surgery, while stability is achieved by a calibrated aperture around the spermatic cord together with selective three-point osteoligamentous fixation (Bencini, 2026). That paper clarified the logic of PIBR, but it also naturally raises a broader question: when is such a non-ligation philosophy justified, and when does sac pathology itself define the limit of pure parietal treatment?

The present paper addresses that question. Its aim is not to defend a universal rule for or against sac excision. Rather, it proposes that sac management should be determined by severity, which in this context means not merely size, but the combined behavior of the sac, the residual cavity, the feasibility of reduction, the dynamic relationship between sac and wall, and the physiological consequences of reintegration. Within this framework, the sac may be functionally secondary, operationally irrelevant, diagnostically absent, or pathologically dominant. A severity-based reading therefore offers a more faithful account of real surgical practice than any simple "remove it" versus "leave it" doctrine (Bencini, 2026; Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

Methods

This article is a narrative review with explicit concept-building intent. The evidence base was assembled from four strata. The first stratum consists of established guidance documents on adult groin hernia management, which define the contemporary standard background for open and minimally invasive repair (Simons et al., 2009; HerniaSurge Group, 2018; Tran et al., 2023). The second stratum consists of registry and cohort studies that clarify the case-mix, complexity, and complication profile of scrotal and advanced inguinoscrotal hernias across different environments (Ohene-Yeboah et al., 2016; Sanders et al., 2008; Tran et al., 2023; Köckerling et al., 202). The third stratum consists of comparative studies and meta-analyses on sac handling, particularly those evaluating sac transection, reduction, distal-sac management, and strategies to reduce seroma or pain (Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025). The fourth stratum consists of original historical surgical publications by the present author and collaborators, addressing large laparoceles in emergency surgery, a giant inguinoscrotal hernia repaired after functional respiratory optimization, and a giant fibrolipoma of the spermatic cord initially mistaken for inguinal hernia (Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

The purpose of using these historical publications is not to claim that they provide modern comparative evidence for current groin hernia techniques. They do not. Their value is different. They document early surgical reasoning about large protrusive masses, dead space, reintegration of content, physiological tolerance of reduction, and the need to distinguish true hernia from non-hernial masses. In a paper devoted to severity-based sac management, these are not trivial background anecdotes; they provide primary-source historical observations relevant to the conceptual argument (Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

The review strategy was deliberately selective rather than exhaustive. Only literature directly relevant to one or more of the following questions was retained: (1) what does sac handling change clinically; (2) when does the sac become a pathologic cavity rather than a passive peritoneal extension; (3) what is the role of dead space in postoperative morbidity; (4) how should loss-of-domain concepts be interpreted in giant inguinoscrotal disease; and (5) how do unusual historical or differential-diagnostic cases refine contemporary thinking about the sac? Because much of the literature on loss of domain arises from ventral and incisional hernia surgery rather than groin surgery, any transfer of those concepts to giant inguinoscrotal hernia is made cautiously and signaled as an extrapolation rather than as direct proof (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012).

No quantitative synthesis was attempted. The heterogeneity of techniques, anatomical settings, and outcome definitions is too substantial for a coherent pooled clinical recommendation beyond what the published meta-analyses themselves already report (Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025). The present contribution is therefore interpretive: to align anatomy, pathophysiology, and operative reasoning into a severity-based framework that remains compatible with

current literature while preserving room for individualized judgment.

Why the Hernia Sac Still Matters

In routine inguinal hernia repair it is tempting to minimize the sac conceptually because the long-term success of repair depends mainly on the wall. That temptation is understandable and often clinically harmless in small, reducible hernias. Yet the sac continues to matter because it is the interface between protrusion and cavity. It embodies the history of the hernia. The more chronic, voluminous, and deforming the hernia becomes, the less the sac behaves like an inert peritoneal sleeve and the more it behaves like a remodeled compartment (Bencini, 2026; Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Daes, 2014; Savoie et al., 2014).

Three features explain why the sac matters. The first is geometry. A small indirect sac that collapses after reduction is very different from a thickened, elongated, multiloculated, or giant distal sac with a residual scrotal cavity. The second is tissue quality. Thin compliant peritoneum is not equivalent to chronically stretched, fibrotic, or adherent tissue. The third is physiology. A sac containing chronically extra-abdominal viscera participates in a broader system of adaptation involving abdominal capacity, diaphragm mechanics, respiratory reserve, venous return, and patient tolerance of reduction (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Bencini et al., 1986).

This means that the sac can occupy more than one role. In a limited inguinal hernia it may be little more than a passive witness to parietal weakness. In a moderate inguinoscrotal hernia it may become a contributor to dead space without yet being the dominant problem. In a giant scrotal hernia it may become a true pathological cavity, either because it resists spontaneous collapse or because its very existence reflects a long-standing displacement of domain. Conversely, in an apparent groin hernia that proves to be a giant fibrolipoma of the cord, the expected sac may not exist at all (Biondi & Bencini, 1988).

Accordingly, the question "what should be done to the sac?" is inseparable from a prior question: "what kind of sac is this, if any?" The answer cannot be based on size alone, because size has different meanings in different pathologies. A large groin mass may contain no sac. A large abdominal wall protrusion may involve cavity management rather than sac excision. A large inguinoscrotal hernia may require distal-sac decisions driven by postoperative fluid behavior or physiologic tolerance. Severity-based management begins precisely at this point: it insists that the sac be interpreted, not merely handled (Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Biondi & Bencini, 1988).

PIBR and the Logic of Pure Non-Ligation

PIBR provides the clearest modern expression of a pure non-ligation approach within the material considered here. The technique was explicitly designed as a wall-centered operation. The sac is reduced gently without dissection, ligation, or resection, and the repair is stabilized by a calibrated aperture around the spermatic cord together with selective fixation to three osteoligamentous points: the pubic tubercle, the superior pubic ramus/pectineal region, and the inguinal ligament (Bencini, 2026).

The conceptual appeal of this approach is strong. First, it minimizes unnecessary trauma to the cord and surrounding structures. Second, it avoids creating fresh peritoneal or distal-saccular dissection planes merely to satisfy a historical ritual. Third, it keeps the surgeon's main attention on the true load-bearing elements of recurrence prevention: restoration of parietal integrity, ring control, and stable mesh geometry (Bencini, 2026). In that sense PIBR is not merely a technical variant; it is an argument that the sac is often a secondary manifestation of wall failure rather than a primary operative target.

But the strength of PIBR should not be misunderstood as a universal claim. A pure non-ligation technique is most coherent when three conditions are met. The first is that reduction is feasible without hazardous force or extensive dissection. The second is that the residual cavity is expected either to be minimal or to collapse spontaneously. The third is that the wall reconstruction itself is reliable enough to prevent re-extrusion without requiring additional sac surgery. If these conditions hold, formal sac treatment may be unnecessary and may even be counterproductive (Bencini, 2026 Chaouch et al., 2023; Delikoukos et al., 2007).

The limits of PIBR are therefore not theoretical but anatomical and physiological. The technique becomes less self-sufficient as the distal sac becomes more redundant, more fibrotic, more space-forming, or more tightly connected to postoperative fluid collections and pseudorecurrence. It also becomes less self-sufficient where giant hernia physiology suggests that reintegration itself is the central problem. A severity-based paper does not weaken PIBR by saying this; it situates PIBR where its logic is strongest. The value of PIBR is that it defines, with unusual clarity, the lower-severity pole of sac management. Once that pole is clear, the upper-severity pole can be analyzed without confusion (Bencini, 2026; Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

What the Comparative Literature Actually Shows

The current literature on sac handling does not support a simplistic all-or-nothing rule. Instead, it shows that sac treatment influences different outcomes in different anatomical contexts. Two themes recur: postoperative pain and postoperative fluid collections (Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

A prospective randomized study in elective tension-free repair of indirect inguinal hernia reported significantly less postoperative pain when high sac ligation and excision were omitted (Delikoukos et al., 2007). This finding is conceptually important because it suggests that less sac aggression may confer a clinical benefit in appropriately selected hernias. It is consistent with the broader intuition behind non-ligation strategies: the sac should not be attacked merely because tradition says so. In routine, functional sacs, minimizing dissection may reduce tissue trauma without compromising the logic of repair (Bencini, 2026; Delikoukos et al., 2007).

The seroma literature points in a different but complementary direction. Meta-analytic data in laparoscopic groin hernia repair suggest that hernia sac transection can reduce seroma and shorten hospital stay compared with full reduction in selected indirect sacs, without obvious penalties in recurrence or overall morbidity (Chaouch et al., 2023; Supsamutchai et al., 2025). These studies do not license an automatic transfer of laparoscopic practice to every anterior repair. However, they do suggest that dead-space behavior is not a minor afterthought; how the sac is managed can alter the fluid dynamics of the postoperative cavity (Chaouch et al., 2023; Supsamutchai et al., 2025).

Additional procedure-specific reports reinforce this point. Daes described a distal-sac management strategy in large inguinoscrotal hernias specifically to avoid clinically significant seroma after endoscopic repair (Daes, 2014). Savoie and colleagues, working in austere conditions, reported that leaving the distal sac in the scrotum could limit early complications in giant inguinoscrotal hernias (Savoie et al., 2014). At first glance these publications might seem to point in opposite directions—one modifying the sac to reduce seroma, the other preserving distal sac to limit complications. In reality, both can be read as supporting the same broader proposition: distal-sac decisions should be tailored to anatomy, dissection risk, and the expected behavior of the residual cavity (Daes, 2014; Savoie et al., 2014).

The literature on direct hernia pseudo-sac is also revealing. A randomized pilot study on laparoscopic direct inguinal hernia repair found that fenestration of the pseudo-sac/thickened transversalis fascia was associated with reduced seroma formation (Lodha et al., 2023). Although this is not the same structure as an indirect peritoneal sac, it shows once again that cavity behavior after reduction matters. The important lesson is not merely that fenestration is beneficial in every setting, but that residual space can itself become the clinically relevant lesion even when the anatomic defect has already been repaired.

Taken together, these studies do not establish a universal preferred sac strategy. They do something more useful: they discourage dogma. Less sac dissection may reduce pain in selected settings (Delikoukos et al., 2007). More decisive interruption of a persistent cavity may reduce seroma in others (Chaouch et al., 2023; Daes, 2014; Lodha et al., 2023; Supsamutchai et al., 2025). Distal-sac preservation may sometimes be safer than aggressive distal dissection (Savoie et al., 2014). These are not contradictions; they are what a severity-based interpretation would predict.

Scrotal Hernias, Case-Mix, and Why Generalization Fails

Scrotal inguinal hernias are not merely larger versions of ordinary groin hernias. They represent a distinct technical and physiological category with higher complexity, different postoperative expectations, and greater heterogeneity in sac behavior. Recent scrotal hernia guidelines emphasize both their underrepresentation in high-resource settings and their heavy burden in low-resource environments, where delayed presentation is more common and where very large scrotal hernias are encountered far more frequently (Tran et al., 2023). Epidemiologic and comparative cohort data from Ghana and from African-versus-European cohorts reinforce this point: case-mix shapes what surgeons regard as "typical," and therefore shapes their intuition about what should be done to the sac (Ohene-Yeboah et al., 2016; Sanders et al., 2008; Tran et al., 2023).

Registry data also show that scrotal hernias differ from medial and lateral inguinal hernias in patient profile and outcomes. In multivariable analyses, scrotal hernias are associated with larger defects, greater complexity, and a less straightforward postoperative course (Köckerling et al., 2021). This matters because an operative philosophy developed primarily in small or moderate groin hernias may fail when transferred unchanged to advanced scrotal disease. The more redundant the distal component and the larger the residual cavity after reduction, the less likely it is that a pure non-ligation strategy will perform identically across the severity spectrum (Tran et al., 2023; Köckerling et al., 2021; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

This is where many debates about the sac become confused. A surgeon whose practice is dominated by small elective groin hernias may understandably conclude that formal sac surgery is often unnecessary. A surgeon whose practice includes delayed, giant, or austere-environment scrotal hernias may conclude the opposite. Both observations may be true within their own case-mix. The error arises when either experience is universalized (Ohene-Yeboah et al., 2016; Sanders et al., 2008; Tran et al., 2023; Köckerling et al., 2021; Daes, 2014; Savoie et al., 2014).

A severity-based framework therefore needs to be global in the best sense: not by flattening differences, but by recognizing them. The sac is not the same surgical entity in all settings because the hernia is not the same disease stage in all settings. Once that is accepted, the literature becomes much easier to interpret. Evidence supporting less dissection in functional sacs and evidence supporting cavity-directed measures in advanced sacs no longer compete with each other; they map onto different parts of the severity continuum (Tran et al., 2023; Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

Loss of Domain: From Ventral Definitions to Giant Inguinoscrotal Physiology

Loss of domain (LOD) is one of the most useful and one of the most abused concepts in abdominal wall surgery. Modern systematic review and Delphi consensus work showed that LOD has been defined inconsistently and that standardized written and volumetric definitions are needed if the term is to function as more than a vague clinical impression (Parker et al., 2019; Parker et al., 2020). Most of that work concerns ventral or incisional hernias, not groin hernias. Nevertheless, the physiological core of LOD is transferable: a substantial portion of the viscera has resided outside the normal abdominopelvic compartment long enough that simple reintegration may no longer be well tolerated (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012).

In giant inguinoscrotal hernia, LOD should not be reduced to a purely volumetric formula. Volumetry matters, but so do chronic diaphragmatic adaptation, respiratory reserve, abdominal compliance, venous return, and the dynamics of forced reintegration. The historical literature on progressive preoperative pneumoperitoneum exists because these problems are real: in selected large hernias the surgeon may need to prepare the patient, not just close the defect (Sabbagh et al., 2012).

The historical case of giant inguinoscrotal hernia repaired after carotid glomectomy is relevant here precisely because it can be read as documenting an early, pre-LOD-language recognition of the same physiological issue (Bencini et al., 1986). In that 1986 report, the central obstacle to repair was not portrayed as a mere technical problem of returning bowel to the abdomen. The central problem was respiratory. Functional improvement of the patient's bronchomotor/respiratory status was undertaken first, and only then was definitive hernia surgery performed. The case therefore anticipates the modern distinction between anatomical reduction and physiological tolerance of reduction (Bencini et al., 1986).

With respect to the sac, this is crucial. In giant hernia, the sac cannot be understood only as a peritoneal wrapper. It is part of a chronic extra-abdominal compartment. Once that has happened, the surgeon is no longer deciding merely whether to ligate or spare a sac; the surgeon is deciding how to dismantle or manage a pathophysiologic domain. That is why the upper end of the severity spectrum cannot be governed by the same logic as a routine indirect hernia (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Bencini et al., 1986).

At the same time, LOD should not be invoked too casually in groin hernia papers. Not every large inguinoscrotal hernia is a true LOD case, and not every difficult reduction implies a formal domain problem. Precision matters. In this review, LOD is used not as a decorative term for "large hernia," but as a marker of cases in which chronic external residence of viscera materially changes operative planning, risk, or the need for staged preparation (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Bencini et al., 1986).

Historical Operative Experience and What It Adds to a Sac-Focused Paper

The historical papers by the present author and collaborators should not be used as surrogate modern evidence. They nevertheless deserve a place in the present bibliography because they document primary-source surgical reasoning about large protrusive lesions, cavity behavior, and the distinction between true hernia and non-hernial mimics (Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

The paper on large laparoceles in emergency surgery is especially instructive (Bencini et al., 1986). It reports experience from 319 laparoceles treated between 1977 and 1985, of which 21 were complex emergency cases. The paper is not a groin hernia paper and does not explicitly theorize the hernia sac in the way a contemporary scrotal hernia manuscript might. Yet the operative logic is highly relevant. The emphasis falls on reintegration of content, reliable parietal reconstruction, and elimination of spaces that could become fluid collections. In modern terms, the paper illustrates an early dead-space consciousness. The dominant lesion is not an abstract sac to be excised, but a cavity-wall problem to be controlled (Bencini et al., 1986).

That historical observation helps the present argument in a limited but legitimate way. It does not prove how an inguinoscrotal sac should be managed. What it suggests is that even in large protrusive abdominal wall disease, the surgeon's operative priority may properly shift from the protrusive envelope to the mechanics of closure and obliteration of residual space. That conceptual move is directly relevant to a severity-based discussion of when the sac is and is not the operative center of gravity (Bencini et al., 1986).

The 1986 Acta Medica Labronica case of giant inguinoscrotal hernia in a patient with severe asthma contributes a different lesson (Bencini et al., 1986). In that case the sac was very much present and was treated actively: an enormous hernia sac was isolated, opened to facilitate reduction, and subsequently ligated as part of a Bassini repair, with additional scrotal remodeling. This case therefore does not support simplistic non-ligation. On the contrary, it shows that in extreme anatomy and physiology the sac may re-emerge as a central operative structure. Its value in the present paper lies precisely there. It marks the limit of any blanket statement that large size alone justifies conservative sac handling (Bencini et al., 1986).

The fibrolipoma paper contributes a third, equally important lesson: the expected sac may not exist (Biondi & Bencini, 1988). The patient presented with a large inguinoscrotal mass initially diagnosed as indirect inguinal hernia. Intraoperatively, however, the lesion proved to be a giant encapsulated, entirely extraperitoneal fibrolipoma of the spermatic cord. It was isolated from the testicle and cord elements, its pedicle was ligated at the deep ring, and careful canal exploration excluded concomitant inguinal hernia. In other words, before one can decide how to treat the sac, one must first establish that a true hernia and a true sac are present (Biondi & Bencini, 1988).

These three historical observations are not redundant. They identify three distinct states relevant to sac management: (1) a large protrusion in which parietal reconstruction and dead-space control dominate operative reasoning (Bencini et al., 1986); (2) a giant true hernia in which the sac becomes a major operative and physiological problem (Bencini et al., 1986); and (3) a giant groin mass in which the presumed hernial sac is absent because the diagnosis is different (Biondi & Bencini, 1988). For a severity-based paper, this triad is conceptually useful and bibliographically defensible.

Why Large Size Alone Does Not Mandate Sac Excision

A particularly important practical point is that large size alone does not mandate sac excision. This statement requires care because it can easily be misunderstood as the mirror-image dogma that large sacs should therefore be preserved. That is not the argument. The argument is that size, taken by itself, has limited explanatory power. A large protrusion may represent a giant but compliant sac that collapses once its content is reduced. It may represent a cavity in which dead space is the real postoperative threat. It may represent a pathologic compartment in which redundancy and fibrosis make sac-directed surgery appropriate. Or it may not represent a hernia sac at all (Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Biondi & Bencini, 1988).

The historical laparoceles paper is useful here by analogy, not by direct equivalence (Bencini et al., 1986). In large laparoceles, the operative center of gravity lies not in excising the protrusive envelope as such, but in reintegration of content, reliable closure, and elimination of spaces liable to collect fluid. Transposed carefully to the groin context, the lesson is not that inguinoscrotal sacs should be treated as incisional hernia sacs. The lesson is more modest and more important: the protrusive shell is not always the true surgical enemy. Sometimes the decisive problem is what remains after reduction, namely the quality of the wall and the behavior of the residual cavity Bencini et al., 1986).

This distinction also clarifies why some surgeons report good results by leaving the distal sac and others by modifying it. The apparent disagreement often reflects different postoperative priorities. Where distal dissection is hazardous, preserving the distal sac may reduce cord or scrotal morbidity (Savoie et al., 2014). Where a persistent cavity is likely to produce clinically relevant seroma, interruption of that cavity may be more important (Daes, 2014; Lodha et al., 2023; Supsamutchai et al., 2025). Neither strategy can be judged intelligently unless one asks what the residual space will do after the hernia is repaired.

In this sense the sac becomes less an object and more a predictor. Its thickness predicts how easily it will collapse. Its length predicts how large a distal cavity may persist. Its chronicity predicts remodeling and adherence. Its contents and duration predict whether reintegration will behave like a simple reduction or like a domain problem. A severity-based framework is therefore not just a classification of sacs; it is an attempt to predict postoperative biology from preoperative and intraoperative observations (Tran et al., 2023; Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

The same reasoning explains why the giant fibrolipoma case belongs in this paper despite not being a hernia paper (Biondi & Bencini, 1988). That case illustrates the most radical form of the principle: there are situations in which the safest and most rigorous sac management is to recognize that the presumed sac is not there. In other words, good sac surgery sometimes begins by refusing the wrong diagnosis. This is not a rhetorical flourish. Any conceptual paper on sac management risks becoming internally circular if it assumes from the outset that every large groin mass is a hernia and every hernia-like protrusion contains a sac worthy of standard hernia logic (Biondi & Bencini, 1988).

Thus the correct formulation is not “the sac should not be removed in large formations.” That would be too absolute. The correct formulation is that even in large formations, sac excision must be justified by sac function, sac pathology, residual cavity behavior, and physiology—not by size alone (Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

The Hernia Sac as Functional Structure, Operative Residue, or Pathological Compartment

A clinically useful classification should not begin with ideology; it should begin with sac behavior. On that basis, the sac can be understood in four progressively more complex states.

State A is the functional secondary sac. This is the typical small or moderate indirect sac that collapses or becomes clinically silent once content is reduced and the wall is reinforced. In this state, the sac is not driving symptoms after repair and formal excision is often dispensable. This is the natural domain of non-ligation, and it is where PIBR is most conceptually comfortable (Bencini, 2026; Delikoukos et al., 2007).

State B is the residual-cavity sac. Here, the sac is not the dominant disease process, but it leaves behind enough dead space that postoperative seroma or pseudorecurrence becomes plausible. The surgeon’s task is not necessarily to resect the entire sac, but to decide whether the cavity requires interruption, fenestration, drainage strategy, distal-sac management, compression, or simply observation. Much of the modern seroma literature fits into this state (Chaouch et al., 2023; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

State C is the pathological compartment sac. In this state, chronic redundancy, fibrosis, persistent cavity formation, or giant extension make the sac itself part of the pathology. It is no longer merely a passive consequence of wall weakness. At this point the sac may require partial management, distal-sac preservation, staged handling, or resection depending on the relation between dissection risk and cavity burden. This state often overlaps with advanced scrotal disease and sometimes with LOD physiology (Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Bencini et al., 1986).

State D is the absent or false sac. This includes cases in which the clinical appearance suggests hernia but the underlying lesion is extraperitoneal or otherwise non-hernial, as in giant spermatic cord fibrolipoma. The lesson is simple but essential: not every groin mass licenses hernia logic (Biondi & Bencini, 1988).

This state-based approach helps explain why arguments about the sac are so often unproductive. Surgeons may be speaking about different states without realizing it. One surgeon is discussing a functional secondary sac; another is discussing a giant pathological compartment; another is discussing a dead-space problem after minimally invasive repair. Once the sac is classified by behavior rather than by dogma, the literature becomes legible and operative choices become more defensible (Bencini, 2026; Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Biondi & Bencini, 1988).

Proposed Severity Classification and Recommended Sac Management

The following severity-based classification is intended as a pragmatic clinical framework rather than a final validated scoring system.

Class I: Functional inguinal hernia. The hernia is reducible, has minimal or no scrotal extension, and the sac is thin and compliant. After reduction, no clinically meaningful residual cavity is expected. Recommended approach: PIBR or another non-ligation strategy is reasonable, provided that ring control and parietal reinforcement are secure (Bencini, 2026; Delikoukos et al., 2007).

Class II: Moderate inguinoscrotal hernia. The hernia extends into the upper or moderate scrotum, but the sac is not grossly fibrotic and residual cavity is expected to be limited. Recommended approach: PIBR remains feasible, but the surgeon should think proactively about dead-space minimization rather than assuming spontaneous collapse. Additional measures should be selective rather than routine (Bencini, 2026; Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

Class III: Advanced scrotal hernia. The sac is elongated, thickened, or redundant, and reduction leaves a clinically meaningful cavity. Seroma, pseudorecurrence, or persistent swelling are plausible. Recommended approach: a pure non-ligation philosophy becomes less reliable. PIBR may still be adapted in selected cases, but sac-cavity management should be planned explicitly. Options include fenestration, partial management, or carefully chosen distal-sac preservation depending on anatomy and dissection risk (Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

Class IV: Giant inguinoscrotal hernia / suspected loss-of-domain physiology. The sac behaves as a space-forming pathological compartment and the physiology of reintegration may be limiting. Recommended approach: avoid doctrinaire pure non-ligation. Sac management should be individualized within a broader reconstruction strategy that may include resection, staged preparation, respiratory optimization, or other measures aimed at tolerable reintegration (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Bencini et al., 1986).

This classification is intentionally centered on behavior rather than on single-dimensional measurements. Size matters, but it is not sovereign. Two sacs of similar size may belong to different classes if one collapses after reduction and the other leaves a large pathological cavity. The severity class emerges from the interaction of anatomy, cavity, dissection risk, and physiology (Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Bencini et al., 1986).

Practical Decision Pathway

A severity-based decision pathway can be summarized in four sequential questions.

First: is this truly a hernia and is there truly a sac? This question is often skipped because the diagnosis appears obvious. Yet the fibrolipoma case shows that very large inguinoscrotal masses can imitate hernia convincingly (Biondi & Bencini, 1988). When the clinical picture is atypical or imaging is suggestive, the surgeon should preserve diagnostic humility.

Second: if a true sac exists, what is its behavior after reduction? Does it collapse? Does it leave a substantial cavity? Is the distal component likely to become a seroma reservoir? These questions determine whether non-ligation remains a simple omission or whether omission itself creates a postoperative problem (Chaouch et al., 2023; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

Third: what is the cost of sac dissection? In some cases extensive dissection risks pain, orchitic complications, bleeding, or avoidable trauma (Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014). In other cases failure to deal with

the cavity may be the more costly choice. The correct strategy is therefore the one that minimizes total biological harm rather than the one that is ideologically most elegant (Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

Fourth: is physiology the dominant problem? If the answer is yes—because of giant extension, long-standing extra-abdominal residence, respiratory limitation, or concern about reintegration—then sac management must be embedded in a broader reconstructive and physiological plan (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Bencini et al., 1986).

A practical algorithm follows naturally. If the lesion is a true Class I hernia, pure non-ligation is reasonable. If it is Class II, non-ligation may still be used, but only with active attention to dead-space behavior. If it is Class III, sac-cavity management should be planned rather than improvised. If it is Class IV, the surgeon should abandon any reflex that size alone either mandates or forbids sac excision; the relevant issue is how to restore anatomy without overwhelming physiology (Bencini, 2026; Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Bencini et al., 1986; Bencini et al., 1986).

Bibliographic Use of Historical Self-Citation

The bibliographic inclusion of older personal surgical publications also deserves explicit methodological justification. In modern academic writing, self-citation is acceptable only when it adds verifiable and non-redundant information. That threshold is met here for three reasons. First, the cited papers are original primary sources, not unpublished recollections (Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988). Second, each contributes a distinct concept relevant to the present thesis: dead-space-centered reconstruction in large protrusions (Bencini et al., 1986), physiology-limited reintegration in giant inguinoscrotal hernia (Bencini et al., 1986), and exclusion of a true hernia sac in a giant groin mass (Biondi & Bencini, 1988). Third, these citations are not used to inflate authority or to substitute for external evidence. On the contrary, their historical nature is acknowledged openly, and their claims are kept within the strict limits of what the original texts document (Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

For that reason, their age is not a weakness in itself. Age becomes a weakness only when an old paper is asked to answer a question it was never designed to answer. Used as historical evidence of operative reasoning, they remain valid. Used as proof of modern comparative superiority, they would be misused. The present paper adopts the former and rejects the latter approach. This distinction is important not merely for scholarly hygiene, but because it models how surgical memory should be integrated into contemporary concept-building: respectfully, transparently, and without overclaiming (Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

Discussion

The central proposition of this paper is straightforward: the sac should be managed according to what it has become in the individual patient. That proposition sounds obvious, yet much of the clinical conversation around the sac continues to oscillate between two unsatisfactory simplifications. One simplification is the older reflex that the sac should be dissected, ligated, and removed because that is what "proper" hernia surgery requires. The opposite simplification is the contemporary reflex that the sac is usually irrelevant because the wall is what ultimately matters. Both statements contain some truth, but each becomes misleading when detached from severity (Lichtenstein et al., 1989; Amid, 2004; Simons et al., 2009; HerniaSurge Group, 2018; Bencini, 2026; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

A severity-based framework resolves this by restoring a hierarchy of questions. It asks first whether the sac exists, then what it does, then what harm its dissection would cause, and finally what harm its persistence would cause. This is a more anatomically faithful and biologically honest framework than any rule based solely on size or tradition (Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Biondi & Bencini, 1988).

Within that framework, PIBR is not weakened but clarified. Its proper strength lies in the lower-severity range, where the sac is functionally secondary and where avoiding unnecessary sac surgery is part of the operation's logic (Bencini, 2026). Indeed, the randomized pain study and the conceptual economy of parietal repair both support the idea that some sacs are better left alone (Bencini, 2026; Delikoukos et al., 2007). But once the sac becomes a redundant cavity or a pathologic compartment, the logic changes. At that point, refusing to think about the sac because one is committed to a parietal philosophy would be just as doctrinaire as attacking every sac because of historical habit (Tran et al., 2023; Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

The historical papers sharpen this point. The large laparoceles paper supports the importance of cavity management and parietal reasoning even in massive protrusive disease (Bencini et al., 1986). The giant inguinoscrotal hernia case can be read as showing that in the most extreme physiological setting the sac may re-emerge as an operative target (Bencini et al., 1986). The fibrolipoma paper reminds us that before formulating sac strategy one must be certain that a true hernia exists (Biondi & Bencini, 1988). Together, these papers do not settle a modern clinical controversy. They enrich the conceptual architecture within which that controversy should be judged.

Another important implication concerns terminology. In surgical discussion, "the sac" is often treated as though it were a single anatomical entity across all hernia states. It is not. There is a major difference between a thin indirect sac, a direct

pseudo-sac, a giant distal scrotal sac, and a non-hernial mimic. Even among true hernias, the operative meaning of the sac differs. If terminology does not distinguish these entities, then literature and experience will appear more contradictory than they actually are (Chaouch et al., 2023; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Biondi & Bencini, 1988).

The proposed severity classification is intentionally simple, but its simplicity is not naivety. It is an attempt to translate complex anatomy into a clinically usable sequence of judgments. It may later require refinement by imaging, objective cavity measurements, or standardized descriptors of distal-sac redundancy. Even so, its present form already offers a practical improvement over undifferentiated language because it ties strategy to behavior rather than to ideology (Tran et al., 2023; Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

Finally, the present paper has a broader methodological implication. In hernia surgery, as in many fields, operative dogma often persists because the same word is used for biologically different problems. A severity-based approach is one way to dissolve false debates. It does not abolish preference or experience; it disciplines them. The goal is not to make every surgeon manage every sac in the same way. The goal is to ensure that when surgeons choose differently, they are choosing in response to different pathology rather than because they are speaking past each other.

Limitations and Future Directions

This review has several limitations. It is narrative, not systematic in the strict methodological sense. It integrates data from heterogeneous surgical settings and from both open and minimally invasive literature. Some of the most conceptually useful literature—especially on loss of domain—comes from ventral and incisional hernia surgery rather than from the groin literature, and therefore any transfer of principle must remain cautious (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012). Likewise, the historical personal publications included here are valuable for conceptual lineage and primary-source observation, but they are not modern comparative evidence (Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

Another limitation is that many clinically important terms remain incompletely standardized. “Large,” “giant,” “advanced,” and even “scrotal” are not always used identically across publications [8]. Outcome reporting is also inconsistent. Seroma may be clinically insignificant in one series and counted rigorously in another. Pseudorecurrence, prolonged swelling, pain, and quality of life are not uniformly defined, which complicates direct comparison (Chaouch et al., 2023; Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

Future work should therefore proceed in several directions. Prospective observational studies should classify sacs by reducibility, thickness, redundancy, and post-reduction cavity behavior. Imaging work could help define objective predictors of persistent cavity or pseudorecurrence. Comparative studies are needed to clarify when fenestration, partial sac management, distal-sac preservation, or resection offer the best risk-benefit balance in advanced scrotal hernia. Finally, the severity classes proposed here should be tested for interobserver reliability and for correlation with postoperative morbidity (Tran et al., 2023; Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025).

A more ambitious future goal would be to build a composite severity score that integrates anatomy, cavity burden, and physiology. Such a score might include reducibility, distal-sac extension, estimated residual cavity, respiratory limitation, and evidence of chronic extra-abdominal residence. Even if imperfect, this would move the field beyond informal impressions toward a more reproducible language of sac management (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Bencini et al., 1986).

Conclusion

The hernia sac should not be treated as a ritual object. It should be treated as a variable anatomical and physiological structure whose meaning changes with disease severity. In some cases it is functionally secondary and non-ligation is rational. In others it is not the main target because parietal reconstruction and dead-space control dominate the problem. In yet others it becomes a pathological compartment whose management may be indispensable. And in some groin masses the presumed sac is absent because the lesion is not a hernia at all (Bencini, 2026; Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Delikoukos et al., 2007; Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025; Bencini et al., 1986; Bencini et al., 1986; Biondi & Bencini, 1988).

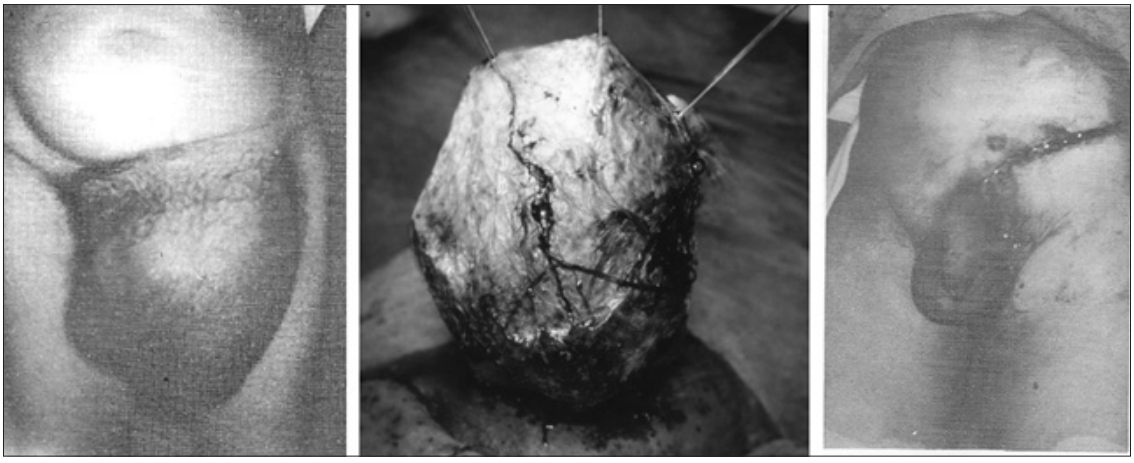
The practical implication is simple: large size alone does not mandate sac excision, but neither does large size justify indiscriminate sac preservation. What matters is the behavior of the sac, the burden of the residual cavity, the cost of dissection, and the physiology of reintegration. A severity-based framework respects these distinctions and therefore may provide a more coherent basis for decision-making than any binary doctrine. Within that framework, pure non-ligation techniques such as PIBR have a clear and legitimate place, but also clear and anatomically intelligible limits (Bencini, 2026).

Table 1: Proposed severity classification and recommended sac management

Class	Typical presentation	Sac behavior	Residual cavity / dead space	Preferred management logic
1	Inguinal / minimal scrotal	Thin, compliant, functionally secondary	Absent or trivial	PIBR or another non-ligation strategy if ring control and wall reinforcement are secure (Bencini, 2026; Delikoukos et al., 2007)
2	Moderate inguinoscrotal	Present but not grossly remodeled	Limited; may collapse	Non-ligation often feasible, but cavity behavior should be assessed deliberately (Chaouch et al., 2023; Delikoukos et al., 2007; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025)
3	Advanced scrotal	Redundant, thickened, or space-forming	Clinically meaningful	Plan sac-cavity management: fenestration, partial management, or carefully chosen distal-sac strategy (Tran et al., 2023; Köckerling et al., 2021; Chaouch et al., 2023; Daes, 2014; Savoie et al., 2014; Lodha et al., 2023; Supsamutchai et al., 2025)
4	Giant / suspected LOD	Pathological compartment linked to physiology	Large pathological cavity	Avoid doctrinaire pure non-ligation; tailor reconstruction and physiological preparation (Parker et al., 2019; Parker et al., 2020; Sabbagh et al., 2012; Daes, 2014; Savoie et al., 2014; Bencini et al., 1986)

This table is a pragmatic framework rather than a validated scoring system. Its purpose is to connect anatomy, cavity behavior, and physiology to operative choice.

Severity-Based Management of the Hernia Sac in Inguinal and Inguinoscrotal Hernias and the Limits of Non-Ligation Techniques (Including PIBR)



(A) (B) (C)

Figure 1(A–C): (A) Giant inguinoscrotal hernia with severe loss of domain and marked abdominal-visceral displacement. (B) Intraoperative view showing the hernia sac as a large peritoneal structure. (C) Postoperative appearance following physiological optimization and surgical repair.

This panel illustrates that, in advanced hernias, operative planning is primarily determined by physiological constraints and domain restoration, while sac management represents only one component of a broader severity-based strategy.
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