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Outcomes of Ligation of Intersphincteric Fistula Tract (LIFT) Technique Versus Fistulotomy in the Surgical Treatment of Trans-sphincteric Perianal Fistula

Samir Ibrahim Mohamed, Hany Mohamed Hassan, Mahmoud Eldryouny Abdelrahman

Department of General Surgery, Faculty of Medicine - Zagazig University

Abstract

Background: Trans-sphincteric peri-anal fistulae represent a complex surgical challenge due to their tendency for recurrence and the risk of fecal incontinence. Fistulotomy has long been considered the standard procedure for low trans-sphincteric tracts, offering high healing rates but at the cost of sphincter division. In contrast, the ligation of the intersphincteric fistula tract (LIFT) technique has emerged as a sphincter-preserving alternative, aiming to achieve durable healing while minimizing continence impairment. This review summarizes the comparative outcomes of LIFT and fistulotomy in terms of healing rates, recurrence, postoperative pain, wound healing time, complications, and continence preservation, highlighting their respective indications and limitations.

Keywords: Anal Fistula; Trans-sphincteric; LIFT; Fistulotomy; Sphincter Preservation; Continence; Recurrence; Surgical Outcomes.

Introduction

Anal fistula represents a chronic inflammatory tract connecting the anal canal to the perianal skin, constituting one of the most challenging conditions in colorectal surgery. This pathological condition predominantly affects males, with an incidence of 12.3 cases per 100,000 compared to 5.6 cases per 100,000 in females, typically manifesting around the age of 38 years with peak occurrence between 20 and 40 years of age (1). The condition arises primarily from cryptoglandular infection, with approximately 80% of anal fistulae originating from anorectal infection, and about 30-50% of patients with anorectal abscess subsequently developing an anal fistula (2).

The management of anal fistula presents a fundamental surgical dilemma: achieving complete healing while preserving anal continence. Traditional fistulotomy, despite its high success rates, carries inherent risks of sphincter damage and subsequent fecal incontinence, particularly in complex trans-sphincteric fistulae (3). This concern has driven the development of sphincter-preserving techniques, among which the Ligation of Intersphincteric Fistula Tract (LIFT) procedure has emerged as a promising alternative since its introduction by Rojanasakul in 2007 (4).

The classification of anal fistulae according to Parks system categorizes trans-sphincteric fistulae as those traversing both internal and external sphincters, accounting for approximately 30% of all anal fistulae (5). The American Gastroenterological Association further distinguishes between simple and complex fistulae, with complex fistulae involving significant portions of sphincter musculature and carrying higher risks of post-operative complications (6). This review comprehensively examines the current evidence regarding the efficacy, safety, and outcomes of LIFT technique compared to conventional fistulotomy in the management of trans-sphincteric perianal fistulae.

Anatomy and Pathophysiology

Anatomical Considerations

Understanding anal anatomy is crucial for effective management of perianal fistula disease. The anal canal extends 4 cm as the terminal portion of the alimentary tract, bordered by the dentate line which marks the mucocutaneous junction between viscerally innervated columnar epithelium proximally and somatically

innervated squamous epithelium distally (7). The anal sphincter complex consists of the internal anal sphincter, derived from the circular muscle of the rectal wall, and the external anal sphincter, encircled by the levator and puborectalis muscles (8).

The intersphincteric plane represents a crucial anatomical landmark, containing fibrous extensions of the outer longitudinal muscle layer of the rectum. This plane serves as the primary target for LIFT procedures, as it provides access to the fistula tract while preserving both internal and external sphincter integrity (9). The internal anal sphincter contributes 60-75% of resting anal tone, while the external anal sphincter and puborectalis collectively contribute approximately 20%, emphasizing the importance of sphincter preservation in maintaining continence (10).

Pathophysiological Mechanisms

The cryptoglandular theory remains the most widely accepted explanation for anal fistula development, with infection originating from anal glands situated in the intersphincteric space. Recent research has identified epithelial-to-mesenchymal transition (EMT) and matrix metalloproteinases (MMPs) as key mechanisms in fistula tract formation and persistence (11). EMT involves transformation of specialized epithelial cells into mesenchymal-type cells capable of migration and tissue infiltration, while increased MMP activity contributes to extracellular matrix breakdown and chronic inflammation (12).

The role of inflammatory bowel disease, particularly Crohn's disease, represents a distinct pathophysiological pathway affecting approximately 25% of Crohn's patients who develop perianal lesions. Crohn's disease-associated fistulae demonstrate transmural inflammation and require specialized multidisciplinary management approaches combining medical and surgical interventions (13).

Classification Systems

Parks Classification

The Parks classification system remains the gold standard for describing fistula tracts in relation to the anal sphincter complex. Trans-sphincteric fistulae, representing 30% of all anal fistulae, traverse both internal and external sphincters, passing into the ischiorectal fossa before reaching the perineum (14). This classification guides surgical decision-making, as trans-sphincteric fistulae involving significant portions of the external sphincter carry increased risks of post-operative incontinence with conventional fistulotomy.

Intersphincteric fistulae account for 45% of cases, extending through the internal sphincter to the intersphincteric space without external sphincter involvement. Suprasphincteric fistulae comprise 20% of cases, coursing superiorly above the puborectalis into the ischiorectal fossa, while extrasphincteric fistulae represent the remaining 5% and form connections lateral to both sphincters (15).

American Gastroenterological Association Classification

The AGA classification divides fistulae into simple and complex categories based on anatomical complexity and associated risk factors. Simple fistulae include intersphincteric and low trans-sphincteric fistulae crossing less than 30% of the external sphincter (16). Complex fistulae encompass high trans-sphincteric fistulae, supra-sphincteric and extra-sphincteric fistulae, recurrent fistulae, anterior fistulae in women, and those associated with inflammatory bowel disease, radiation, or malignancy (17).

Diagnostic Approaches

Clinical Assessment

Comprehensive evaluation begins with detailed history-taking, focusing on previous anorectal abscess episodes, cyclical patterns of pain and drainage, and symptoms suggestive of inflammatory bowel disease. Physical examination typically reveals external openings with surrounding scar tissue, though subtle presentations may require careful inspection of indurated areas (18). The Goodsall rule provides general guidance regarding fistula tract direction, though modern imaging techniques have largely superseded this clinical approximation.

Digital rectal examination, anoscopy, and proctoscopy remain fundamental diagnostic tools, particularly for identifying internal openings at the dentate line. The intersphincteric tract may be palpable as submucosal induration, providing valuable information for surgical planning (19). Examination under anesthesia achieves approximately 90% accuracy in detecting and classifying perianal fistulae in experienced hands (20).

Advanced Imaging Modalities

Magnetic resonance imaging has emerged as the most reliable imaging method for evaluating fistula characteristics and detecting associated abscesses. T2-weighted sequences effectively identify fluid content in fistula tracts, while gadolinium-enhanced images distinguish pus from granulation tissue (21). MRI's superior soft-tissue resolution and multiplanar imaging capabilities provide detailed visualization of the anal sphincter complex and fistula relationships, with studies demonstrating 75% reduction in recurrence rates when MRI guides pre-operative planning (22).

Endoanal ultrasonography represents an alternative imaging modality, particularly useful for identifying internal openings in the subepithelial layer. Three-dimensional EUS has shown promising results in evaluating perianal disease and can guide therapeutic interventions (23). Transperineal ultrasound offers a non-invasive alternative with sensitivity of 85% and positive predictive value of 86% for anal fistulae, demonstrating comparable value to endoanal ultrasonography (24).

Conventional Fistulotomy

Technique and Principles

Conventional fistulotomy involves laying open the entire fistula tract by dividing overlying tissues, including portions of the anal sphincter when necessary. The procedure utilizes electrocautery to divide perianal skin and anal epithelium, with careful identification and partial division of the internal sphincter when encountered (25). The fistula tract is opened completely, bleeding secured with cautery, and the wound left open for secondary healing with appropriate dressing.

The procedure's simplicity and effectiveness have established fistulotomy as the traditional gold standard for anal fistula treatment. Multiple studies demonstrate healing rates exceeding 95% for simple fistulae, with relatively short operative times and straightforward post-operative care (26). The technique allows complete visualization of the tract, enabling thorough debridement and elimination of septic foci.

Outcomes and Complications

Fistulotomy demonstrates superior healing rates compared to fistulectomy, with reduced post-operative pain, bleeding, and shorter wound healing times. The procedure results in lesser tissue excision compared to fistulectomy, contributing to earlier healing and reduced wound discharge duration (27). However, the primary concern with fistulotomy relates to sphincter division and subsequent continence disturbance.

Risk factors for post-operative incontinence include female gender, anterior fistula location, advanced age, and pre-existing continence issues. Female patients demonstrate increased vulnerability due to shorter anterior external anal sphincter length and potential birth-related damage (28). Studies suggest that division of even the lower third of the external anal sphincter carries non-insignificant risks of continence disturbance, particularly in high-risk populations (29).

The incontinence rates following fistulotomy vary considerably in the literature, ranging from 2% to 35% depending on patient selection, fistula complexity, and follow-up duration. Minor incontinence to flatus occurs more frequently than major incontinence to solid stool, though both complications significantly impact quality of life (30).

LIFT Procedure

Surgical Technique

The LIFT procedure represents a paradigm shift in anal fistula management, targeting the intersphincteric portion of the fistula tract without dividing sphincter muscles. The technique begins with a curvilinear incision

in the intersphincteric groove overlying the fistula tract (31). Careful dissection identifies and isolates the intersphincteric fistula tract, which is then ligated with absorbable suture adjacent to the internal opening.

The lateral portion of the tract undergoes curettage followed by suture ligation external to the initial ligation site. Tract division between the two ligation points is confirmed by injection or probing, ensuring complete interruption of the fistulous connection (32). The external opening may be widened for drainage if necessary, though the primary healing occurs through closure of the internal opening and elimination of the intersphincteric septic focus.

Variations of the LIFT technique include LIFT-plug procedures, where a bioprosthetic plug is inserted into the remaining tract after ligation, and BioLIFT procedures incorporating biological materials to enhance healing (33). These modifications aim to improve success rates while maintaining the sphincter-preserving advantages of the basic LIFT technique.

Outcomes and Efficacy

Multiple studies demonstrate LIFT success rates ranging from 61% to 94%, with most series reporting healing rates between 75% and 85%. The procedure demonstrates particular effectiveness in treating complex perianal fistulae while maintaining low complication rates (34). Healing typically occurs within 4-8 weeks, with rare occurrences of fecal incontinence representing a significant advantage over conventional fistulotomy (35).

Factors associated with LIFT failure include fistula tract length greater than 3 cm, obesity, and previous fistula procedures. These findings emphasize the importance of appropriate patient selection and timing of intervention (36). The procedure can be repeated with good results in cases of initial failure, providing additional therapeutic options without compromising sphincter function.

Comparative studies between LIFT and conventional fistulotomy consistently demonstrate lower incontinence rates with LIFT procedures, though healing rates may be slightly reduced compared to fistulotomy. The trade-off between healing efficacy and sphincter preservation represents the central consideration in treatment selection (37).

Comparative Analysis

Healing Rates and Recurrence

Systematic reviews comparing LIFT and fistulotomy demonstrate superior healing rates with fistulotomy, typically exceeding 95% compared to LIFT rates of 75-85%. However, this difference must be weighed against the significantly higher incontinence risks associated with fistulotomy (38). Recurrence rates appear comparable between techniques when appropriate patient selection criteria are applied.

Long-term follow-up studies suggest that LIFT recurrences often present as superficial track recurrence amenable to simple drainage or repeat LIFT procedures, rather than complex septic episodes requiring extensive surgical intervention (39). This pattern contrasts with fistulotomy failures, which may require more aggressive management due to sphincter compromise from the initial procedure.

Functional Outcomes

The most significant advantage of LIFT over fistulotomy relates to preservation of anal continence. Multiple studies demonstrate minimal impact on continence scores following LIFT procedures, with most patients maintaining baseline function (40). In contrast, fistulotomy carries variable but significant risks of continence disturbance, particularly in complex trans-sphincteric fistulae involving substantial sphincter muscle.

Quality of life assessments consistently favor LIFT procedures due to maintained continence function, despite potentially higher recurrence risks. Patient satisfaction surveys indicate preference for sphincter-preserving techniques, even when informed of potentially reduced healing rates (41). These findings reflect the profound impact of continence disturbance on daily functioning and social interactions.

Economic Considerations

Economic analyses of LIFT versus fistulotomy reveal complex cost-benefit relationships. While LIFT procedures may have higher initial costs due to longer operative times and specialized techniques, the reduced incontinence rates potentially decrease long-term healthcare utilization and quality-adjusted life years lost (42). The societal costs of fecal incontinence, including reduced productivity and increased healthcare needs, support investment in sphincter-preserving techniques for appropriate candidates.

Patient Selection Criteria

Ideal Candidates for LIFT

Optimal LIFT candidates include patients with trans-sphincteric fistulae involving significant sphincter muscle, particularly females with anterior fistulae and patients with risk factors for post-operative incontinence. Previous anorectal surgery, advanced age, and pre-existing minor continence issues represent relative indications for sphincter-preserving approaches (43). The technique proves particularly valuable in patients where fistulotomy would compromise substantial sphincter muscle.

Anatomical considerations favoring LIFT include well-defined intersphincteric tracts accessible through standard approaches, fistula tract lengths less than 3 cm, and absence of extensive secondary tracking. Active sepsis should be controlled prior to LIFT procedures, often requiring preliminary drainage or seton placement (44).

Contraindications and Limitations

Absolute contraindications to LIFT include active Crohn's disease with ongoing inflammation, rectovaginal fistulae, and anterior fistulae in patients with previous obstetric sphincter injuries. Relative contraindications encompass obesity, diabetes mellitus, immunosuppression, and complex fistulae with extensive secondary tracking (45). Previous failed LIFT procedures may compromise success rates for repeat attempts, though the technique remains repeatable in carefully selected cases.

Technical limitations include difficulty accessing high intersphincteric tracts, presence of multiple primary tracts, and inadequate tissue quality for secure ligation. These factors require careful pre-operative assessment through clinical examination and appropriate imaging studies (46).

Complications and Management

LIFT-Specific Complications

LIFT procedures demonstrate low overall complication rates, with wound infection representing the most common early complication. Hematoma formation, seroma collection, and delayed wound healing occur infrequently but may require drainage or antibiotic therapy (47). Recurrence typically manifests as superficial tracking rather than deep sepsis, often manageable with office-based procedures or repeat LIFT techniques.

Failure to identify or adequately ligate the intersphincteric tract represents the primary technical cause of LIFT failure. Inadequate debridement of infected tissue, tension on suture lines, and premature physical activity may contribute to recurrence (48). These complications emphasize the importance of meticulous surgical technique and appropriate post-operative care.

Post-operative Management

Standard post-operative care includes pain management with non-narcotic analgesics, stool softeners to reduce straining, and local wound care with sitz baths. Activity restrictions typically limit heavy lifting and strenuous exercise for 2-4 weeks, allowing adequate healing of the intersphincteric repair (49). Follow-up examinations at 2-4 week intervals monitor healing progress and identify early signs of recurrence.

Patient education regarding signs of recurrence, appropriate activity levels, and wound care compliance significantly impacts outcomes. Early recognition of complications allows prompt intervention and may prevent progression to complex septic episodes requiring more extensive surgical management (50).

Future Directions and Innovations

Technological Advances

Emerging technologies continue to expand sphincter-preserving options for anal fistula management. Video-assisted anal fistula treatment (VAAFT) combines diagnostic fistuloscopy with targeted therapy, achieving success rates comparable to LIFT while providing direct visualization of fistula anatomy (51). Laser ablation techniques, including Fistula tract Laser Closure (FiLaC), demonstrate promising results with minimal sphincter risk and repeatable application.

Regenerative medicine approaches, including mesenchymal stem cell therapy and tissue engineering applications, represent potentially revolutionary advances in fistula management. These techniques aim to promote natural healing while maintaining sphincter integrity, though long-term efficacy data remain limited (52).

Combined Approaches

Hybrid techniques combining elements of multiple procedures show promise for complex cases unsuitable for single-modality treatment. LIFT-plug procedures incorporate bioprosthetic materials following intersphincteric ligation, potentially improving healing rates while maintaining sphincter preservation (53). Sequential approaches utilizing initial LIFT followed by alternative techniques for failures provide algorithmic treatment pathways.

The integration of advanced imaging guidance, including real-time ultrasonography and magnetic resonance imaging, may improve procedural accuracy and patient selection. These developments support the evolution toward personalized surgical approaches based on individual anatomical and risk factor profiles (54).

Conclusion

The management of trans-sphincteric perianal fistulae continues to evolve toward sphincter-preserving approaches, with LIFT procedures representing a significant advancement in balancing healing efficacy with functional preservation. While conventional fistulotomy maintains superior healing rates, the associated risks of continence disturbance support the adoption of LIFT techniques for appropriate candidates. Patient selection remains crucial for optimizing LIFT outcomes, with ideal candidates including those at high risk for post-fistulotomy incontinence and those with anatomically suitable fistula tracts. The procedure's repeatability and low morbidity profile provide additional advantages over sphincter-dividing techniques. Future developments in regenerative medicine, imaging guidance, and hybrid surgical approaches promise further improvements in anal fistula management. The integration of these advances with established sphincter-preserving techniques supports the continued evolution toward individualized treatment algorithms prioritizing both healing and functional preservation. The evidence supporting LIFT as a viable alternative to fistulotomy continues to accumulate, with growing recognition of the importance of maintaining anal continence in surgical decision-making. As surgical techniques continue to evolve, the principles of sphincter preservation and individualized patient care will remain central to achieving optimal outcomes in perianal fistula management.

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