Original Article

A Single-surgeon Experience of Treating Anal Fistulas Using the Ligation of the Intersphincteric Fistula Tract (LIFT) Procedure: Comparison between the Past and the Present

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Key Words
Ligation of intersphincteric fistula tract;
Anal fistula;
Magnetic resonance imaging

Purpose. Although ligation of intersphincteric fistula tract (LIFT) procedure for anal fistula with cryptoglandular origin has increasingly gained popularity in the world, disease recurrence rates remained unsatisfactory in many institutions. We noticed that disease recurrence rates went down gradually in our hospital in recent years. Therefore, we intended to explore the reason why improving disease recurrence rates were observed in our institution.
Methods. We performed a retrospective chart review to assess the surgical results of executing LIFT procedure by a single surgeon in recent 1.5 years, and made a comparison between previously published results and the present study.
Results. A total of 98 LIFT procedures, which treated 5 intersphincteric fistula (5.1%), 67 low transsphincteric fistula (68.4%), 12 high transsphincteric fistula (12.3%), 14 unilateral or bilateral ischioanal fistulas (14.3%) were identified by the chart review from October 2019 to March 2021. The primary healing rate within 6 months postoperatively was 91.8%. The total recurrence rate was 8.2%, in which high transsphincteric and ischioanal type fistulas had recurrence rates of 16%.
Conclusion. The present LIFT procedure in our hospital achieved good primary healing rates with comparatively low recurrence rates after we added a technical modification and increased preoperative magnetic resonance imaging use as an adjunct study for high transsphincteric and ischioanal fistula patients.

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A growing interest in the ligation of the intersphincteric fistula tract (LIFT) procedure has been observed since it was first introduced by Dr. Rojanasakul[1] in 2007 with an impressive healing rate of 94.4% and no clinical incontinence. Many studies on the LIFT procedure have shown a variety of primary healing rates ranging from 57% to 94.2%,[5-10,21-25] with a reported recurrence rate ranging from 5.9% to 28%.[6,8-10,21-23,25] In our hospital, we have started to perform LIFT procedure since 2013, which was reported in 2018, with to-

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tal recurrence rate of 19.5% in our previous study.[2] Although the surgical success rates in our previous study were favorable for low transsphincteric anal fistulas, the recurrence rate was still high, especially in high transsphincteric and ischioanal fistulas.

To address this problem, since September 2019, the corresponding author modified a small technical step of the LIFT procedure through a published correspondence, stressing that the intersphincteric fistula tract over the internal sphincter edge could be suture-closed more securely through this small modification,[3] which partially addressed the main concern that the residual fistula tract in the internal sphincter muscle could not be tested by H_2O_2 injection.[4]

Besides, since the anatomy of high transsphincteric complex fistulas is hard to delineate not only during physical examination but also during surgery, magnetic resonance imaging (MRI) became one of the most frequently used diagnostic modalities for the preoperative assessment of complete fistula anatomy and surgical planning for complex anal fistulas.[12-20] With regards to the treatment of high transsphincteric complex anal fistulas, we believe that the reasons for the high surgical failure rates reported in the literature can be associated with not only patient factors but also the technical details of the operation and the failure to assess the accurate anatomy of complex fistulas preoperatively. Therefore, additional preoperative MRIs have been performed for our patients with suspected high transsphincteric or ischioanal fistulas before undergoing surgery.

The aim of this study is to present a retrospective review of the treatment outcomes of patients with anal fistulas in recent years and to make a comparison between our past and present results.

Materials and Methods

We performed a retrospective chart review from a prospectively maintained database for every anal fistula patient who underwent the LIFT procedure in the National Cheng Kung University Hospital (NCKUH) since May 2013. We enrolled patients from September 2019 to March 2021 to achieve an adequate follow-up period of at least 6 months postoperatively.[11] All the patients were operated by the corresponding author, PC Chen. We excluded patients who had undergone procedures other than the LIFT procedure, including traditional fistulotomy/fistulectomy, advancement flap procedure, and video-assisted anal fistula treatment (VAAFT). This study was approved by the Internal Review Board of the NCKUH (B-ER-110-236).

The essential steps of the LIFT procedure done in NCKUH

All patients received one time enema per rectum before surgery. No preoperative antibiotic was used. In the operating room, the patient was placed in the prone jackknife position with the anus being taped open from both sides.

First, the corresponding author routinely used the LIFT retractor invented by Dr. Rojanasakul to develop the reproducible intersphincteric plane dissection. The Lone Star Retractor System, though a popular choice for many surgeons, was not the preferred instrument in our hospital. Second, for high transsphincteric fistulas, since it would be difficult to securely suture-ligate the intersphincteric segment of the fistula tract in the relatively limited working space, we always clamped close the intersphincteric fistula tract over the internal sphincter side as the first step. Then, we divided the tract and let the intersphincteric segment retrace into the external sphincter muscle defect, gaining a wider working space to securely suture-close the fistula stump[3] (Fig. 1). The intersphincteric segment could be easily dealt with later, either by curettage only or en bloc resection with the fistula tract. Third, we routinely suture-closed the external sphincter muscle defect to increase the chance of converting complex fistulas to a much simpler intersphincteric fistula, which has already been proven in many institutions. Finally, the intersphincteric incision would be closed with interrupted 3-0 Vicryls (Ethicon, Johnson and Johnson, USA).

Similar to the standard routine developed by Dr. Rojanasakul, we routinely prescribed 1 week dose of amoxicillin-clavulanic acid postoperatively due to the closed wound around the anus. Another week of anti-

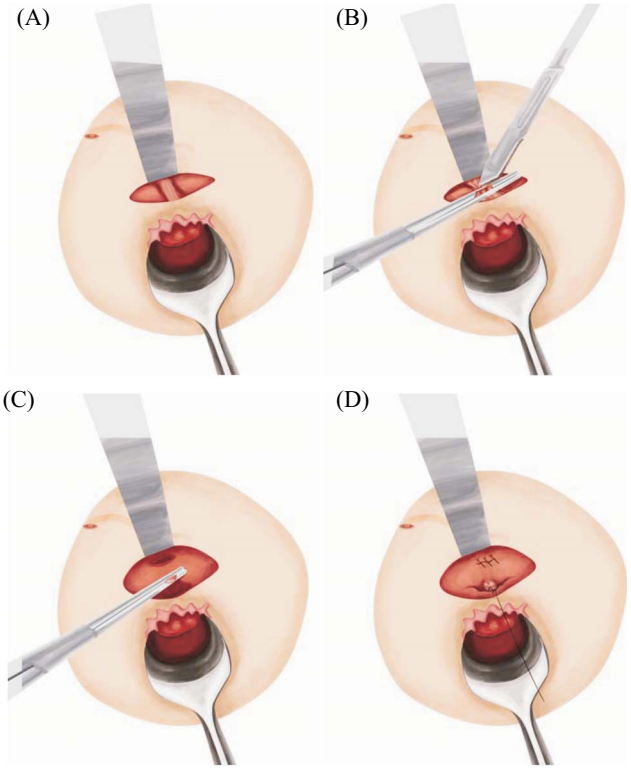

Fig. 1. (A) Intersphincteric dissection by LIFT retractor. (B) We clamped close the intersphincteric fistula tract over the internal sphincter side using a long curved hemostat clamp and divided the tract at the edge of the clamp. (C) We let the intersphincteric segment retrace into the external sphincter muscle defect, so we can obtain a wider working space to securely suture-close the fistula stump. (D) We routinely suture-closed the external sphincter muscle defect.

biotic prescription will be guided based on the intraoperative aerobic and anaerobic wound culture results. The patients were instructed to clean his or her wound 2-3 times a day, but sitz bath was not recommended. Subsequent follow-up was performed at 2- to 4-week intervals until the wound was completely healed.

Definition of recurrence and follow-up methods

The definitions of recurrence, including early recurrence and recurrence, were determined clinically. Early recurrence was defined as persistently unhealed wound either at the intersphincteric incision or at the external orifice after 6 months postoperatively. Late recurrence was defined as recurrent purulent discharge either from the previously healed intersphincteric incision or from the previously healed external orifice at any time after the LIFT procedure. In the present study, primary healing was defined as complete healing of both the intersphincteric incision and the external orifice with resolution of symptoms in 6 months postoperatively.

All patients were followed up regularly in the outpatient clinic until the wounds were healed, which were documented in the electronic medical record of the NCKUH. For patients who did not come back for follow-up before the surgical wounds were completely healed, we conducted telephone interviews to confirm whether the patients' wounds were completely healed with no residual symptoms. All 89 patients were contacted by telephone to confirm the current status on December 2021.

Statistical analysis

The continuous variables were calculated using Student's t-test. The categorical variables were calculated using Fischer's exact test. The Mann-Whitney *U* test was performed to assess the significant differences for nonparametric tests. Statistical analyses were conducted using PRISM for Windows version 6. The significance level was set at 0.05.

Results

A total of 89 patients underwent 98 LIFT procedures between September 2019 and March 2021 at the NCKUH were included for the analysis in this study. All 89 patients were evaluated in the outpatient setting or emergency room by colorectal surgeons or primary care doctors. Patient history was recorded and physical examination was performed. For imaging survey, computed tomography, endoanal ultrasound, and magnetic resonance imaging were performed at the discretion of the primary care doctors. Of the 89 patients, 80 were male and 9 were female. The median age of these patients was 41 years. Thirty-one (31.96%) patients had previous interventions for anal fistula or perianal

abscess disease. Based on Dr. Rojanasakul's anal fistula classification,[5] 5 (5.1%) intersphincteric fistulas, 67 (68.4%) low transsphincteric fistulas, 12 (12.3%) high transsphincteric fistulas, and 14 (14.3%) unilateral or bilateral ischioanal fistulas were included in this study. Table 1 shows the demographics and clinical data of these patients.

The median operation time was 34 minutes. All operations were successfully completed, without any intraoperative complication, conversion to traditional fistulectomy, or mortality. The median hospital stay was 2 days (range: 2-4 days). During the outpatient clinic follow-up, the median follow-up time was 536.3 days (range: 265-786 days). The primary healing rate within 6 months postoperatively was 91.8%. The recurrence rate was 8.2%, including 1.0% early recurrence and 7.1% late recurrence (Table 2). The recurrence rates of the LIFT procedure for anal fistula in our previous study[2] and in the present study were 19.5% and 8.2%, respectively (Table 3). Of the 8 disease recurrences in our series, 1 (20%) was intersphincteric fistula, 3 (4.5%) were low transsphincteric fistulas, 2 (16.7%) were high transsphincteric fistulas, and 2 (15.4%) were ischioanal fistulas. Compared with our previous study,[2] in which the recurrence were much higher: 42.9% for the intersphincteric fistula, 8.3% for the low transsphincteric fistula, 38.5% for the high transsphincteric fistula, and 33.3% for the ischioanal fistula (Table 3).

In the present study, 24.5% of the cases (24/98) had undergone preoperative MRI compared with only 9.1% of the cases in our previous study. Of the 24 cases that had undergone preoperative MRI, 8 were demonstrated to below transsphincteric fistula, 7 to be high transsphincteric fistula, and 9 to be ischioanal fistula. Overall, most of the preoperative MRIs were performed for either high transsphincteric or ischioanal fistula. The recurrence rate of cases undergoing preoperative MRI was 12.5% in the present study, compared to 71.4% in our previous study.

Table 1. Demographics and clinical data

Variable	N = 98
Number (LIFT/patient)	98/89
Follow up time, weeks (IQR)	77.64 (61.57-91.71)
Gender, n (%)	
Male	80
Female	9
Age, years (IQR)	41 (33-51)
Type, n (%)	
Intersphincteric type	5 (5.1)
Low transsphincteric type	67 (68.4)
High transsphincteric type	12 (12.3)
Unilateral ischioanal type	9 (9.2)
Bilateral ischioanal type	5 (5.1)
Previous intervention for fistula, n (%)	31 (31.96)
Fistulotomy or fistulectomy	5 (5.15)
I&D	26 (26.8)
Pre-operation image, n (%)	
CT	13 (13.3)
Endoanal ultrasound	33 (33.7)
MRI	24 (24.5)
Cormobidity, n (%)	
HTN	16 (16.3)
DM	8 (8.2)
Hyperlipidemia	4 (4.1)
CAD	1 (1.0)
CKD	2 (2.0)
Cancer history	3 (3.1)
HBV/liver cirrhosis	6 (6.1)
COPD/Asthma	1 (1.0)
CVA	2 (2.0)

Discussion

Our study demonstrated that by modifying a LIFT procedure step to better suture-close the intersphincteric fistula tract at the internal sphincter muscle border, and increasing the use of MRI to study the fistula anatomy preoperatively, the overall disease recurrence rates went down significantly over all types of anal fistulas.

Table 2. Outcome

Variable	n = 98
Primary healing, n (%)	90 (91.8)
Median operation time, mins (range)	34 (13-109)
Median hospital stay, days (range)	2 (2-4)
Median follow-up period (days)	536.3 (265-786)
Time to complete healing, weeks (IQR)	6 (4-7.75)
Recurrence, n (%)	8 (8.2)
Early recurrence	1 (1.0)
Late recurrence	7 (7.1)

Table 3. Comparison between our study and previous study

Variable	Our study	Lin et al.[2]	*p*-value
LIFT number	98	77	
Primary healing rate	91.8% (90/98)	90.9% (70/77)	> 0.99
Median operation time, mins (range)	34 (13-109)	35 (13-100)	
Median hospital stay, days (range)	2 (2-4)	2 (2-6)	
Pre-operation image			
CT	13.3%	11.69%	0.82
Endoanal ultrasound	33.7%	42.86%	0.27
MRI	24.5%	9.1%	0.009
Fistulography	0%	2.6%	0.19
Recurrence rate	8.2% (8/98)	19.5% (15/77)	0.04
Recurrence rates according to fistula types			
Intersphincteric type	20% (1/5)	42.9% (3/7)	0.58
Low transsphincteric type	4.5% (3/67)	8.3% (4/48)	0.23
High transsphincteric type	16.7% (2/12)	38.5% (5/13)	0.37
Ischioanal type	15.4% (2/13)	33.3% (3/9)	0.61
Recurrence rates of patients undergoing pre-operative MRI	12.5% (3/24)	71.4% (5/7)	0.005

Since the LIFT procedure was first introduced in 2007 by Dr. Rojanasakul,[1] several surgeons have adopted this technique to treat complex transsphincteric anal fistulas. However, varying treatment outcomes were presented, in which studies have shown recurrence rates as high as 56.5%-76% for high transsphincteric anal fistula.[26,27] For institutions reporting relatively low recurrence rates using the LIFT procedure to treat high transsphincteric anal fistulas, Madbouly et al.[6] performed a prospective randomized trial and reported a 6% disease persistence and 21% recurrence rate. Sun et al.[8] conducted a retrospective study and reported recurrence rate of 15.7%. In our previous study,[2] the recurrence rate was 38.5% for high transsphincteric and complex anal fistulas. However, the present study demonstrated a much lower overall recurrence rates for all types of anal fistulas, and lower recurrence rates for high transsphincteric and ischioanal anal fistulas compared with our previous study. We believe that the improvement in the disease recurrence rates in the present study can be attributed to two factors. First, we had frequent observation of "ligature getting loose during surgery" after the intersphincteric fistula tract was divided, confirming that the initial suture ligation before the fistula was divided was not as reliable as it was initially thought, which might have contributed to the high recurrence rates in our previous study. After we routinely clamped close the intersphincteric fistula tract at the inner edge of the internal sphincter muscle before we divided the tract and let the intersphincteric segment retraced into the external sphincter muscle defect to gain a wider working space to securely suture-ligate the fistula stump, the recurrence rates started to reduce dramatically. The advantage of this small technical modification was especially valuable when treating high transsphincteric and complex anal fistulas, in which the intersphincteric fistula tracts were usually positioned deep in the postanal intersphincteric space with high surrounding tissue tension. Using our method, the wider working space made securely suture-ligating the fistula stump much easier and safer. Therefore, this technical modification became the most important part of the whole procedure to improve our surgical outcomes.

Second, many studies have already demonstrated that MRI could provide precise pelvic anatomy and a detailed depiction of the fistula tracts in relation to the pelvic floor and sphincter muscles. Accordingly, MRI provides surgeons the accurate map of the anal fistula and its relationship with regional anatomy for appropriate surgical planning to decrease the incidence of recurrence and complication. Thus, MRI is already considered the imaging method of choice for the preoperative evaluation of anal fistula,[12-20] especially for high transsphincteric and complex anal fistulas. In

this study, we arranged preoperative MRI study for most high transsphincteric and ischioanal fistulass, and some for patients with previous fistulectomy history treated by other surgeons. In this study, the patients undergoing preoperative MRI have much lower disease recurrence rate than the previous study. We believe that since MRI provides an accurate and comprehensive anatomical evaluation before surgery, we could avoid unnecessary exploration during surgery, thus improving our surgical success rates. In short, both factors influence the treatment outcomes of patients with anal fistulas.

Our study has several limitations. First, this is a retrospective cohort study of a single-surgeon experience with a relatively small number of patients. Therefore, the clinical outcomes were closely correlated to the surgeon's technique and experience. Second, although reduction of disease recurrence rates was observed in all types of fistulas, no statistical significance was observed in respective fistula types, which could be attributed to the small sample size. Third, the definitions of primary healing and recurrence calculation between the previous and current studies were not completely the same. However, the favorable outcome in the present study is still valid.

Conclusion

We achieved some improvement in treating anal fistulas by LIFT procedure when comparing the present study with our previous study. Our favorable results could be attributed to our modification of the LIFT procedure and the additional use of MRI for preoperative evaluation and surgical planning.

Conflicts of Interest

None.

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None.

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原　著

以括約肌間廔管結紮手術治療肛門廔管之單一外科醫生經驗：過去和現在之比較

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目的　括約肌間廔管結紮手術治療因肛門腺體感染導致的肛門廔管雖然在全世界日益受歡迎，但在許多機構中的疾病復發率仍差強人意。我們試圖找出在我們醫院裡，括約肌間廔管結紮手術的疾病復發率能夠改善的因素。

方法　以回溯性研究分析最近 1.5 年間由單一外科醫生執行括約肌間廔管結紮手術的成果，並且與過去經驗做比較。

結果　從 2019 年 10 月至 2021 年 3 月間，共有 98 個肛門廔管進行括約肌間廔管結紮術，其中有 5 個 (5.1%) 括約肌間型廔管，67 個 (68.4%) 低位穿括約肌間型廔管，12 個 (12.3%) 高位穿括約肌型廔管，14 個 (14.3%) 單側或雙側坐骨肛門型廔管。術後 6 個月內初步癒合率為 91.8%，總復發率為 8.2%，高位穿括約肌型及坐骨肛門型廔管復發率為 16%。

結論　在我們對手術技巧改良以及增加術前磁振造影檢查頻率後，括約肌間廔管結紮手術對肛門廔管的治療已達到不錯的初步癒合率及相對降低的復發率。

關鍵詞　括約肌間廔管結紮手術、肛門廔管、磁振造影。