

## Ligation of intersphincteric fistula tract and its modification: Results from treatment of complex fistula

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### Abstract

**AIM:** To compare healing rates between intersphincteric fistula tract (LIFT) and LIFT plus partial fistulectomy procedures.

**METHODS:** A study of complex fistula-in-ano patients was carried out from 1<sup>st</sup> March 2010 to 31<sup>th</sup> January 2012. All operations were done by colorectal surgeons at a referral center in a Ministry of Public Health hospital. Data collected included patients' demographic details, fistula type determined by endorectal-ultrasoundography, preoperative and postoperative continence status, previous operations, time between diagnosis of fistula-in-ano and operation, type of surgery, healing rates, recurrence rates, and types of failure examined by endorectal-ultrasoundography, re-operation in recurrence or failure cases, and complications.

**RESULTS:** The study involved 41 patients whose average age was  $40.78 \pm 11.84$  years (range: 21-71 years). The major fistula type was high-transsphincteric type fistula. The median follow-up period was 24 wk. The overall success rate was 83%: in the LIFT (Ligation intersphincteric fistula tract) group the success rate was

81% and in the LIFT plus (LIFT with partial coreout fistulectomy) group it was 85% ( $P = 0.529$ ). The median wound-healing time was 4 wk in both groups ( $P = 0.262$ ). The median time to recurrence was 12 wk. Neither group had incontinence (Wexner incontinence score=0) and the difference in healing rates between the two groups was not statistically significant.

**CONCLUSION:** There was no difference in results between LIFT and LIFT plus operations. The LIFT procedure is a good option for maintaining continence in management of fistula-in-ano.

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**Key words:** Fistula-in-ano; Complex fistula; Intersphincteric fistula tract; Perianal disease; Incontinence

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### INTRODUCTION

The ideal way to treat anal fistula is to cure the disease without any risk of fecal incontinence. The many surgical techniques used in treating anal fistula can be divided into 2 groups: sphincter-sacrificing and sphincter-sparing methods. The sphincter-sacrificing techniques, with or without immediate repair, have a high healing rate but also a high post-operative incontinence rate, while the sphincter-sparing methods have varied healing rates but little or no resultant incontinence. The impairment of continence has an effect on quality of life, so the sphincter-sparing methods are now popular. There are a number of sphincter-sparing methods such as fibrin or cyanoacrylate glue injection<sup>[1,2]</sup>, anal fistula plug<sup>[3]</sup>, endorectal

**Table 1** Assessment of clinical continence grading

Category	Description
A	Continent of solid and liquid stools and flatus ( <i>i.e.</i> , normal continence)
B	Continent of solid and usually liquid stools but not flatus (no fecal leakage)
C	Acceptable continence for solid stool but no control over liquid stool or flatus (intermittent fecal leakage)
D	Continued fecal leakage

Reproduced from Browning *et al*<sup>[26]</sup>.

muscular or mucosal advancement flap<sup>[4,5]</sup>, core-out fistulectomy<sup>[6,7]</sup>, radiofrequency ablation<sup>[8]</sup>, ayurvedic seton<sup>[9]</sup>, ligation of intersphincteric fistula tract (LIFT)<sup>[10,11]</sup>, and finally, video-assisted anal fistula treatment (VAAFT)<sup>[12]</sup>.

Several sphincter-sparing methods carry their own risk of recurrence and some degree of incontinence. Most of these are complicated and difficult procedures, and require expertise, highly-experienced surgeons, or high-technology equipment. The ligation of LIFT procedure was presented by Rojanasakul *et al*<sup>[10]</sup> with a healing rate of 94%. This procedure was a simple, safe, minimally-invasive technique. It was also effective, with a high and rapid healing rate without any resultant incontinence. However, later reports showed healing rates varying between 57% and 83%<sup>[13-21]</sup>. The treatment failure or recurrence might have been related to inadequate management of sources of infection or remnant fistula tract as proposed by Rojanasakul *et al*<sup>[22]</sup> and Mitalas *et al*<sup>[23]</sup>. The aim of this prospective study was to compare the success rates between treating complex anal fistula with the original LIFT and LIFT with partial coreout fistulectomy (LIFT plus).

## MATERIALS AND METHODS

The study was conducted from 1<sup>st</sup> March 2010 to 31<sup>st</sup> January 2012 in Rajavithi Hospital. All of the patients were diagnosed with fistula-in-ano from their medical history and physical examination. All patients underwent endoanal ultrasonography (Hitachi, EUB 7500) combined with hydrogen-peroxide for classification into simple and complex fistula-in-ano. The ultrasonography study was performed by a colorectal surgeon. The patients' continence was evaluated at the preoperative and postoperative phases by Wexner incontinence score (WIS)<sup>[24,25]</sup> and clinical continence grading (Table 1)<sup>[26]</sup> was recorded at every visit. Written informed consent was obtained from all the patients after they were given a full explanation of the procedure, and they agreed to participate in regular follow-up assessments. This study was approved by the Rajavithi Hospital Medical Ethics Committee.

Inclusion criteria were: (1) age more than 18 years; (2) complex cryptoglandular anal fistulas in patients with newly-diagnosed fistula-in-ano; and (3) no sinus abscess confirmed by endoanal ultrasonography.

Exclusion criteria were: (1) superficial fistulas that could be treated by simple fistulotomy; (2) Crohn's perianal disease; and (3) other inflammatory bowel disease or malignancy.

A database was created to collect information pertaining to this study. The unit recorded data on patient demographics, past surgical treatments, fistula characteristics, Endorectal ultrasonographic findings, operative data and follow-up findings. The database also included information on operative findings, postoperative morbidity and length of follow-up.

Patients with complex fistula-in-ano were divided into 2 groups. The first group (the LIFT group) underwent ordinary LIFT, as described by Rojanasakul<sup>[22]</sup>, and the second group (the LIFT plus group) had LIFT combined with partial core-out fistulectomy.

## Definitions

**Simple fistulas:** Low transsphincteric and intersphincteric fistulas that cross 30% of the external sphincter<sup>[27]</sup>.

**Complex fistulas:** High transsphincteric fistulas with or without a high blind tract; suprasphincteric and extrasphincteric fistulas; horseshoe fistulas; and those associated with inflammatory bowel disease, radiation, malignancy, pre-existing incontinence, or chronic diarrhea<sup>[27]</sup>.

**Treatment failure or recurrence:** Persistent discharge (purulent stool) more than 4 wk after surgery or recurrent drainage; air leakage from external opening and/or intersphincteric incision wound after the wound had healed.

**Healing wound or success:** Defined as healing of the external opening and intersphincteric incision wound.

**Partial core-out fistulectomy:** Excision of fistula tract from the external opening to the outer rim of the anal sphincter muscle.

## Operative technique

All patients were admitted 1 d before surgery with no bowel preparation. A wide-spectrum antibiotic was given for 1 wk. Regional anesthesia was performed by anesthesiologists. The Prone-Jackknife position was used. An internal opening was identified by injecting methylene blue or povidine iodine from an external opening, and an incision was made parallel to the anal verge about 2 centimetres above the intersphincteric groove. Dissection deep down into intersphincteric space was carried out with scissors and electric cautery to identify the fistula tract. This tract was then ligated on the internal opening site by polyglactin 3/0 (Vicryl 3/0) before being transected. In order to confirm that it was the correct tract, normal saline, methylene blue or povidine solution was injected, after which the tract was ligated on the external site with polyglactin 3/0.

The first group of patients had the tract curretted

**Table 2 Patient demographic data**

	LIFT	LIFT plus	P value
Patients	21	20	
Age average (mean $\pm$ SD, yr) (range)	43.95 $\pm$ 12.35 (23-71)	37.45 $\pm$ 10.58 (21-54)	0.650
Sex			
Male	17	14	0.326
Female	4	6	
Underlying disease	0	0	
BMI (kg/m <sup>2</sup> , mean $\pm$ SD)	24.20 $\pm$ 4.62	23.08 $\pm$ 5.38	0.480
Prior fistula operation	0	0	
Fistula type			0.365
High-transsphincteric	19	14	
Horseshoe-transsphincteric	1	3	
Suprasphincteric	0	1	
Low-transsphincteric	1	2	
Preoperative incontinence			
Clinical	A	A	
WIS	0	0	
Timing from diagnosis of fistula-in-ano to operation (median, wk) (range)	16 (4-52)	18 (4-150)	0.547

BMI: Body mass index; WIS: Wexner incontinence score; LIFT: Ligation of intersphincteric fistula tract.

from the external opening while patients in the second group had partial core-out fistulectomy performed from the external opening to the external sphincter. The fistula tracts of both groups were sent for pathological examination.

All of the patients were discharged the following day with analgesia and stool softeners. Before being discharged, they were shown how to cleanse their wounds with tap water.

All patients were scheduled for follow-up at 2, 4, 8 and 12 wk postoperatively, and at 4-weekly intervals thereafter. At each visit the patient's clinical continence status<sup>[26]</sup> was evaluated, and incontinence rates were recorded using WIS<sup>[24,25]</sup>. Wound examination was carried out at both the internal and external openings of the wound, and other morbidity was also assessed.

### Statistical analysis

The authors used  $\chi^2$  analysis and the Fisher-exact test to compare factors of recurrence, and the student *t*-test and Mann-Whitney *U* test were used to compare basic characteristics of the patients such as age and underlying diseases in the two groups (SPSS version 17, Microsoft Corp).

## RESULTS

From 1<sup>st</sup> March 2010 to 31<sup>st</sup> January 2012, 45 complex fistula-in-ano patients were treated in Rajavithi Hospital. We excluded 4 patients from the study: 2 of them did not complete all follow-up visits, 1 had a fistula caused by tuberculosis, and 1 patient had a fistula associated with carcinoma of the anal canal. The remaining 41 complex fistula-in-ano patients were included. There were 31 male and 10 female cases whose average age was 40.78  $\pm$

11.84 years (range: 21-71 years). Classification by type of fistula showed that 33 patients had high-transsphincteric type fistula, 4 had horseshoe-transsphincteric type, 1 had suprasphincteric type, and 3 female patients had anterior low-transsphincteric type. The average healing rate was 83%, the median wound healing time was 4 wk and the time to recurrence was 12 wk (range: 6-16 wk). None of the patients had incontinence. Of the 41 patients, 21 had the LIFT operation, and 20 had the LIFT + partial coreout fistulectomy. Table 2 shows a comparison of the demographic data of the two groups.

In the postoperative period, we had 1 minor bleeding complication from a core-out wound, and 2 anal fissures (one in each group). The fissures were healed by conservative treatment. None of the patients had recurrence of fistula, and none of their complications was associated with recurrence.

In all, there was treatment failure of the fistula in 7 cases. Re-examination by endoanal ultrasonography was carried out before re-operation (by other colorectal surgeons or endoscopists). In the LIFT group, there were 4 cases of recurrence, which was defined as non-healing of the external opening after a second visit or one month after the operation. One case had a sinus abscess due to fistula tract remnants (presented as perianal abscess) while another 3 cases were caused by failure of the ligation of the intersphincteric fistula tract in the intraoperative stage. In the LIFT PLUS group there were three instances of recurrence: 2 were due to failure to ligate the fistula tract and another was due to a new abscess appearing near the operation site, and fistula-in-ano occurred after incision and drainage with a new internal opening. All 6 fistula recurrence cases underwent re-operation: 4 by the LIFT procedure, and 2 by the LIFT PLUS. The patient with the sinus abscess was managed by incision and drainage and curettage. All of the recurrence cases healed after the second operation with no incontinence. Univariate analysis of factors of recurrence showed that body mass index (BMI) was a significant factor for recurrence (Tables 3 and 4).

## DISCUSSION

The success rates of sphincter-sparing methods in treating anal fistula have varied considerably. Fibrin glue injection is simple but the results have been disappointing, with success rates as low as 16%-25%<sup>[28-30]</sup>. Similarly, anal plug studies reported success rates of 29%-87%<sup>[31-33]</sup>. Draining seton is also a simple technique, but has a long healing time, varying from about 3-9 mo<sup>[34,35]</sup>. Endoanal advancement flaps and coreout fistulectomy are complicated procedures with high success rates of 86%-97% and with minimal change in continence<sup>[6,7]</sup> due to stretching or tearing of the anal sphincter (Table 5).

Currently, there is a growing interest in ligation of LIFT because the procedure is minimally invasive, easy to learn and perform, and can be used on recurrent cases. The early results of the LIFT procedure were quite im-

**Table 3 Results**

	LIFT	LIFT PLUS	P value
Operative time (mean $\pm$ SD, min) (range)	37.67 $\pm$ 17.40 (20-75)	44.00 $\pm$ 14.29 (25-90)	0.400
Healing rate	81%	85%	0.529
Postoperative incontinence			
Clinical	A	A	
WIS	0	0	
Postoperative complications			0.520
Headache	0	0	
Urinary retention	0	0	
Bleeding (minor)	0	1	
Anal fissure	1	1	
Difficulty in defecating	0	0	
Wound healing time (median, wk)	4	4	0.262
Follow up (median, wk) (range)	18 (12-22)	20 (12-24)	
Time to recurrence (median, wk)	10	12	0.354
Recurrence cases <i>n</i> (%)			
High-transsphincteric	4 (19)	3 (15)	
Horseshoe-transsphincteric	0 (0)	0 (0)	
Suprasphincteric	0 (0)	0 (0)	
Anterior low-transsphincteric	0 (0)	0 (0)	
females			
Re-operation	3	3	

WIS: Wexner incontinence score.

pressive with success rates ranging from 57%-94% with minimal morbidity and little or no impact on continence status<sup>[10,13-15]</sup>.

Some surgeons have used modifications of LIFT by combining it with additional procedures such as transanal advancement flap<sup>[36]</sup> or bioprosthetic plug<sup>[37]</sup>. The healing rate improved to 95% in the LIFT with anal fistula plug procedure, but did not improve with the combination of advancement flap.

Our study showed that primary healing was achieved in 17 patients (81%) in the LIFT group and 17 patients (85%) in the LIFT plus group ( $P = 0.529$ ), with median wound healing time of 4 wk in both groups ( $P = 0.262$ ). The healing rate following excision of the fistula tract was unchanged from that of the non-excision group, similar to the comparison of healing results in fistulotomy and fistulectomy<sup>[38]</sup>. Seven patients (4 in the LIFT group and 3 in the LIFT plus group) had treatment failure or suspected recurrence at median time 12 wk (range: 6-16 wk) after surgery. These results showed that the excision of the fistula tract or partial fistulectomy did not improve the rates of success. It should be noted that in this study there were no cases of persistent anal abscess, which may be a common cause of treatment failure, so it should not be assumed that incomplete removal of the fistula tract is the only possible cause of treatment failure (Table 3).

Recurrence of anal fistula is mainly due to infection and technical errors. Infection was one of the reasons for non-healing of internal opening wounds, because it caused the breakdown of the closure wound on the internal sphincter. So, in cases with persistent anal abscess or infected incisional wounds, infection could be a factor for treatment failure. All of our failure cases underwent preoperative endorectal ultrasonography to delineate the

**Table 4 Comparative factors of recurrence (mean  $\pm$  SD)**

Factor	Heal ( <i>n</i> = 34)	Recurrence ( <i>n</i> = 7)	P value
Age, yr	41.35 $\pm$ 12.00	38.00 $\pm$ 11.43	0.502
BMI, kg/m <sup>2</sup>	22.0 $\pm$ 3.9	30.54 $\pm$ 3.54	< 0.001
Timing from diagnosis of fistula-in-ano to operation (median, wk) (range)	16 (4-150)	16 (4-110)	0.985

**Table 5 Overall LIFT success rate**

Author, year	Success rate	Patient	Follow up period	Incontinence rate
Rojanasakul <i>et al</i> <sup>[10]</sup> , 2007	94%	17	4 wk	0
Bleier <i>et al</i> <sup>[13]</sup> , 2010	57%	39	NA	NA
Shanwani <i>et al</i> <sup>[14]</sup> , 2010	77%	45	9 mo	0
Tan <i>et al</i> <sup>[15]</sup> , 2011	78%	93	23 wk	NA
Sileri <i>et al</i> <sup>[16]</sup> , 2011	83%	18	4 mo	Same as preoperative
Ooi <i>et al</i> <sup>[18]</sup> , 2012	68%	25	22 wk	0
Wallin <i>et al</i> <sup>[20]</sup> , 2012	57%	93	19 mo	NA
Abcarian <i>et al</i> <sup>[21]</sup> , 2012	74%	40	18 wk	NA
van Onkelen <i>et al</i> <sup>[36]</sup> , 2012	82%	22	19.5 mo	0

NA: Not available.

association of anal sphincter anatomy with the fistula tract and secondary tract as well as collection or abscess. In our study, there was no incidence of anal abscess, and the failure rate from infection in this study was 2.4% (1 out of 41 cases), resulting from infection of the incision wound.

There were 6 cases (3 in each group) of technical errors in the identification of the fistula tract caused by incorrect ligation of the "true" fistula tract, but these results showed no statistical significance. The error was confirmed by endorectal ultrasonography which demonstrated the same internal opening and fistula tract. The reason for the difficulty in identifying the fistula tract could have been patient obesity, thinness or small size of the fistula tract, or a deep-seated fistula tract. Failure to identify the fistula tract occurred more often in obese patients with BMI of more than 30 ( $P = 0.001$ ), which suggests that obesity might be a factor for treatment failure<sup>[39]</sup>. It has been suggested that inserting a draining seton for 8-12 wk<sup>[19]</sup> preoperatively to eradicate septic foci by adequate drainage and to promote maturation of the fistula tract around the seton, would reduce infection and make it easier to perform LIFT with impressive outcomes (Table 4).

There were minor incidences of morbidity with 1 case of minor bleeding of an external wound which was treated by pressure dressing, and 2 cases of anal fissure which were healed by conservative management. Continence was normal, identical to the preoperative phase with WIS = 0. Most previous reports of the LIFT technique also showed minimal or no impact on continence, and minimal morbidity, even though the healing rates varied.



In recurrence or treatment failure cases, re-operation was performed in 6 of the 7 cases with either LIFT or LIFT plus. All of these patients healed without morbidity or change in continence status. Another possible advantage of the LIFT procedure is that it can be performed in cases of recurrence even when failure occurred with previous use of the LIFT technique<sup>[20]</sup>. Moreover, in most recurrence cases the fistula type was converted to an intersphincteric fistula type which is easy to handle by simple fistulotomy<sup>[15]</sup>.

The limitations of this study were its small sample size, unequal distribution of fistula type<sup>[40]</sup> and short follow-up period<sup>[41,42]</sup>.

In conclusion, the LIFT procedure is relative easy to perform, has a high healing rate and appears to be safe with low morbidity and no impact on continence. The excision of fistula tract combined with LIFT does not improve success rates. The results of LIFT and LIFT with partial fistulectomy procedures are similar.

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## COMMENTS

### Background

The 3 major basic aims of fistula-in-ano management are: (1) control of sepsis; (2) closure of the fistula; and (3) maintenance of continence. Nowadays, operations for fistula-in-ano are classified into 2 groups: first, sphincter-sacrificing procedures such as sphincterotomy and sphincterectomy; second, sphincter-preserving procedures such as anal fistula plug, anal flap, seton and intersphincteric fistula tract (LIFT). There are 2 differences between LIFT and the total sphincter-conservation procedure used: (1) Ligation produces more favorable results than sewing; and (2) Curettage is more practical and less time-consuming than total excision of the fistulous tract.

### Research frontiers

This study aimed to compare the effectiveness of clearing fistula tract or granulation tissue using original LIFT and LIFT plus partial fistulectomy.

### Innovations and breakthroughs

This study showed no significant difference in healing rates or times between the LIFT and LIFT plus partial fistulectomy, and most importantly, it found that there was no resultant postoperative incontinence either from the LIFT or LIFT plus procedure.

### Applications

These results show removal of infected granulation tissue in the fistulous tract and cavity by curettage or partial fistulectomy is equally successful. A second advantage was that there was good postoperative continence status, which may facilitate the management of recurrence or complex cases.

### Peer review

This manuscript is impressive in that it studied not only the difference in success rates between the LIFT and LIFT plus partial fistulectomy procedures in the removal of fistula tract, but also the healing rates and postoperative continence status.

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