



## Original Article

# Systematic review of efficacy of LIFT procedure in cryptoglandular fistula-in-ano



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## ABSTRACT

**Background:** fistula-in-ano is a common problem. Ligation of intersphincteric fistula tract (LIFT) is a new addition to the list of operations available to deal with complex fistula-in-ano. **Objective:** we sought to qualitatively analyze studies describing LIFT for cryptoglandular fistula-in-ano and determine its efficacy.

**Data sources:** MEDLINE (Pubmed, Ovid), Embase, Scopus and Cochrane Library were searched.

**Study selection:** all clinical trials which studied LIFT or compared LIFT with other methods of treatment for anal fistulae, prospective observational studies, clinical registry data and retrospective case series which reported clinical healing of the fistula as the outcome were included. Case reports, studies reporting a combination with other technique, modified technique, abstracts, letters and comments were excluded.

**Intervention:** the intervention was ligation of intersphincteric fistula tract in cryptoglandular fistula-in-ano.

**Main outcome measure:** primary outcome measured was success rate (fistula healing rate) and length of follow-up.

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## Revisão sistemática da eficácia do procedimento LIFT em fistula anal criptoglandular

## RESUMO

**Background:** fistula anal é um problema comum. A ligadura interesfincteriana do trajeto fistuloso (LIFT) é uma nova adição à lista de cirurgias disponíveis para tratar a fistula anal complexa.

**Objetivo:** buscou-se analisar qualitativamente estudos descrevendo o uso de LIFT para fistula anal criptoglandular e determinar a sua eficácia.

## Palavras-chave:

Fístula anal

Complexa

Interesfincteriana

Ligadura

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Recorrência  
Incontinência  
Seguimento

*Fontes de dados:* as bases de dados MEDLINE (Pubmed, Ovid), Embase, Scopus e Biblioteca Cochrane foram pesquisadas.

*Seleção dos estudos:* todos os ensaios clínicos que estudaram LIFT ou compararam LIFT com outros métodos de tratamento da fístula anal, estudos observacionais prospectivos, dados de registros clínicos e série de casos retrospectivos que relataram a cura clínica da fístula anal como desfecho foram incluídos. Relatos de casos, estudos que relatam uma combinação com outra técnica, técnica modificada, resumos, cartas e comentários foram excluídos.

*Intervenção:* a intervenção foi ligadura interesfincteriana do trajeto fistuloso em fístula anal criptoglandular.

*Medida do desfecho principal:* a medida do desfecho principal foi a taxa de sucesso (taxa de cura da fístula) e período de seguimento.

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## Introduction

Fistula-in-ano is a common condition but a potentially complex disease process. A fistula can be found in 26–38% of all anorectal abscesses,<sup>1,2</sup> and is characterized by chronic purulent drainage or cyclical pain associated with abscess re-accumulation followed by intermittent spontaneous decompression.<sup>3</sup> Most are of cryptoglandular origin.<sup>4,5</sup> Fistula-in-ano are more common in men than women.<sup>6,7</sup>

Fistula-in-ano is categorized on the basis of location relative to the anal sphincter muscles according to the Parks classification: inter-sphincteric, trans-sphincteric, supra-sphincteric, or extra-sphincteric.<sup>8</sup> A fistula-in-ano can be “simple” or “complex”. Submucosal, low (traversing less than 30% of anal sphincter muscle) inter-sphincteric and low trans-sphincteric fistulas are considered simple. Fistula-in-ano is considered complex if found to have any of the following characteristics: tract crosses more than 30–50% of external sphincter, anterior fistula in a female, presence of multiple tracts, recurrent fistula, preexisting incontinence, local irradiation and Crohn’s disease.<sup>9,10</sup>

The goal of surgical management is to effectively eradicate current and recurrent septic foci, associated epithelialized tracts and preserve continence. No single technique achieves these aims for all anal fistulas. It is often necessary to balance the degree of sphincter division and continence disturbance. An ideal procedure for treating a fistula-in-ano should be minimally invasive with minimal failure rates and morbidity.

Ligation of the intersphincteric fistula track (LIFT) has recently been described by Rojanasakul et al. from Thailand.<sup>11</sup> Since the initial description in 2006, several studies on LIFT have been reported in literature with variable results and indications. Our objective to this study was to perform a systematic review to comprehensively summarize existing literature exploring the efficacy of LIFT in treating fistula-in-ano.

## Methods

### Search strategy

A systematic review of all literature relevant to efficacy of Ligation of intersphincteric fistulous track (LIFT), published between January 2005 and February 2013 was carried out

using PubMed, Embase, Cochrane Database, Science Citation Index, CINAHL, National Health Service Centre for Reviews and Dissemination, and Google Scholar. Searches were performed using a combination of Medical Subject Headings (MeSH) terms and text words ‘fistula-in-ano’, ‘complex’, ‘inter-sphincteric’, ‘ligation’, ‘recurrence’, ‘incontinence’, ‘follow-up’. Manual reference checks of accepted papers in recent reviews and included papers were performed to supplement the electronic searches.

### Definitions

Fistulae with multiple tracts were defined as fistulae with single primary and multiple secondary openings. A successful outcome was defined by the complete healing of the surgical intersphincteric wound and external opening. Recurrence was defined as a non-healing wound or re-appearance of an external opening with persistent discharge or re-appearance of a fistula after the initial wound had healed. In trials with patients with multiple tracts, the procedure was considered successful only if all the tracts were closed.

### Inclusion criteria

All randomized/non-randomized, controlled/non-controlled clinical trials, which studied LIFT or compared LIFT with other methods of treatment for anal fistulae, prospective observational studies, clinical registry data and retrospective case series which reported clinical healing of the fistula as the outcome were included, as were conference proceedings.<sup>39–44</sup>

### Exclusion criteria

Case reports, reviews, abstracts, letters and comments were excluded. We excluded three studies reporting the usage of bioprosthetic grafts to reinforce LIFT (BioLIFT procedure) for management of complex anal fistulae<sup>12–14</sup> and another reporting the use of LIFT for patients with perianal sinus after stapled hemorrhoidopexy<sup>15</sup> was also excluded. Patients from studies where LIFT patients underwent an additional procedure (advancement flap or fibrin glue) along with the LIFT<sup>16</sup> were also excluded from the review as were studies where the mean or median follow-up was less than two months. Patients with rectovaginal, anovaginal, rectourethral, or ileal-pouch

vaginal fistulas were also not included as were studies on LIFT that looked at outcome measures other than fistula healing rates, e.g., incontinence or septic complications and did not report healing rates. Two studies which reported a modification to standard LIFT procedure<sup>17,18</sup> were also excluded. When multiple articles or abstracts on LIFT from the same author/institution were analyzed, only the most recent publication was chosen for review if the same cohort of patients were analyzed in an earlier report.

### Data extraction

In total, there were five investigators involved. Data on type of trial, total number of patients treated, follow-up period, overall success rate with LIFT, total number of patients having complex fistulae, multiple tracts, single tracts and recurrent disease, total number of tracts with tract closure rate, sepsis or abscess formation in the postoperative period were extracted from the included studies by the reviewers. To guard against reviewer bias, all data were extracted separately by all reviewers. The names of the authors were blinded and only the material and methods and results section were reviewed. Any discrepancies were settled after discussions and consensus between the reviewers. All data and results of statistical tests were extracted from the papers onto a proforma specifically designed for this study. For particular outcomes that were evaluated, if the data were not specifically reported, it was regarded as not reported or missing and no assumptions were made regarding the missing data. Analysis of some variables was not possible because of the lack of both uniformity and the quantity of the data reported. These variables were the impact of seton insertion before LIFT procedure, role of antibiotics, objective pain assessment after the procedure and the efficacy of multiple LIFT procedures in the same patient. The methodological quality of the studies that met the selection criteria was assessed and evaluated by the authors using the Downs and Black Quality Index score system.<sup>47</sup> This is a validated scoring checklist for assessing the quality of both randomized clinical trials and non randomized studies. It consists of several items distributed among five subscales: reporting, external validity, bias, confounding and power. Downs and Black score ranges were given corresponding quality levels: excellent (26–28), good (20–25) and fair (15–19). Studies that scored poor (<=14) were excluded, except where it was the only available evidence. The authors individually reviewed each included article for quality (based on the Downs and Black checklist) using a quality scoring sheet. The authors independently rated all the studies, recorded final scores for each article and resolved any differences by discussion.

### Outcome measures

Primary outcome measured was success rate (fistula healing rate) of LIFT procedure. Success was defined as closure of all secondary openings, an absence of fistula drainage, and an absence of abscess formation. Secondary outcome measured were development of incontinence and recurrence. Recurrence was defined as an abscess spontaneously discharging or requiring surgical drainage, or a recurrent fistula either at the same site or at a different site.

### Systematic review

A total of 51 studies on LIFT were found (Fig. 1), of which twenty-two studies fulfilled the inclusion criteria<sup>19–40</sup> (Table 1). Among the included studies, one was a randomized control trial, fifteen were prospective studies and six were retrospective case series.

### Statistical analysis

Because of the heterogeneity (randomized control, retrospective and prospective studies, inclusion of complex as well as noncomplex fistulae in different studies) amongst included studies, we could not perform a weighted analysis to get a summary estimate of the efficacy of the procedure. Hence, the success rate of different parameters was expressed as a range.

## Results

We have provided a narrative synthesis of the findings from the included studies, structured around the type of outcome. A total of 683 patients were analyzed (Table 1) with a follow-up range of 0–67 months (Table 2). The LIFT procedure had a success rate (fistula healing rate) ranging from 40% to 94.4% (479/676) (Table 3). The abscess formation rate ranged from 5.6% to 60% (197/676). The number of complex fistulae (reported in 19/22 studies) studied was 447, while those of recurrent fistulae (reported in 16/22 studies) studied was 197, single tract fistulae (reported in 16/22 studies) was 490 and multiple tract fistulae (reported in 11/22 studies) was 64. However, the individual success rate for these fistulae could not be assessed from the data available. No incontinence or change in continence were reported in 18/21 studies analyzed, while one study reported temporary incontinence to gas (2 patients) and another study reported gas (12 patients), liquid incontinence (2 patients) and both liquid and gas incontinence (1 patient).<sup>27,36</sup>

## Discussion

No single technique is appropriate for the treatment of all fistula-in-ano and the surgeon's experience and judgement should guide treatment decision. LIFT is a recent procedure with one randomized controlled trial published on it so far, although there are a few under way. The other studies published so far are only cohort studies and retrospective case series. While the studies analyzed in this review are heterogeneous and the number of patients in these studies is small, their systematic analysis provides some useful insight into the role of LIFT in the management of fistulae-in-ano (Fig. 2).

Fistulotomy continues to be the procedure of choice for simple low fistulas, where the tract is submucosal, intersphincteric or located in the lower third of the external anal sphincter.<sup>1,10,41,42</sup>

On the other hand, surgical treatments for high and complex fistulas may result in variable degree of anal sphincter impairment. Surgical options, such as flap repair, fibrin glue injection, seton drainage and fistula track plug insertion have been proposed with wide ranging and often disappointing success rates.<sup>43–46</sup> Usually less invasive approaches do not

**Table 1 – Characteristics of included studies.**

References	Year published	Type of study	Sex M/F	Median age in years. (Range in years)	Total no of patients	Methodology of assessment						Downs & Black score		
						Pre-op. seton insertion	Pre-op		Antibiotic		Operative position		Anaesthesia	Duration of admission
							MRI	EUS	Pre-op	Post-op				
Rojanasakul <sup>19</sup>	2007	PS	14/4	NR (26–72)	18	NR	NR	NR	NR	18	PJK	LR	ON	Good
Shanwani et al. <sup>20</sup>	2010	PS	32/13	41.5 (27–56)	45	0	0	12	NR	45	PJK	LR	DC	Good
Bleier et al. <sup>21</sup>	2010	PS	20/19	49 (NR)	39	NR	NR	NR	NR	NR	PJK	GA/LR/LA	NR	Good
Aboulian et al. <sup>22</sup>	2011	RCS	17/7	39 (NR)	25	17	NR	NR	25	25	PJK	GA/LR/LA	DC	Good
Ooi et al. <sup>23</sup>	2011	PS	17/8	40 (21–67)	25	NR	18	0	NR	25	PJK	NR	ON	Good
Sileri et al. <sup>24</sup>	2011	PS	10/8	NR (4–62)	18	3	18	18	18	18	L	GA	DC	Good
Tan et al. <sup>25</sup>	2011	RCS	77/16	40 (16–71)	93	16	0	93	NR	93	L/PJK	NR	DC	Good
Christoforidis et al. <sup>26</sup>	2011	PS	8/3	41 (24–61)	11	7	NR	NR	NR	NR	NR	GA	DC	Fair
Espin et al. <sup>27</sup>	2011	PS	13/16	NR (26–83)	29	24	NR	NR	NR	NR	NR	NR	NR	Fair
Iachino et al. <sup>28</sup>	2011	PS	NR	61.8 (NR)	31	NR	NR	NR	NR	NR	NR	NR	NR	Fair
Giarratano et al. <sup>29</sup>	2011	PS	6/12	NR	18	NR	NR	18	NR	NR	NR	NR	NR	Fair
Franceschilli et al. <sup>30</sup>	2011	PS	8/3	NR	11	3	NR	11	NR	11	NR	NR	NR	Fair
Alfred et al. <sup>31</sup>	2011	PS	NR	NR	17	NR	NR	17	NR	NR	NR	GA	NR	Fair
Koh et al. <sup>32</sup>	2011	PS	7/12	38 (NR)	19	18	0	19	NR	NR	NR	NR	ON	Fair
Lo et al. <sup>33</sup>	2012	PS	19/6	48 (22–64)	25	13	NR	NR	25	NR	PJK	GA/LR	ON	Fair
Tan et al. <sup>34</sup>	2012	RCS	21/3	41 (16–75)	24	24	0	24	NR	24	L/PJK	NR	NR	Good
Mushaya et al. <sup>35</sup>	2012	RCT	17/8	47.5 (25–70.1)	25	1	25	25	0	0	PJK <sup>a</sup> L <sup>b</sup>	GA	DC	Excellent
Ulrik et al. <sup>36</sup>	2012	RCS	57/36	43 (21–76)	93	70	NR	NR	NR	NR	PJK	GA/LR/LA	NR	Good
Abcarian et al. <sup>37</sup>	2012	PS	NR	NR (22–70)	40	NR	NR	1	NR	NR	PJK	GA/LR	NR	Good

**Table 1 – (Continued)**

References	Year published	Type of study	Sex M/F	Median age in years. (Range in years)	Total no of patients	Methodology of assessment						Downs & Black score		
						Pre-op. seton insertion	Pre-op		Antibiotic		Operative position		Anaesthesia	Duration of admission
							MRI	EUS	Pre-op	Post-op				
Liu et al. <sup>38</sup>	2013	RCS	28/10	42 (26-58)	38	29	NR	NR	38	38	PJK	GA/LR	DC	Good
Lehmann et al. <sup>39</sup>	2013	PS	9/8	49 (30-76)	17	4	NR	NR	17	0	NR	GA	DC (7)	Good
Van Onkelen et al. <sup>40</sup>	2013	RCS	13/9	45 (17-59)	22	NR	22	0	22	NR	PJK	GA	NR	Good

PS, prospective study; RCS, retrospective case series; RCT, randomized control trial.

NR, not reported/cannot be concluded from the data provided.

Pre-operative bowel preparation – MBP, mechanical bowel preparation (pre-operative), BE, Bowel enema (pre-operative).

MRI (Magnetic resonance imaging) or EUS (Endo anal ultrasound).

Operative position: Lithotomy (L); Prone jack knife (PJK); a used for Anterior fistula; b used for Posterior fistula.

Anaesthesia: General anaesthesia (GA); Loco-regional (LR); Local anaesthesia (LA).

Duration of admission: Day care (DC); Overnight (ON).

Downs and Black score ranges: excellent (26-28); good (20-25); fair (15-19); poor (<=14).

**Table 2 – Characteristics of included studies.**

Reference	No. patients with complex fistula	No. patients with IBD	No. fistulas with multiple tracts	No. recurrent fistula treated	Follow-up (range in months), patients followed up (%), method of follow-up	Success/Total patients (Healing rates %)	Abscess/sepsis No. (%)	Other complications	Further treatment given for recurrence	Median healing time (wks), range (weeks)	Median time to recurrence (weeks), range (weeks)
Rojanasakul <sup>19</sup>	5	0	0	0	(1–6.5), 100, C	17/18 (94.4)	1 (5.6)	NR	Repeat LIFT (1/1)	NR, (1–8)	NR
Shanwani et al. <sup>20</sup>	12	0	4	5	(2–4), 100, C	37/45 (82.2)	8 (17.7)	None	Repeat LIFT (5/8)	7, (4–10)	NR, (12–32)
Bleier et al. <sup>21</sup>	10	NR	7	29	(0–14.5), 90, NR	20/35 (57) 4 pts NR	15 (42.8)	Anal fissure (1/35) Chronic anal pain (1/35)	NR	NR	10, (2–38)
Aboulian et al. <sup>22</sup>	9	NR	2	8	(2–13), 100, C	17/25 (68)	8 (32)	Vaginal fungal infections (2/25)	Fistulotomy (1/8) Repeat LIFT (1/8) Fibrin plug (1/8) I&D (2/8) Awaiting operation (3/8)	NR	NR
Ooi et al. <sup>23</sup>	13	0	3	10	(1–10.7), 100, C	17/25 (68)	7 (28)	NR	I&D + Seton (7/7)	6, (3–17)	NR, (7–20)
Sileri et al. <sup>24</sup>	18	0	1	4	(4–10), 100, C	15/18 (83.3)	3 (16.7)	Hemorrhoidal thrombosis (1/18)	Fistulotomy (1/18) Seton + AFP (2/18)	NR	NR
Tan et al. (2011) <sup>25</sup>	64	NR	10	26	(1–21.2), 100, C	80/93 (86)	13 (13.9)	NR	Fistulotomy (4) Repeat LIFT (1) Adv flap (1)	4, (1–12)	22, (15–33)
Christoforidis et al. <sup>26</sup>	11	NR	NR	3	(1.2–9.5), 100, NR	6/11 (54.5)	5 (45.4)	NR	Fistulotomy (1)	NR	NR
Espin et al. <sup>27</sup>	19	NR	0	NR	(12–26), 100, NR	19/29 (65)	10 (35)	Temporary gas incontinence (2/10)	Fistulotomy (1)	NR, (2.7–9.7)	NR
Iachino et al. <sup>28</sup>	31	NR	6	NR	(1–12), 100, C, EUS	27/31 (87)	4 (13)	NR	NR	NR	NR
Giarratano et al. <sup>29</sup>	18	NR	NR	NR	(6–11), NR, C	16/18 (88.9)	2 (11.1)	None	NR	NR	NR
Franceschilli et al. <sup>30</sup>	11	NR	1	4	3, 100, C, EUS	8/11 (72)	3 (28)	None	NR	NR	NR
Alfred et al. <sup>31</sup>	11	NR	NR	NR	13	13/17 (76.5)	4 (24.5)	NR	NR	NR	NR
Koh et al. <sup>32</sup>	18	NR	NR	4	(0.5–18.5), 100, C	12/19 (63)	7 (37)	None	Fistulotomy (2)	NR	NR

Table 2 – (Continued)

Reference	No. patients with complex fistula	No. patients with IBD	No. fistulas with multiple tracts	No. recurrent fistula treated	Follow-up (range in months), patients followed up (%), method of follow-up	Success/Total patients (Healing rates %)	Abscess/sepsis No. (%)	Other complications	Further treatment given for recurrence	Median healing time (wks), range (weeks)	Median time to recurrence (weeks), range (weeks)
Lo et al. <sup>33</sup>	25	NR	0	14	(1–21.5), 100, C	23/25 (89)	2 (11)	None	Fibrin glue (1) Drainage + Seton (1)	2, (1–8)	NR
Tan et al. (2012) <sup>34</sup>	24	0	NR	0	(4–67), 100, C	15/24 (62.5)	9 (37.5)	NR	Fistulotomy (4/9) Seton (4/9) I&D (1/9) ERAF (2/9) Repeat LIFT (1/9)	NR	NR
Mushaya et al. <sup>35</sup>	25	0	1	2	(8.4–31.3), 96, C	19/25 (76)	5 (20)	Bleeding (1/25)	NR	NR	16, NR
Ulrik et al. <sup>36</sup>	93	0	16	30	(44–55), 100, C	37/93 (40) –primary LIFT 44/93 (47) – repeat LIFT	56 (60)	Gas incontinence (12) Liquid incontinence (2) Liquid & gas incontinence (1) NR	Seton (20) Fistulotomy (11) LIFT (13) Abscess Drainage (9) Fistula plug (2) Advancement flap (1) NR	NR	28, NR
Abcarian et al. <sup>37</sup>	NR	1	NR	27	(0.5–16), 95, C	29/40 (74)	10 (25)	NR	NR	NR	NR
Liu et al. <sup>38</sup>	38	NR	13	18	(3–44) NR, C, TC [26 pts > 12 months follow-up (68%)]	23/38 (61)	15 (39)	Vaginal fungal infections (2)	Curettage (2) Fistulotomy (2) Repeat LIFT (1) Fistula plug (2)	8, (4–36)	16, (0–48)
Lehmann et al. <sup>39</sup>	17	NR	0	17	(8–26), 88, C, EUS	11/17 (65)	6 (40)	Local haematoma (1) Subcutaneous infection (1)	NR	54, (NR)	NR
Van Onkelen et al. <sup>40</sup>	0	0	0	10	(3–35), 100, C, TC	18/22 (82)	4 (18)	None	Fistulotomy (4/4)	NR	NR

IBD, Inflammatory bowel disease; Follow-up methods, clinical examination (C); EUS, Endoscopic ultrasound; TC, Telephone communication; NC, Nil change in continence; NR, Not reported; I&D, Incision and Drainage; ERAF, Endorectal advancement flap.

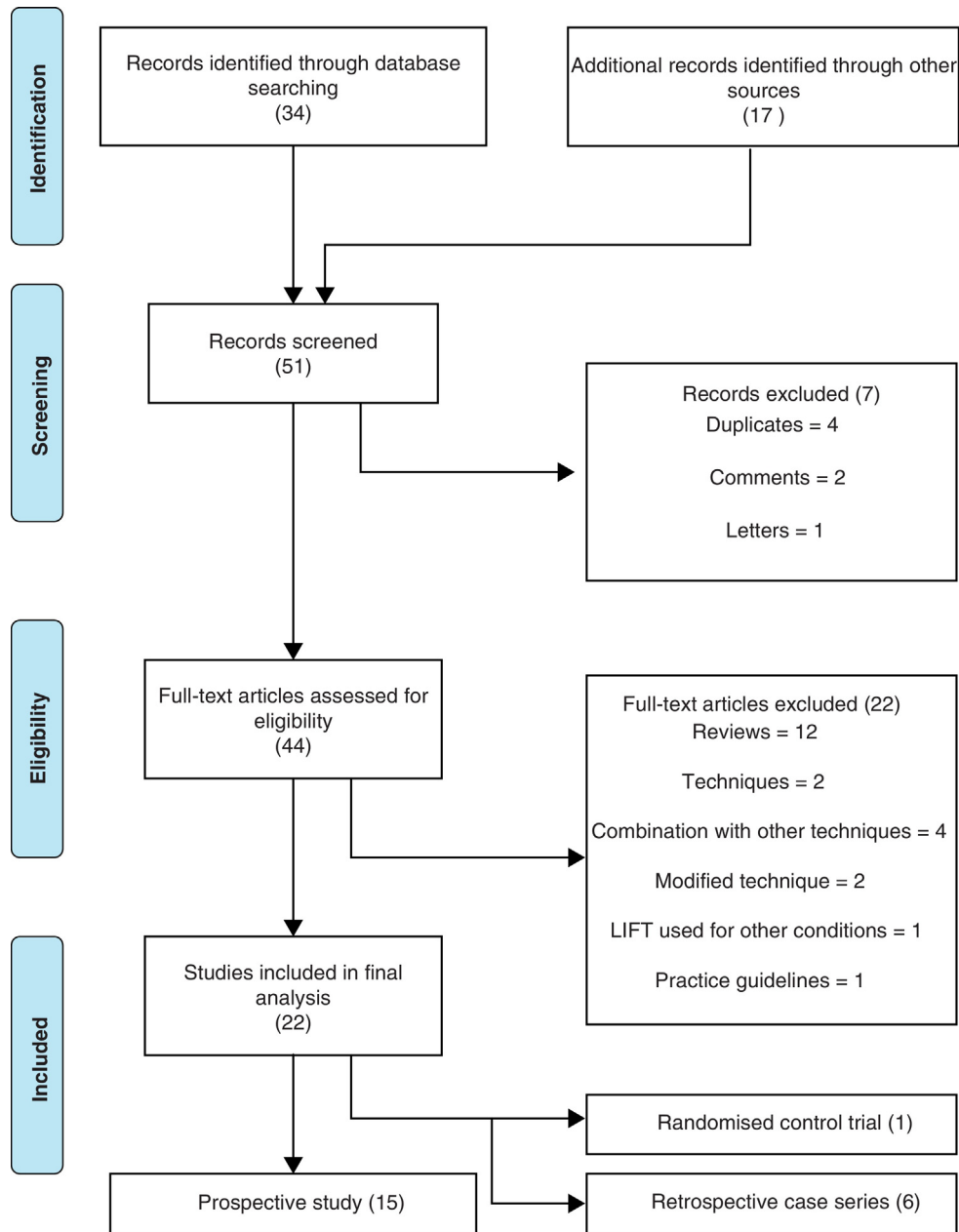


Fig. 1 – Prisma 2009 flow diagram.

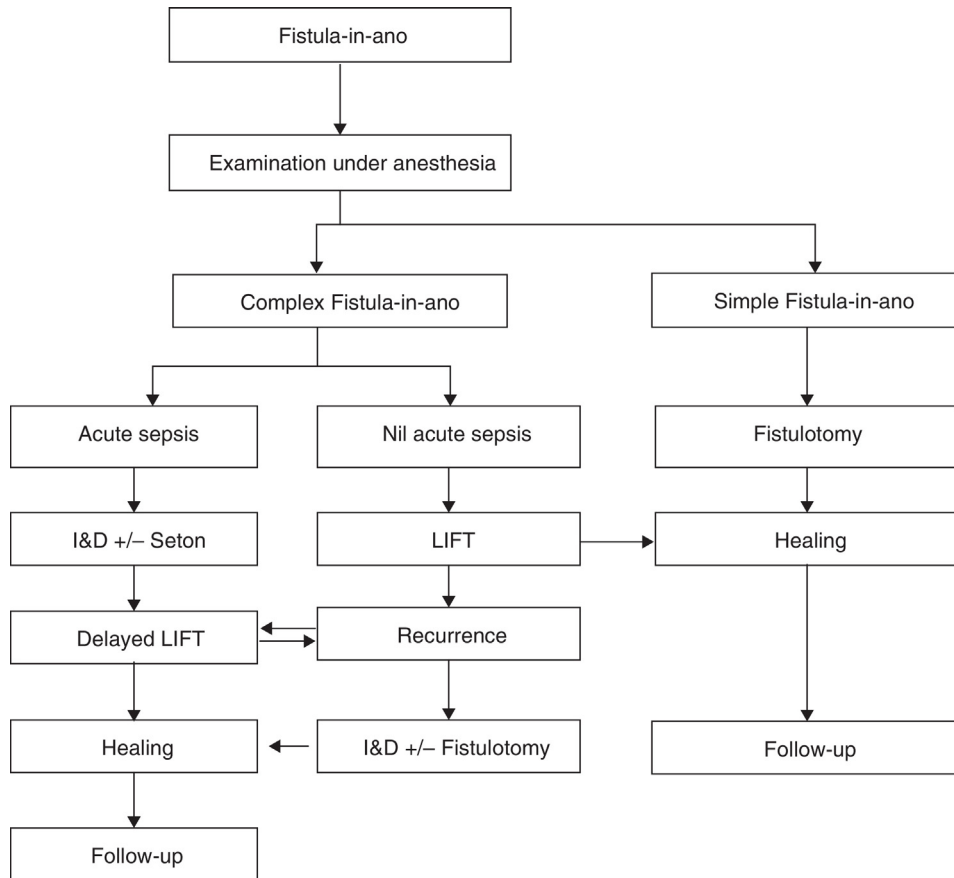
Table 3 – Success rate of LIFT procedure in different parameters.

No.	Parameter	No of studies analyzed	Total no. (reported)	Successful cases	Range of success rates (%)
1	Overall	22	683	479	40-94
2	Studies with minimum follow up > 6 months	5	182	102	40-88.9
3	Complex fistula	19	461	NR	NR
4	Recurrent fistula	16	211	NR	NR
5	Single tract fistula	15	490	NR	NR
6	Multiple tract fistula	11	64	NR	NR

Fistula healing rate = 40-94% (479/683).

Abscess formation (sepsis/suppuration) = 5.6-60% (197/683).





**Fig. 2 – Our recommended treatment algorithm for complex fistula-in-ano.**

jeopardize continence, but healing rates can be very low. Reported recurrence and incontinence rates range from 0% to 32% and from 0% to 63%, respectively.

The LIFT procedure combines two important concepts: removal of the infected cryptoglandular tissue through the intersphincteric approach and closure of the internal orifice with negligible trauma to the sphincters. Essential steps of the procedure include incision at the intersphincteric groove, identification of the intersphincteric tract and ligation of the intersphincteric tract close to the internal opening. All granulation tissue is debrided and the defect in the external sphincter muscle is sutured at. This technique prevents the entry of faecal material into the fistula tract and eliminates the formation of a septic nidus in the intersphincteric space to allow healing of the fistula-in-ano.<sup>19</sup> In the initial publication by Rojanasakul et al., a success rate of 94% was reported with no case of incontinence. Fistula healing rates range from 40% to 94% with variable follow-up as shown in Table 2. Others have confirmed the effectiveness of LIFT although with lower rates of success.

The reported success rate of LIFT among the prospective studies, with a minimum follow-up greater than 6 months, varied between 40% and 88.9%. In the six retrospective case series analyzed, the success rate was between 40% and 86%. From the only randomized control study, we can observe that the success rate was 76%. These results are moderate yet impressive considering that the procedure is minimally

invasive and less morbid with little risk of incontinence. However further prospective randomized trials studies with longer follow-up periods are warranted to further validate these findings.

One important observation was that even when the LIFT procedure fails to completely eradicate the fistula, it was able to “downstage” the original anatomy of a trans-sphincteric fistula to either an intersphincteric sinus or fistula. This medialization of the external opening to the intersphincteric wound simplifies subsequent management. Intersphincteric sinuses can be managed locally by the application of silver nitrate, whereas an intersphincteric fistula can often be laid open. In those patients with complete failures it is imperative to perform a thorough reevaluation before subsequent surgical management. It is recommended that a seton is placed for 6–12 weeks if there is evidence of acute inflammation, purulence or excessive drainage.<sup>23</sup>

Thirteen studies (Table 1) looked at the use of setons prior to LIFT. None of them found any significant changes in closure rates. Further studies are needed to evaluate the role of the seton in the LIFT procedure.

LIFT seems to be very safe in terms of morbidity. Among the studies, we observed a single episode of haemorrhoidal thrombosis, bleeding, anal fissure and chronic anal pain, while two were reported to have vaginal fungal infections. Continence is consistently preserved.

### Limitations of the study

All the studies included in this analysis are of small sample size. In addition there is absence of long-term follow-up in the available studies. Perhaps more importantly though is the failure of gauging the impact of the LIFT procedure on continence and lack of objective measurement of evidence of fistula healing (endorectal ultrasound or magnetic resonance imaging). However, the systematic analysis provides us with an insight into the initial results of a new procedure with encouraging outcomes.

### Conclusion

Despite the LIFT technique having been adopted in many centres around the world, there is a paucity of information regarding the patterns of failures and recurrences after the LIFT procedure and their subsequent management.

The initial results with LIFT are promising, with success rate of up to 40–94% in complex fistulae-in-ano. Findings from our study reflect a simple and safe procedure with little morbidity and low risk of incontinence. Although the literature is limited, this review provides the most accurate estimate, based on the data currently available, as to the probability of success for patients with complex fistula-in-ano with the use of LIFT procedure.

### Conflicts of interest

The authors declare no conflicts of interest.

### REFERENCES

- Ramanujam PS, Prasad ML, Abcarian H, Tan AB. Perianal abscesses and fistulas. A study of 1023 patients. *Dis Colon Rectum*. 1984;27:593–7.
- Vasilevsky CA, Gordon PH. The incidence of recurrent abscesses or fistula-in-ano following anorectal suppuration. *Dis Colon Rectum*. 1984;27:126–30.
- Whiteford MH, Kilkenney III J, Hyman N, et al. American Society of Colon and Rectal Surgeons. Practice parameters for the treatment of perianal abscess and fistula-in-ano (revised). *Dis Colon Rectum*. 2005;48:1337–42.
- Parks AG. Pathogenesis and treatment of fistula-in-ano. *Br Med J*. 1961;1:463–9.
- Eisenhammer S. The internal anal sphincter and the anorectal abscess. *Surg Gynecol Obstet*. 1956;103:501–6.
- Sainio P. Fistula-in-ano in a defined population. Incidence and epidemiological aspects. *Ann Chir Gynaecol*. 1984;73:219–24.
- Abcarian H. Anorectal infection: abscess-fistula. *Clin Colon Rectal Surg*. 2011;24:14–21.
- Parks AG, Gordon PH, Hardcastle JD. A classification of fistula-in-ano. *Br J Surg*. 1976;63:1–12.
- Parks AG, Stitz RW. The treatment of high fistula-in-ano. *Dis Colon Rectum*. 1976;19:487–99.
- Mizrahi N, Wexner SD, Zmora O, et al. Endorectal advancement flap: are there predictors of failure? *Dis Colon Rectum*. 2002;45:1616–21.
- Rojanasakul A. LIFT procedure: a simplified technique for fistula-in-ano. *Tech Coloproctol*. 2009;13:237–40 [Epub 2009 Jul 28].
- Neal Ellis C. Outcomes with the use of bioprosthetic grafts to reinforce the ligation of the intersphincteric fistula tract (BioLIFT procedure) for the management of complex anal fistulas. *Dis Colon Rectum*. 2010;53:1361–4.
- Han JG, Yi BQ, Wang ZJ, et al. Ligation of the intersphincteric fistula tract plus bioprosthetic anal fistula plug (LIFT-Plug): a new technique for Fistula-in-Ano. *Colorectal Dis*. 2013;15:582–6.
- Cui JJ, Wang ZJ, Zheng Y, Han JG, Yang XQ. Ligation of the intersphincteric fistula tract plus bioprosthetic anal fistula plug (LIFT-plug) in the treatment of transsphincteric perianal fistula. *Zhonghua Wei Chang Wai Ke Za Zhi*. 2012;15:1232–5. Chinese. PubMed PMID: 23268266.
- Baharudin MN, Hassan ZM, Nor AM, Rahman AA. Recurrent infection of a sinus tract at the staple line after hemorrhoidopexy: extending the indications for ligation of the intersphincteric fistula tract (LIFT). *Tech Coloproctol*. 2011;15:479–80 [Epub 2011 Oct 21].
- van Onkelen RS, Gosselink MP, Schouten WR. Is it possible to improve the outcome of transanal advancement flap repair for high transsphincteric fistulas by additional ligation of the intersphincteric fistula tract? *Dis Colon Rectum*. 2012;55:163–6.
- Menon R, Bastawrous A, Egan M, Gladstone L, Billingham R. A simple modification to ligation of intersphincteric fistula tract procedure for trans-sphincteric fistula in ano. *Colorectal Disease*. 2011;13 Suppl. 5:66 [Posters].
- Chen TA, Liu KY, Yeh CY. High ligation of the fistula track by lateral approach: a modified sphincter-saving technique for advanced anal fistulas. *Colorectal Dis*. 2012;14(9):e627–30.
- Rojanasakul A, Pattanaarun J, Sahakitrungruang C, Tantiphlachiva K. Total anal sphincter saving technique for fistula-in-ano; the ligation of intersphincteric fistula tract. *J Med Assoc Thai*. 2007;90:581–6.
- Shanwani A, Nor AM, Amri N. Ligation of the intersphincteric fistula tract (LIFT): a sphincter-saving technique for fistula-in-ano. *Dis Colon Rectum*. 2010;53:39–42.
- Bleier JI, Moloo H, Goldberg SM. Ligation of the intersphincteric fistula tract: an effective new technique for complex fistulas. *Dis Colon Rectum*. 2010;53:43–6.
- Aboulian A, Kaji AH, Kumar RR. Early result of ligation of the intersphincteric fistula tract for fistula-in-ano. *Dis Colon Rectum*. 2011;54:289–92.
- Ooi K, Skinner I, Croxford M, Faragher I, McLaughlin S. Managing fistula-in-ano with ligation of the intersphincteric fistula tract procedure: the Western Hospital experience. *Colorectal Dis*. 2012;14:599–603.
- Sileri P, Franceschilli L, Angelucci GP, et al. Ligation of the intersphincteric fistula tract (LIFT) to treat anal fistula: early results from a prospective observational study. *Tech Coloproctol*. 2011;15:413–6 [Epub 2011 Nov 11].
- Tan KK, Tan IJ, Lim FS, Koh DC, Tsang CB. The anatomy of failures following the ligation of intersphincteric tract technique for anal fistula: a review of 93 patients over 4 years. *Dis Colon Rectum*. 2011;54:1368–72.
- Christoforidis D, Popeskou S, Burckhardt O, Demartines N. The LIFT procedure for anal fistula: technique and initial experience. Abstracts of the Association of Coloproctology of Great Britain and Ireland Annual Meeting. *Colorectal Dis*. 2011;13 Suppl. 6:28–62.
- Espin E, Lozoya R, Vallribera F, et al. LIFT (ligation of intersphincteric tract): long term results. Abstracts of the Association of Coloproctology of Great Britain and Ireland Annual Meeting. *Colorectal Dis*. 2011;13 Suppl. 6:28–62.
- Iachino1 C, Guerrero Y, Catot L, Saccone M. Lift technique: preliminary results. Abstracts of the Association of Coloproctology of Great Britain and Ireland Annual Meeting. *Colorectal Disease*. 2011;13 Suppl. 6:28–62.

29. Giarratano G, Toscana C, Ghini C, Mazzi M, Lucarelli P, Stazi A. Ligation of the intersphincteric fistula tract (LIFT): a minimally invasive procedure for complex anal fistula. Preliminary results of a prospective study. Abstracts of the Association of Coloproctology of Great Britain and Ireland Annual Meeting. *Colorectal Dis.* 2012;14 Suppl. 2:28–67, <http://dx.doi.org/10.1111/j.1463-1318.2012.03157.x>.
30. Franceschilli L, Angelucci GP, Lazzaro S, et al. Ligation of the intersphincteric fistula tract (LIFT) to treat anal fistula: early results from a prospective observational study. Abstracts of the Association of Coloproctology of Great Britain and Ireland Annual Meeting. *Colorectal Dis.* 2011;13 Suppl. 6: 28–62.
31. Alfred K, Roslani A, Chittawatanarat K, Tsang C. Short-Term Outcomes of the Ligation of Intersphincteric Fistula Tract (LIFT) Procedure for Treatment of Fistula-in-Ano: A Single Institution Experience in Singapore. Poster Abstracts of The American Society of Colon and Rectal Surgeons Annual Meeting. *Dis Colon Rectum.* 2008.
32. Koh CE, Lee PJ, Byrne CM, Wright CM, Chew EH. The lift procedure for fistula-in-ano. initial experience at a single tertiary referral center. *Colorectal Dis.* 2011;13 Suppl. 5:19 [Orals].
33. Lo OSH, Wei R, Foo DCC, Law WL. Ligation of intersphincteric fistula tract procedure for the management of cryptoglandular anal fistulas. *Surg Pract.* 2012;16:120–1, <http://dx.doi.org/10.1111/j.1744-1633.2012.00604.x>.
34. Tan KK, Alsuaigh R, Tan AM, et al. To LIFT or to flap? Which surgery to perform following seton insertion for high anal fistula? *Dis Colon Rectum.* 2012;55:1273–7.
35. Mushaya C, Bartlett L, Schulze B, Ho YH. Ligation of intersphincteric fistula tract compared with advancement flap for complex anorectal fistulas requiring initial seton drainage. *Am J Surg.* 2012;204(3):283–9 [Epub 2012 May 19].
36. Wallin UG, Mellgren AF, Madoff RD, Goldberg SM. Does ligation of the intersphincteric fistula tract raise the bar in fistula surgery? *Dis Colon Rectum.* 2012;55:1173–8.
37. Abcarian AM, Estrada JJ, Park J, et al. Ligation of intersphincteric fistula tract: early results of a pilot study. *Dis Colon Rectum.* 2012;55:778–82.
38. Liu WY, Aboulian A, Kaji AH, Kumar RR. Long-term results of ligation of intersphincteric fistula tract (LIFT) for Fistula-in-Ano. *Dis Colon Rectum.* 2013;56:343–7.
39. Lehmann JP, Graf W. Efficacy of LIFT for recurrent anal fistula. *Colorectal Dis.* 2013;15:592–5.
40. van Onkelen RS, Gosselink MP, Schouten WR. Ligation of the intersphincteric fistula tract in low transsphincteric fistula: a new technique to avoid fistulotomy. *Colorectal Dis.* 2013;15:587–91.
41. Toyonaga T, Matsushima M, Kiriu T, et al. Factors affecting continence after fistulotomy for intersphincteric fistula-in-ano. *Int J Colorectal Dis.* 2007;22:1071–5 [Epub 2007 Jan 30].
42. Westerterp M, Volkers NA, Poolman RW, van Tets WF. Anal fistulotomy between Skylla and Charybdis. *Colorectal Dis.* 2003;5:549–51.
43. Williams JG, MacLeod CA, Rothenberger DA, Goldberg SM. Seton treatment of high anal fistulae. *Br J Surg.* 1991;78:1159–61.
44. Loungnarath R, Dietz DW, Mutch MG, et al. Fibrin glue treatment of complex anal fistulas has low success rate. *Dis Colon Rectum.* 2004;47:432–6.
45. Ellis CN, Clark S. Fibrin glue as an adjunct to flap repair of anal fistulas: a randomized, controlled study. *Dis Colon Rectum.* 2006;49:1736–40.
46. Christoforidis D, Etzioni DA, Goldberg SM, et al. Treatment of complex anal fistulas with the collagen fistula plug. *Dis Colon Rectum.* 2008;51:1482–7.
47. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health.* 1998;52: 377–84.