Tech Coloproctol (2014) 18:13–22
DOI 10.1007/s10151-013-1050-7

REVIEW

Overview of anal fistula and systematic review of ligation of the intersphincteric fistula tract (LIFT)

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Received: 3 December 2012 / Accepted: 7 July 2013 / Published online: 27 July 2013

Abstract Anal fistula management has long been a challenge for surgeons. Presently, no technique exists that is ideal for treating all types of anal fistula, whether simple or complex. A higher incidence of poor sphincter function and recurrence after surgery has encouraged the development of a new sphincter-sparing procedure, ligation of the intersphincteric fistula tract (LIFT), first described by Van der Hagen et al. in 2006. We assessed the safety, feasibility, success rate, and continence of LIFT as a sphincter-saving procedure. A literature search of articles in electronic databases published from January 2006 to August 2012 was performed. Analysis followed Preferred Reporting Items for Systematic Reviews recommendations. All LIFT-related articles published in the English language were included. We excluded case reports, abstracts, letters, non-English language articles, and comments. The procedure was described in detail as reported by Rojanasakul. Thirteen original studies, including 435 patients, were reviewed. The most common fistula procedure type was transsphincteric (92.64 %). The overall median operative time was 39 (±20.16) min. Eight authors performed LIFT as a same-day surgery, whereas the others admitted patients to the hospital, with an overall median stay of 1.25 days (range 1–5 days). Postoperative complications occurred in 1.88 % of patients. All patients remained continent postoperatively. The overall mean length of follow-up was 33.92 (±17.0) weeks. The overall mean healing rate was 81.37 (±16.35) % with an overall mean healing period of 8.15 (±5.96) weeks. Fistula recurrence occurred in 7.58 % of patients. LIFT represents a new, easy-to-learn, and inexpensive sphincter-sparing procedure that provides reasonable results. LIFT is safe and feasible, with favorable short- and long-term outcomes. However, additional prospective randomized studies are required to confirm these findings.

Keywords Ligation · Intersphincteric · Anal · Fistula

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Introduction

A fistula is an abnormal pathological tract that communicates between two epithelial organs. Anal fistula is a common complication after abscess formation, with cryptoglandular infection being the most widely accepted etiologic factor [1]. Usually, pus will follow the path of least resistance; this determines the location of the abscess and the type of fistula.

A thorough understanding of the relevant anatomy is essential in the management of fistula-in-ano. Anal fistulas can be classified into five main types based on the involvement of the anal sphincter muscles [1]: (1) submucosal or superficial: the fistula tract passes superficially beneath the submucosa and does not involve a sphincter muscle; (2) intersphincteric: the tract passes through the internal sphincter and continues in the intersphincteric plane to the perianal skin, not including the external anal sphincter; (3) transsphincteric: the tract crosses the internal and external anal sphincters as it exits toward the perianal area. The amount of external anal sphincter that is involved further subdivides this type of fistula into "low"! when up to one-third of the distal external anal sphincter or less is involved, and "high" if a larger area of the external sphincter is included; (4) suprasphincteric: the fistula tract passes through the internal sphincter but crosses the

external sphincter below the puborectalis muscle; and (5) extrasphincteric: the fistula track passes outside the sphincter complex through the ischiorectal fossa to the perianal skin. In this case, the fistula does not originate from the dentate line but could be of rectal, pelvic, or supralevator origin, usually secondary to an inflammatory or neoplastic process.

The American Gastroenterological Association divides fistulas into simple and complex types [2–4]. Simple fistulas are a low type of fistula and involve a small portion (or sometimes none) of the sphincter complex type. These fistulas include superficial, low intersphincteric, or low transsphincteric fistulas. Conversely, complex fistulas are anatomically higher: they involve significant portions of the sphincter musculature, may have multiple tracts, involve other organs (i.e., the vagina or bladder), and may be associated with radiation, neoplasms, or inflammatory bowel disease. Recurrent fistulas are usually included in this category [5]. This classification system is clinically more useful and can facilitate operative decision making.

The treatment for anal fistula has long been a challenge for physicians. References to fistula disease and the use of both fistulotomy and setons can be found in the writings of Hippocrates, dating from 400 BC [6]. The ideal treatment is based on 3 cornerstones: (1) control of sepsis; (2) closure of the fistula; and (3) maintenance of continence [5].

The aim of surgical treatment for anal fistula is to heal the fistula, possibly avoiding damage to the sphincter muscles. Various procedures have been developed to achieve this goal. The most common procedures in the literature include fistulotomy, fistulectomy, the use of setons, the use of fistula plugs, the use of fistula glue, the use of flaps, the use of radiofrequency, the use of stem cells, and ligation of the intersphincteric fistula tract (LIFT). Some of these techniques are sphincter-sparing.

Surgery for anal fistula frequently results in recurrence and incontinence. The reported rates of recurrence and incontinence are 0–32 and 0–63 %, respectively [7, 8]. These undesirable outcomes depend on many factors, the surgical technique used being the most important.

In 2006, Rojanasakul et al. [9] from Bangkok, Thailand, described a new sphincter-saving procedure involving LIFT. The technique involves disconnection of the internal opening from the fistula tract and removal of the residual infected anal gland, without dividing any part of the anal sphincter complex. Many surgeons have adopted this technique. The LIFT technique has gained popularity particularly due to its high success rate and preservation of continence. We reviewed all reports on LIFT to obtain better evidence regarding the use of this procedure and to evaluate the outcome. Our aim in this systematic review was to assess the safety, feasibility, success rate, and continence associated with this sphincter-saving procedure.

Materials and methods

Literature search

The PubMed, Google Scholar, EMBASE, and Science Citation Index electronic databases were reviewed, and potentially relevant publications were identified in the bibliographies of all included articles.

We searched all articles from January 2006 to August 2012. The following keywords were used: ligation, intersphincteric, anal, ano, and fistula.

Abstracts of all articles were obtained, and the full texts of studies considered to contain data on the ligation of intersphincteric fistulas were retrieved.

All articles reporting ligation of intersphincteric fistulas published in the English language were included. We excluded case reports, abstracts, letters, non-English language articles, and comments.

Methods for analysis and inclusion criteria were based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA); recommendations were specified and documented in a formal protocol.

Data collection

The target population consisted of adults (>18 years old), male or female, who underwent the LIFT procedure.

All types of fistulas managed by LIFT were included in the present review. We retrieved the following data regarding each study: study type, procedure type, patient number, patient comorbidity, short-term outcome, follow-up data, complications, incontinence, healing rate, non-healing rate, and recurrence rate.

Healing was indicated by complete skin as well as internal and external opening closure without discharge. Non-healing was indicated by persistent wound or opening discharge or incomplete wound or opening closure. Recurrence was indicated by complete healing in the presence of another fistula tract at the same site.

Statistical analysis

The relative risks, confidence intervals, z statistics, and mean values were calculated using the SPSS system (Statistical Product and Service Solution 18 for Windows, SPSS Inc., Chicago, IL, USA).

Preparation

Initially, most surgeons performed full bowel preparation; however, as they gained experience in performing the procedure, most shifted to only one or two bowel enemas or did not use bowel preparation. Additionally, most

surgeons used preoperative antibiotics, which were in some cases continued postoperatively.

LIFT technique

Here, we report the technical points described by Rojanasakul [7] who first described the LIFT procedure. A preoperative rectal enema was administered the night before surgery. The procedures were performed with the patient in the prone jackknife position, under regional anesthesia. However, some surgeons performed the procedure under general anesthesia.

The steps involved in the procedure are as follows:

1. Identify the internal opening by injecting water through the external opening or by gently probing the fistula tract. Some authors used hydrogen peroxide for this purpose.
2. Enter the intersphincteric plane at the site of fistula using a 3–4-cm curvilinear incision (Fig. 1).
3. Identify the intersphincteric tract using a ureteric catheter or Lockhart–Mummery and lacrimal probes, as suggested by other authors. Next, perform a meticulous dissection, using scissors and electrocautery. Exposure of the intersphincteric plane can be facilitated by using specially designed long and narrow blade retractors (Fig. 2). A Lone Star retractor or any type of self-retaining retractor was used by some surgeons.
4. Hook the intersphincteric tract using a small right-angled clamp (Fig. 3).
5. Ligate the tract close to the internal sphincter with polyglactin 3/0 (Fig. 4a, b). Some authors prefer suture transfixation.
6. Divide the tract distal to the point of ligation. Remove the remnant of the intersphincteric tract or possibly the infected gland and send the remnant specimen for histopathological analysis (Fig. 5).
7. Inject water through the external opening once more to confirm that the tract was divided correctly.
8. Curette the fistula tract (Fig. 6).
9. Drain the external opening adequately via an additional incision or insert a drainage catheter and suture the defect at the external sphincter (Fig. 7).
10. Re-approximate the intersphincteric incision wound loosely with an interrupted polyglactin 3/0 suture (Fig. 8).

Note: All figures were taken from a video of the Rojanasakul procedure, which was uploaded to YouTube.com by Supakij Khomvilai on March 14, 2010.

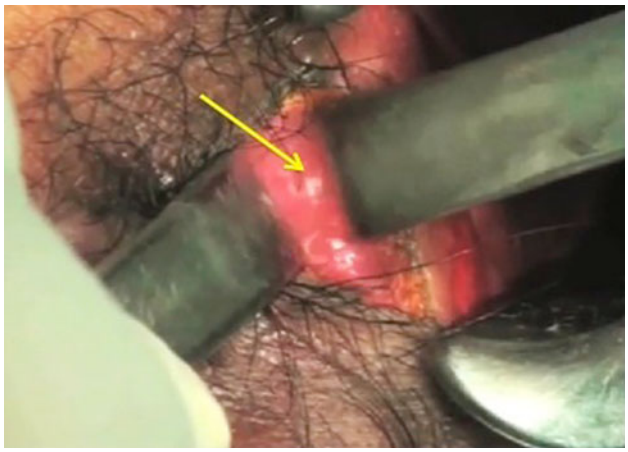

Fig. 2 Use of long, narrow blade retractors to open the intersphincteric space (*arrow*)

Fig. 1 A 3–4-cm curvilinear incision in the intersphincteric groove

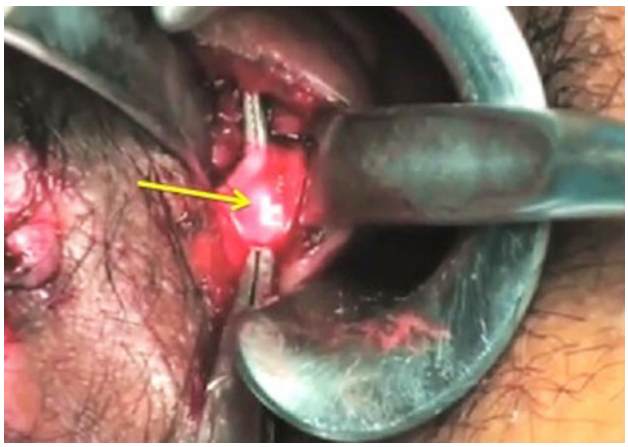

Fig. 3 Right-angled clamp hooked around the fistula tract while the ureteric catheter inside the tract (*arrow*)

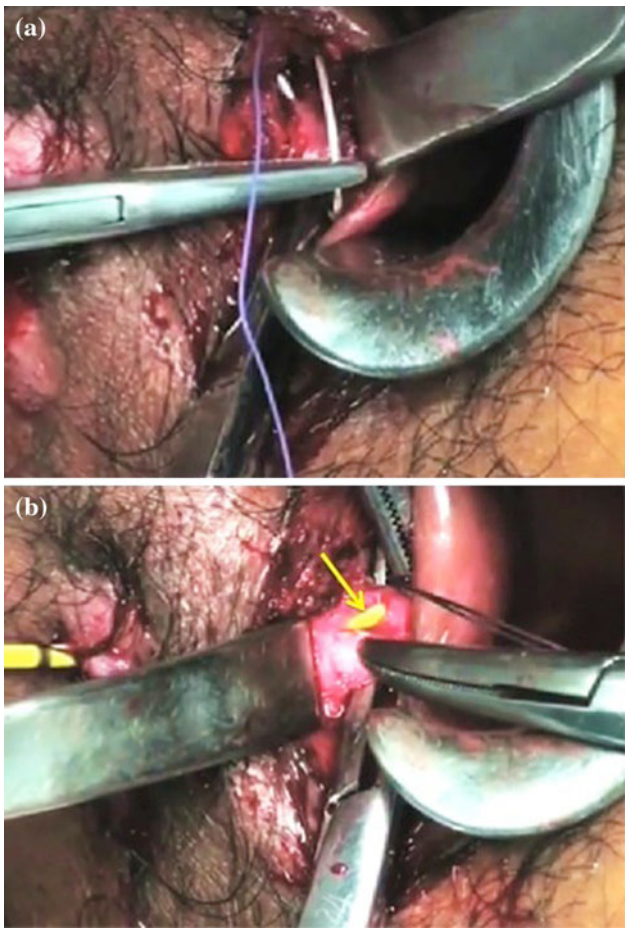

Fig. 4 **a** Secure closure of the tract close to the internal opening. **b** Ligated fistula tract at the internal opening side. Note the ureteric catheter (*arrow*) withdrawn in the remaining part of the tract before ligation

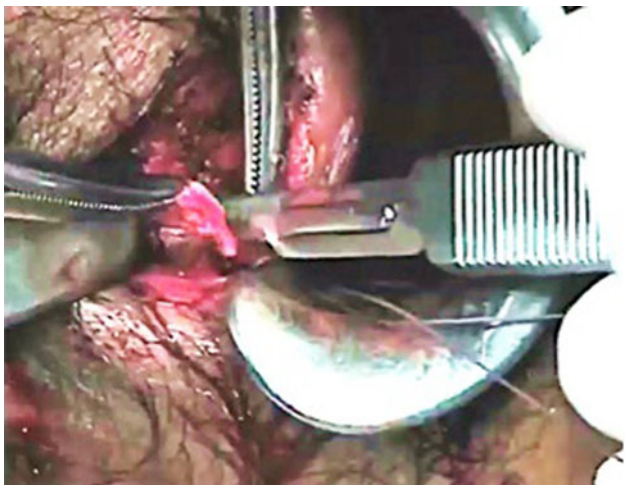

Fig. 5 Division of the tract distal to the point of ligation. The remnant of the intersphincteric tract or possibly the infected gland is removed, and the specimen is sent for histopathological analysis

Fig. 6 Removal of the cryptoglandular infection and curettage of distal fistula tract

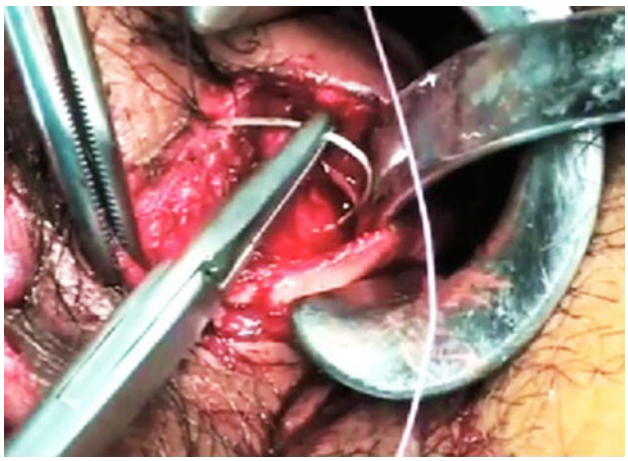

Fig. 7 Suture the defect at the external sphincter muscle

Fig. 8 The wound is closed with interrupted wide sutures to allow spontaneous drainage

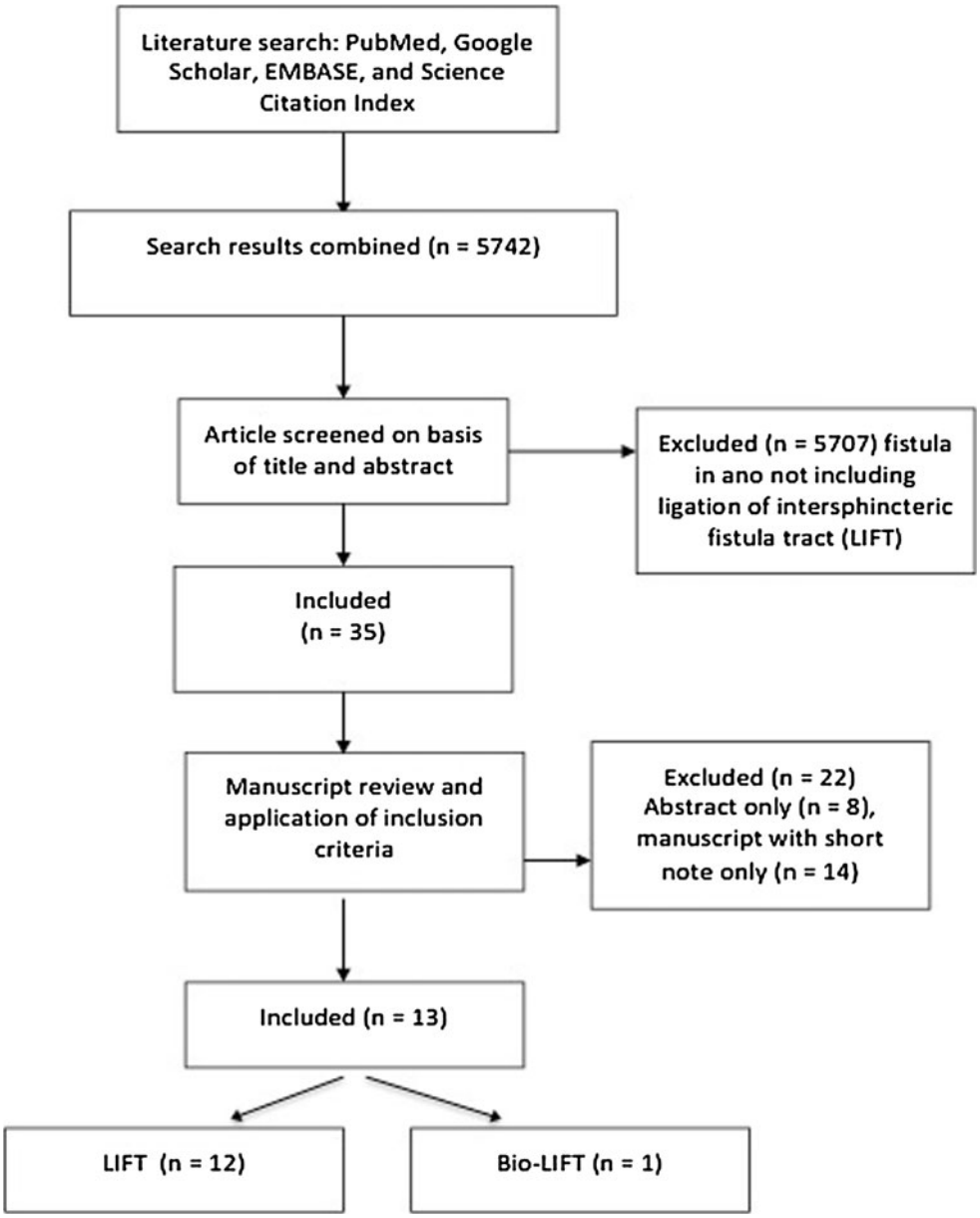

Fig. 9 Flow chart of systematic review

Results

A flow chart of this systematic review, with the number of articles retrieved, included, and excluded, as well as the reasons for exclusion, is shown in Fig. 9. Over the period from January 2006 to August 2012, a total of 13 original articles that included 435 patients were reviewed. Abcarian et al. [10] did not report the numbers of both genders in his total cohort. The only available data for gender number reported in the other 12 studies were 285 males and 110 females. All patients underwent the LIFT procedure, except for those in one study published by Ellis et al. [11] in which bioprosthetic grafts were used to reinforce LIFT (BioLIFT). The study that included the greatest number of patients who underwent the LIFT procedure was that by Tsang et al. [12] from Singapore (Table 1). Rojanasakul et al. [9] published the first LIFT procedure in 2006. Next, he published his prospective case series in 2007. The highest proportion of studies was published in the USA (33.3 %) and the next highest (16.7 %) in Australia (Table 1). From 2007 to 2010, no article was published. In 2010, the technique became more popular. Three additional articles were published that year, followed by 4 in 2011 and 5 in 2012. Of the 13 studies, only that by Bartlett et al. [13] had a prospective randomized design, in which the patients were randomized into two groups: those who underwent LIFT and those who underwent anorectal advancement flap surgery. The remaining studies included 6 that were prospective case series and 6 that were retrospective case series (Table 1).

Table 1 The author, year of publication, country, study design, procedure type, number of the patients, sex, and comorbidities

References	Years	Country	Study design	Procedure	No.	Male	Female	Comorbidity
Rojanasakul [9]	2007	Thailand	Prospective case series	LIFT	18	14	4	–
Shanwani [19]	2010	Malaysia	Prospective case series	LIFT	45	32	13	–
Ellis [11]	2010	USA	Retrospective	Bio LIFT	31	22	9	6 DM 4 Crohn's 13 Smoking
Belier [5]	2010	USA	Retrospective	LIFT	39	20	19	–
Ooi [16]	2011	Australia	Prospective case series	LIFT	25	17	8	–
Tsang [12]	2011	Singapore	Retrospective	LIFT	93	77	16	–
Sileri [18]	2011	Italy	Prospective case series	LIFT	18	10	8	–
Kumar [21]	2011	USA	Retrospective	LIFT	25	17	8	–
Bartlett [13]	2012	Australia	Prospective randomized	LIFT	25	17	8	IHD, AF, DM, Asthma, Dyslipidemia, Bowel CA, RA
Abcarian [10]	2012	USA	Prospective case series	LIFT	40	–	–	3 DM 8 Smoking 9 Obesity 1 IBD 1 HIV
Lo [34]	2012	Hong Kong	Retrospective	LIFT	25	19	6	–
Schouten [14]	2012	Netherlands	Prospective case series	LIFT + ARAF	41	32	9	–
Chen [20]	2012	Taiwan	Retrospective	LIFT	10	8	2	–
Total			13		435	325	110	

N number, *DM* diabetes mellitus, *IHD* ischemic heart disease, *AF* atrial fibrillation, *RA* rheumatoid arthritis, *IBD* inflammatory bowel disease, *HIV* human immunodeficiency virus

The types of fistulas treated using LIFT were transsphincteric (low, intermediate, or high), intersphincteric, suprasphincteric, horseshoe, and rectovaginal. The patients enrolled either had a fistula for the first time or had a recurrent fistula after having undergone different treatments. Few authors excluded fistulas that had been treated previously using a different procedure.

Of the 435 patients, 403 (92.64 %) were diagnosed with transsphincteric fistula, 10 (2.29 %) with suprasphincteric fistula, 8 (1.83 %) with horseshoe fistula, 4 (0.91 %) with rectovaginal fistula, and 10 (2.29 %) with intersphincteric fistula. Comorbidities were reported in t3 studies. The most common comorbidities were smoking and diabetes mellitus. Other reported comorbidities were inflammatory bowel disease, ischemic heart disease, bowel cancer, atrial fibrillation, bronchial asthma, rheumatoid arthritis, and human immunodeficiency virus infection (Table 1).

The operative time was reported in 5 studies (Table 2). The median operative time ranged from 10 to 67.5 min with an overall mean operative time of 39 ± 20.16 min. The duration of hospital stay was reported in all articles. Eight articles reported the procedure being performed as a same-day surgery. The other 5 involved the patients being admitted to the hospital, and the overall median length of stay was 1.25 days (range 1–5 days). Of 435 patients, only 8 (1.83 %) had postoperative complications. Four patients had purulent discharge, 2 had superficial persistent wound dehiscence, and one had each of the following complications: anal fissure, persistent anal pain, thrombosed hemorrhoids, and secondary bleeding (Table 2).

The median follow-up was ranged from 18 to 65 weeks with an overall mean of 33.92 ± 17.00 weeks.

Continence was evaluated in all studies, with a single exception. Most of the studies evaluated the patients in the clinic subjectively. However, no patient complained of postoperative incontinence. Four authors used different scores to evaluate incontinence. The Rockwood Fecal Incontinence Severity Index (RFISI) was used by Schouten [14], the Cleveland Clinic Florida Fecal Incontinence Score (CCF-FI) was used by Ooi and Bartlett [13, 15–17], and the Fecal Incontinence Severity Index (FISI) score was used by Sileri et al. [18]. None documented postoperative incontinence.

All authors reported the healing rate. Healing was achieved in 345 of the 435 patients over a mean period of 8.15 (±5.96) weeks with a range of 2–24 weeks. The healing rate was 51–100 % with an overall mean of 81.37 % (±16.35). Conversely, 90 patients did not achieve initial healing (0–49 %), with an overall mean non-healing rate of 19.82 % (±16.63). The relative risk between the

Table 2 The median operative time, length of hospital stay, median follow-up period, complications, and incontinence rate

References	Median OR time (min)	Median LOS (days)	Median follow-up (weeks)	Complication	Incontinence
Rojanasakul [9]	40	1.25	19	No	No
Shanwani [19]	67.5	2.5	36	No	No
Ellis [11]	–	DS	60	No	No
Belier [5]	–	DS	20	1 Anal fissure, 1 Persistent pain	No
Ooi [16]	39	Overnight	22	No	No
Tsang [12]	–	DS	23	No	–
Sileri [18]	–	DS	24	1 Hemorrhoidal thrombosis	No
Kumar [21]	–	DS	27	2 Vaginal fungal infection	No
Bartlett [13]	10	DS	65	1 Secondary bleeding, 2 superficial perineal wound dehiscence	No
Abcarian [10]	–	DS	18	No	No
Lo [34]	39	1	39	No	No
Schouten [14]	–	5	60	No	No
Chen [20]	–	DS	28	No	No
Total	(39 ± 20.16)[a] R (10–67)	(33.92 ± 17.00)[a] R (18–65)	8 (1.83 %)		0

SD standard deviation, *DS* day surgery, *OR* operating room, *LOS* length of stay

[a] Mean ± SD

healing and non-healing groups was 0.793 with a confidence interval of 0.756–0.832 and a z statistic of 9.424 ($p < 0.0001$; Table 3).

Recurrence was reported by 6 authors. Of the 435 patients, 33 (7.58 %) experienced fistula recurrence with a mean recurrence rate of 13.30 % (±8.03) over a mean period of 15.25 (±5.3) weeks. Six were treated by repeated LIFT (Table 4).

Discussion

Anal fistula is a common disease that is devastating to patients and poses challenges to surgeons. Proper management requires both knowledge of the etiology and an understanding of the relevant anatomy.

Thus far, the available treatment methods have not achieved the main goals of prevention of recurrence and preservation of continence. The lack of level I evidence, absence of long-term follow-up, inconsistent results, and varying methodologies in published studies have resulted in the current lack of consensus. However, the unacceptable recurrence rates and occurrence of incontinence prompted the search for more effective methods [1].

Many techniques, such as endorectal advancement flap, anoderm island flap, excision and closure of internal opening, fibrin glue, and fistula plug, have been developed recently. These are associated with a lower risk of anal incontinence despite some instances of recurrence. These procedures are technically demanding, are operator dependent, may interfere with reoperation, cannot be performed in a previously scarred anus, and are expensive.

Presently, no single technique exists that is appropriate for all types of fistula-in-ano, whether simple or complex. Rojanasakul described the LIFT procedure, with the aim of treating complex fistulas with low incidences of recurrence and incontinence, and a high healing rate [7, 9].

In order for LIFT to be indicated, the fistula tract must pass through the intersphincteric space. For that purpose, some authors use preoperative magnetic resonance imaging or endorectal ultrasonography to select patients for whom this technique is appropriate.

Most patients selected for this procedure had transsphincteric fistulas (92.47 %). Ellis [11] and Abcarian et al. [10] reported the success of this technique in patients with Crohn's disease, whereas those patients were excluded by some other authors.

Regarding the technical aspects of LIFT, most surgeons use the technique described by Rojanasakul. Shanwani et al. [19] combined the LIFT technique with coring out of the external tract, starting from the external opening and continuing to the outer margin of the external sphincter, without the need to divide any part of the anal sphincter complex. Schouten et al. [14], in addition to LIFT procedure, used a flap of mucosa, submucosa, and some of the most superficial fibers of the internal anal

Table 3 The healing rate, non-healing rate, confidence interval, and the median time for healing rate

References	Total	Healing rate	Non-healing	CI	Median time of healing (weeks)
Rojanasakul [9]	18	17 (94.4 %)	1 (5.6 %)	0.723 to >0.999	4
Shanwani [19]	45	37 (82.2 %)	8 (17.7 %)	0.684 to 0.909	7
Ellis [11]	31	29 (94 %)	2 (6 %)	0.782 to 0.992	6
Belier [5]	39	20 (57 %)	19 (48.7 %)	0.362 to 0.661	10
Ooi [16]	25	24 (96 %)	1 (4 %)	0.788 to >0.999	6
Tsang [12]	93	86 (92.47 %)	7 (7.5 %)	0.850 to 0.965	4
Sileri [18]	18	15 (83.3 %)	3 (16.7 %)	0.599 to 0.949	6
Kumar [21]	25	17 (68 %)	8 (32 %)	0.482 to 0.829	24
Bartlett [13]	25	17 (68 %)	8 (32 %)	0.482 to 0.829	4
Abcarian [10]	50	29 (74 %)	11 (27.5 %)	0.442 to 0.706	15
Lo [34]	25	23 (98 %)	2 (11 %)	0.739 to 0.989	2
Schouten [14]	42	21 (51 %)	20 (49 %)	0.355 to 0.644	12
Chen [20]	10	10 (100 %)	0 (0 %)	0.679 to 1.000	6
Total	435	345	90	0.756–0.832	(8.15 ± 5.96)
		(81.37 % ± 16.35)[a]	(19.82 % ± 16.63)[a]	RR 0.793	R (2–24)
		R (100–51 %)	R (0–49 %)	*z* statistic 9.424	
				$p < 0.0001$	

CI confidence interval, *R* range, *RR* relative risk

[a] Mean

sphincter. Only Ellis [11] reported the use of LIFT in combination with bio-prosthetic grafts (BioLIFT) to reinforce the ligation of the LIFT. In that approach, after performing LIFT, the dissection in the intersphincteric plane was continued at least 1–2 cm proximal and lateral to the transected fistula tract. The 4–7-cm bioprosthetic graft (Surgisis Biodesign; Cook Surgical Inc., Bloomington, IN, USA) was trimmed to the appropriate width and placed in the intersphincteric grove with at least 1–2 cm of overlap on all sides of the transected fistula tract. The graft was secured with 3/0 polyglycolic acid sutures to the levator ani muscles and external sphincter to prevent migration.

A new modified approach was reported for high ligation of the fistula tract without damage to the sphincter system and avoidance of incision over the intersphincteric plane [20]. This modification involves making an incision from the external opening and extending this toward the internal opening, dissection of the fistula from the underlying soft tissue, high ligation above the internal sphincter, and removal of the distal part of the fistula tract for pathological examination.

The LIFT procedure can be performed either unilaterally or bilaterally (at both anal sides). Abcarian et al. [10] reported that one of their patients underwent a successful simultaneous bilateral LIFT procedure. None of the authors reported any instance in which LIFT was planned but could not be completed.

The LIFT procedure performed by most of the authors demonstrated an acceptable operative time and a mean operative time of 39 (±20.16) min. The longest reported time was 67.5 min.

During the overall mean follow-up period of 33.92 (±17.00) weeks, no mortality was reported. Moreover, there were few postoperative complications (1.83 %), and all were treated successfully with no reported case of new onset or worsening incontinence. Different scoring systems were used for evaluation of incontinence. However, objective physiological testing was lacking.

Regarding the 435 patients who underwent the procedure, 81.37 (±16.35) % were healed, and 19.82 (±16.63) % failed to heal. Chen et al. initially reported complete healing in all cases without failure; however, after follow-up, 2 patients who had healed completely had recurrence. One reason for non-healing of the internal opening could be breakdown of the closure wound on the internal sphincter. This might occur if the internal opening was too large or the tissues were too unhealthy in the presence of ongoing infection [12]. Thus, some authors have suggested delaying the LIFT procedure until local sepsis is well controlled via insertion of a seton for 8–12 weeks [21]. This ensures adequate drainage, control of sepsis, and maturation of the fistula tract around the seton, which are vital to the success of the LIFT procedure. Technical factors can also lead to failures. Meticulous dissection along the intersphincteric plane while maintaining the integrity of the internal sphincter and the anal mucosa is critical. Any breach or buttonhole tear of the anal canal mucosa during the procedure can lead to a higher risk of failure [12]. Accurate intraoperative

Table 4 The recurrence rate, the period of recurrence, and number of LIFT reoperations in patients with recurrent fistulas

References	Recurrence *N*	Period of recurrence (weeks)	Reoperation with LIFT
Rojanasakul [9]	–	–	–
Shanwani [19]	8 (17.7 %)	22	5 (11.1 %)
Ellis [11]	–	–	–
Belier [5]	4 (10.25 %)	10	–
Ooi [16]	7 (28 %)	13	–
Tsang [12]	6 (6.5 %)	22	–
Sileri [18]	–	–	–
Kumar [21]	3 (12 %)	19	1 (4 %)
Bartlett [13]	2 (8 %)	16	–
Abcarian [10]	–	–	–
Lo [34]	1 (4 %)	8	–
Schouten [14]	–	–	–
Chen [20]	2 (20 %)	12	–
Total	33 (7.58 %)	15.25 ± 5.37	6
	(13.30 % ± 8.03)[a]	R (8–22)	
	R (4–28 %)		
	95 % CI (6.587–20.025)		

N number, *CI* confidence interval, *R* range

[a] Mean

identification of the intersphincteric tract is vital. This is particularly important in the presence of scarring from previous operations. A confirmatory test should show cessation of extravasation of saline or hydrogen peroxide following excision and suture ligation of the intersphincteric tract [12].

Recent studies of anorectal advancement flap surgery reported recurrence rates of up to 63 % (range 13–63 %) [22–28]. Moreover, fibrin glue injections and fistula plugs have been associated with recurrence rates of 40–84 % [29–31] and 57–76 % [32, 33], respectively. Only 33 patients (7.58 %) experienced recurrence, 5 of whom were treated successfully with repeated LIFT. Indeed, we found that in patients with recurrent fistulas, this technique converted the transsphincteric fistula to an intersphincteric sinus or fistula (down-staging), making possible subsequent treatment by fistulotomy or seton placement [11, 12, 20].

Generally, the reasons for recurrence of anal fistula are fecal material entering the internal opening, causing recurrent infection, or intermittently closed septic foci and persistent chronic sepsis in the LIFT, which is normally compressed between the internal and external anal sphincters [9, 12, 19].

Technically, ligation and division of the intersphincteric tract may prevent fecal material from being forced into this area during defecation, causing persistent sepsis. The mechanism of fistula recurrence through the medial incision proposed by Ooi et al. [16] after 3 of their patients had recurrence was probably a persistent internal opening, which implies that the medial ligation of the tract had failed.

Few authors have reported comorbidities and previous operations as a cause of failure or recurrence. For instance, smoking tobacco, obesity, and previous surgery were reported by Abcarian et al. [10] to be causes of recurrence, and the healing rate decreased from 90 to 65 % if the patient had undergone more than 2 previous surgical attempts. Sileri et al. [18] also reported an association between recurrence and the number of previous operations. Furthermore, Lo et al. [34] reported that one of their patients with recurrence had a suprasphincteric fistula, and another had a perianal abscess, indicating that a higher and more difficult localization of the intersphincteric tract and persistence of sepsis increase the chance of recurrence.

Regarding obesity, Schwander et al. [35] reported that, of 220 patients with fistulas, the collective success rate after treatment was 82 % over a 6-month follow-up period. The recurrence rate in 152 non-obese patients [body mass index (BMI) <30 kg/m^2] was 14 %, whereas that in obese patients (BMI >30 kg/m^2) was 28 % ($p < 0.01$). In multivariate analysis, obesity was a predictive factor for success or failure ($p < 0.02$).

Because we used no material for LIFT, cost was not an issue, and the procedure is inexpensive compared with other techniques that use a variety of synthetic materials as part of the procedure [21].

Limitations

Most of the studies were non-randomized case series; only one was prospective and randomized. Additionally, no study included an objective assessment of incontinence.

Conclusions

Ligation of the intersphincteric fistula tract (LIFT) tract is a new, easy-to-learn, and inexpensive sphincter-sparing procedure that has had reasonable results. It is safe and feasible, with favorable short- and long-term outcomes. However, additional prospective randomized studies are required to confirm our findings.

Conflict of interest None.

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