



# Long-term incontinence rates after traditional lateral internal sphincterotomy: a 5-year retrospective analysis from a high-volume tertiary referral center for proctologic disorders

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## Abstract

**Background** Chronic anal fissures (CAF) are a common proctological condition that significantly impacts patients' quality of life. Lateral internal sphincterotomy (LIS) is widely considered the gold-standard treatment for CAF; however, postoperative fecal incontinence remains a potential risk. The aim of this study is to evaluate long-term incontinence rates following traditional LIS for CAF.

**Methods** A retrospective analysis was conducted on patients with CAF who underwent traditional LIS. Patients with any degree of continence impairment prior to surgery, as well as those who experienced events potentially affecting continence function after surgery, were excluded from the analysis. Incontinence was assessed using the Vaizey score both preoperatively and at follow-up.

**Results** Between January 2014 and May 2019, 98 patients met the inclusion criteria. The mean follow-up duration was 7 years (range 5–10 years). At follow-up, the Vaizey score ranged from 1 to 4 in 19 patients (19.4%) and from 5 to 9 in 5 patients (5.1%). Incontinence primarily involved gas or liquid stool; no patients reported solid stool incontinence. A total of four patients (4.1%) experienced defecatory urgency. No patients required constipating medications or reported lifestyle changes; only one patient (1.0%) required the use of pads. No correlation was found with age, sex, BMI, or smoking status.

**Conclusions** When present, incontinence following traditional LIS is generally mild, does not require constipating medications, and does not interfere with patients' lifestyle.

**Keywords** Chronic anal fissures · Traditional lateral internal sphincterotomy · Incontinence · Long-term outcomes · Surgical treatment

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## Introduction

Anal fissure is a common proctological condition that can significantly impact quality of life. While most acute fissures heal with conservative management, a subset of patients develop chronic anal fissures (CAF)—traditionally defined as symptoms persisting for more than 6 weeks—that are refractory to medical therapy [1–4]. In such cases, lateral internal sphincterotomy (LIS) is considered the gold-standard treatment when increased anal tone is still present, achieving high healing rates, symptom resolution, and low recurrence rates [5–8].

Despite its effectiveness, LIS carries the risk of fecal incontinence in up to 9.2% of patients [5, 9, 10]. As many as 39% of patients experience transient incontinence after LIS, ranging from the inability to control gas or loose stool to a loss of control over formed stool [11], with resolution of symptoms typically occurring within 6–8 weeks. While short-term outcomes are well documented, data on long-term incontinence remain inconsistent, with reported prevalence varying widely across studies. Furthermore, different LIS techniques have been described; although the impact of the “open” versus “closed” approach on incontinence rates remains debated [12–14], the extent of internal sphincter division (traditional—up to the dentate line, versus tailored—up to the apex of the fissure) appears to be more strongly associated with the occurrence of incontinence [10, 15]. Given the impact of postoperative incontinence on quality of life, a thorough assessment of long-term incidence and risk factors is essential.

Between 2014 and 2019, our surgical unit performed traditional LIS (extending up to the dentate line). This study aims to evaluate long-term incontinence rates following traditional LIS to clarify the balance between efficacy and safety of this procedure in the surgical management of CAF.

## Materials and methods

### Study design

The study has been reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [16]. As this was a retrospective study based on anonymized and nonsensitive data, ethical approval was waived according to institutional and national guidelines. This was a single-center retrospective study conducted at a high-volume tertiary referral center for proctological disorders. Between 2014 and 2019, traditional LIS was performed up to the dentate

line; thereafter, the procedure was restricted to the fissure apex (tailored LIS). Patients included in the study were affected by idiopathic CAF with increased anal sphincter tone, treated with traditional LIS between 2014 and 2019. Patients were excluded if they were younger than 18 years or older than 90 years, had inflammatory bowel disease or secondary (non-idiopathic) anal fissures, exhibited symptoms of incontinence before surgery, had normal or decreased anal sphincter tone at the time of initial clinical assessment, were operated on after 2019 (when the tailored approach—up to the fissure apex—was used), received other anal procedures alongside LIS, had vaginal deliveries during the follow-up period, or underwent additional colorectal or anal surgery during the follow-up period. A prospectively maintained database was used to select patients. Informed consent was obtained from all individual participants included in the study.

Diagnosis and severity of CAF were established clinically by two expert colorectal surgeons, who also determined the indications for performing LIS and conducted the operation itself. The preoperative assessment included a comprehensive proctological evaluation (including medical history, perineal examination, digital rectal examination, and anoscopy), as well as a colonoscopy and endoanal ultrasound to rule out any additional pathology. In cases where a full proctological examination could not be performed (particularly digital rectal examination and anoscopy), the diagnosis of CAF was made intraoperatively during the inspection of the perianal area. The criteria for diagnosing chronicity included the presence of a sentinel skin tag, hypertrophic anal papillae, an exposed internal anal sphincter, a fibrotic lateral fissure, or a fibrotic anal sphincter [4].

Surgery was conducted on a day surgery basis. Patients were positioned in the lithotomy position, and antibiotic prophylaxis with cephalosporin was administered. The procedure was conducted under local anesthesia with a tailored anal block and mild sedation [17]. The closed technique of sphincterotomy was performed up to the dentate line [18]. More specifically, a small (5–8 mm) incision was made at the intersphincteric groove, typically in the left lateral position. A fine-tipped mosquito clamp was gently introduced into the intersphincteric plane to isolate the internal sphincter. Once identified, the distal internal sphincter was divided under tactile control using a scalpel, taking care not to extend beyond the dentate line. Precision safeguards included digital rectal examination before and after sphincterotomy to assess tone, limit dissection depth and lateral spread, and visual confirmation of minimal resistance loss during sphincter division. Hemostasis was confirmed, and no suturing was typically required. Thereafter, patients who underwent LIS were encouraged to prevent passing hard stools and constipation by using laxatives (macrogol twice or three times a day) and a recommended oral dose of ketorolac

tromethamine (10 mg every 6 h) on an as-needed basis, not exceeding 40 mg per day [19]. Moreover, they were advised to take regular warm sitz baths, to maintain a high-fiber diet, and to increase their fluid intake up to a minimum of 2 L of water daily.

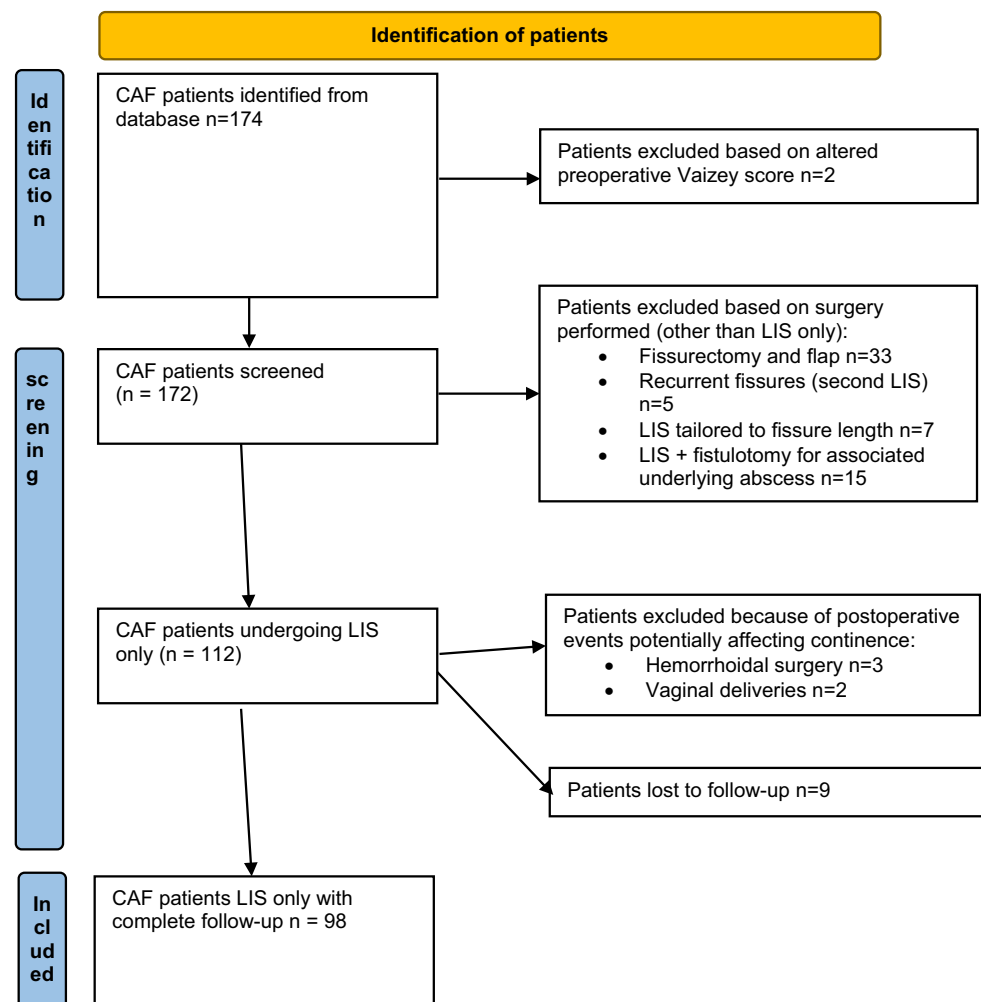
Follow-up visits included a thorough medical history, perianal examination (including digital rectal examination), and anoscopy, performed 1 week, 1 month, and 3 months after surgery. Thereafter, follow-up continued with annual phone interviews, with in-person visits only if deemed necessary on the basis of the responses provided. Continence levels were assessed using the Vaizey score, which was recorded before LIS, at each follow-up visit, and during each phone interview [20–22].

### Statistical analysis

All data were inserted into an Excel database (Microsoft, Redmond, WA, USA) and analyzed with STATISTICA

(data analysis software system), Version 7 (Statsoft Inc.). Descriptive statistics used were the mean  $\pm$  standard deviation for continuous parametric variables, the median and range for continuous nonparametric variables, and frequencies for categorical variables. Normality assumptions were demonstrated with D'Agostino–Pearson's K2 test and Levene's test. The postoperative Vaizey score was used to define continent patients (postoperative Vaizey = 0) versus those who manifested continence alterations (Vaizey  $\neq$  0). Paired two-tailed Student's *t*-tests were used to define differences between these two groups with regards to continuous parametric variables. The chi-squared test was carried out to define associations between groups for categorical variables (Fisher's exact test if the counts in cells were fewer than 5). A two-tailed Spearman's rank correlation was performed between postoperative Vaizey score and sex, age, body mass index (BMI), and smoking habits, which were treated as continuous and predictors, respectively. A *P*-value less than 0.05 was considered statistically significant.

**Fig. 1** Flow chart of the patients' selection process. CAF chronic anal fissure, LIS Lateral internal sphincterotomy



## Results

Between January 2014 and May 2019, a total of 172 patients with CAF were assessed, and 112 underwent LIS for increased anal sphincter tone (Fig. 1). In total, three patients underwent surgery for hemorrhoidal disease after LIS, two patients had uncomplicated vaginal deliveries, and nine patients were lost to follow-up. Complete follow-up data were available for 98 patients (Fig. 1, Table 1). The mean age at the time of surgery was  $60 \pm 13$  years, with 51 patients being male (52.0%). The mean BMI was  $25.6 \pm 4.4$ , and 23 patients were smokers (23.5%). All patients had a preoperative Vaizey score of 0. After surgery, nine patients (9.2%) experienced fissure recurrences after 9 months (range 4–11 months) and were successfully treated with conservative measures including both nifedipine and lidocaine and anal dilators (Dilatan, Sapi Med, Alessandria, Italy).

**Table 1** Demographics characteristics of patients involved in the study, and comparison between continent and incontinent patients

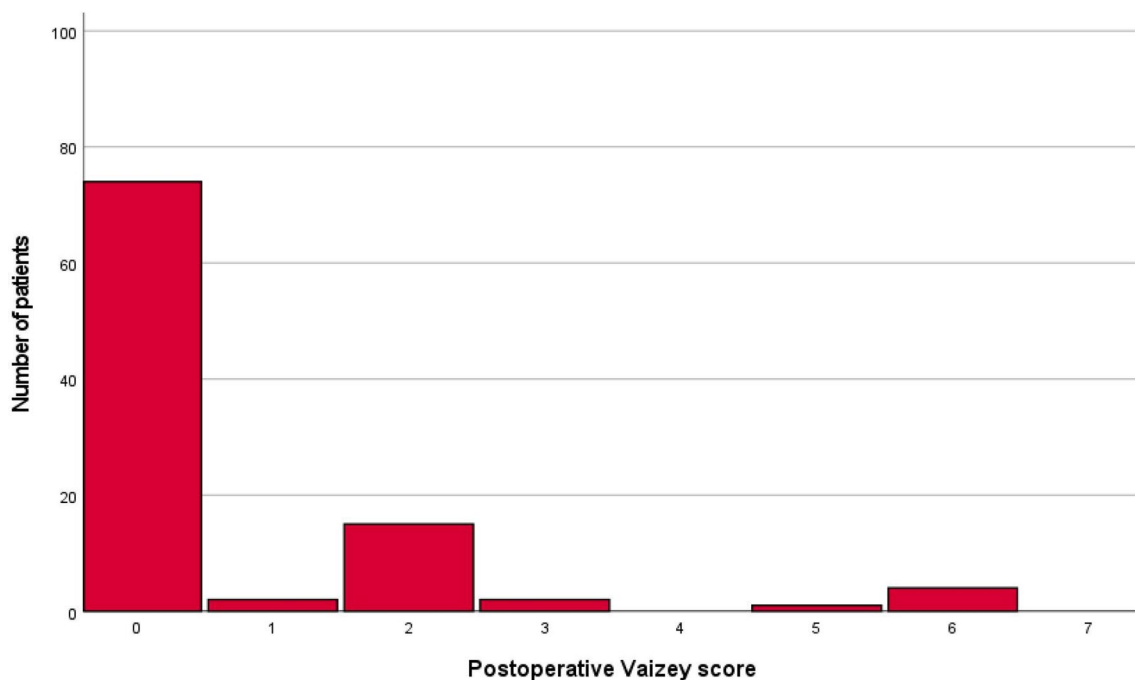
	All ( <i>n</i> =98)	Continent patients ( <i>n</i> =74)	Incontinent patients ( <i>n</i> =24)	<i>p</i> -Value
Age (years)	$60 \pm 13$	$60 \pm 13$	$61 \pm 14$	0.523
Sex (males)	51 (52%)	37 (50%)	14 (58.3%)	0.493
BMI	$25.6 \pm 4.4$	$25.8 \pm 4.7$	$24.9 \pm 3.1$	0.205
Smokers	23 (23.5%)	21 (28.4%)	2 (8.3%)	0.054

The median duration of follow-up was 7 years (range 5–10 years). A total of 24 patients (24.5%) experienced an increase in the Vaizey score and were classified as having some degree of incontinence; these continence issues manifested within 1 year of LIS. No patient reported incontinence for solid stools; 2 patients (2.0%) had incontinence for liquid stools, and 24 patients (24.5%) had incontinence for gas. In total, four patients (4.1%) experienced defecatory urgency. No patient required constipating medications or had alterations in their lifestyle, and only one patient (1.0%) needed pads. There were no significant differences between continent and incontinent patients with regard to age, sex, BMI, or smoking status (Table 1).

The Vaizey score in incontinent patients was 1–4 in 19 patients (19.4%) and 5–9 for 5 patients (5.1%; Fig. 2). Pre- and post-operative scores were significantly different ( $p < 0.001$ ). No significant correlations were found between postoperative Vaizey score and sex ( $r = 0.004$ ), age ( $r = -0.001$ ), BMI ( $r = -0.04$ ), and smoking habits ( $r = -0.18$ ).

## Discussion

Previous literature reports a wide range of incontinence rates following LIS [12], likely reflecting differences in patient selection, duration of follow-up, definitions and grading of incontinence severity, assessment tools employed, and nuances in surgical technique [1, 9]. To avoid interpretation



**Fig. 2** Postoperative Vaizey score

bias arising from patients with preoperative incontinence (up to 14.8%) [10], and to effectively evaluate the effects of traditional LIS on continence, we decided to exclude patients who had any degree of incontinence, as well as those who experienced events potentially affecting continence after surgery. The Vaizey incontinence score was selected, among others, for several reasons. It is not only a widely adopted tool in both clinical and research settings, and validated in Italian [20], but it also captures important aspects of continence dysfunction—such as urgency and the need for constipating medications—that are often overlooked by other scoring systems. These additional components make it a more sensitive instrument than scores based solely on frequency, and is particularly relevant to our study's aim of identifying long-term, potentially mild degrees of incontinence. This methodological strategy detected an overall incidence of incontinence following traditional LIS of 24.5%, comparable to that observed with other surgical interventions such as fissurectomy [23]. Most cases were mild, similar to results reported for fissurectomy [24], and manifested within the first postoperative year; patients who remained continent during this period maintained preserved sphincter function throughout long-term follow-up. Although postoperative incontinence may initially arise, it often improves spontaneously within 6–8 weeks.

The first-line treatment for CAF remains conservative, with calcium channel blockers—such as nifedipine—frequently combined with topical anesthetics such as lidocaine and anal dilators, due to their favorable cost-effectiveness and tolerability compared with nitrates [8, 25–28]. However, a substantial subset of patients either fails to respond or experiences recurrence after cessation of therapy. In several cases, prolonged reliance on medical management may delay appropriate surgical referral and increase the risk of septic complications [29, 30]. LIS remains the gold-standard surgical option for CAF refractory to conservative treatment, particularly in patients with increased anal sphincter tone. Its effectiveness stems from disrupting the cycle of pain and sphincter hypertonia that sustains fissure chronicity, leading to consistently high healing rates [1, 11, 23, 31, 32]. However, concerns about postoperative fecal incontinence persist—particularly in specific patient groups such as young individuals who may require future anorectal procedures or undergo vaginal deliveries, and elderly patients with age-related decline in sphincter function. For these reasons, surgery is typically reserved for a minority of patients, given its potential complications and higher associated costs compared to medical therapies [33].

Surgical decisions are generally guided by the patient's response to prior treatment and the underlying anal sphincter tone (low-normal versus increased) [34]. The optimal surgical technique remains a subject of ongoing debate, i.e. the closed versus open approach. We selected the closed

technique for lateral internal sphincterotomy on the basis of its minimally invasive nature, shorter operative time, and low risk of wound complications, all of which are advantageous in a day-surgery setting. Although the closed approach is sometimes considered less controlled, our surgical team's extensive experience with this technique, combined with careful preoperative and intraoperative assessment, ensured safe and consistent outcomes. Furthermore, literature shows at least comparable efficacy and continence outcomes between open and closed techniques when performed by experienced colorectal surgeons [13, 14]. Still, the main debate remains in the ideal proximal extent of sphincterotomy. While extending the incision up to the dentate line (traditional LIS) may promote faster healing, it appears to carry a higher risk of incontinence compared with limiting the division to the apex of the fissure (tailored LIS). In 2007, Elsebae suggested that this tailored approach may reduce the risk of incontinence while preserving therapeutic efficacy [10]. This consideration is especially relevant in female patients, who generally have a shorter internal anal sphincter and may face additional risks related to previous or future vaginal deliveries [35]. Between 2014 and 2019, our unit adopted the traditional LIS technique, extending the internal sphincter division to the dentate line. This approach was based on its proven efficacy in treating CAF associated with elevated resting anal tone. However, the retrospective analysis presented in this study revealed a 24.5% incidence of postoperative incontinence—mostly mild and not significantly affecting daily life. Moreover, these findings, together with the accumulating evidence in literature, led to a critical reassessment of our surgical strategy. Since 2019, all sphincterotomies performed in our institution have been tailored to the fissure apex, reflecting a more conservative and individualized approach to the surgical management of CAF.

This study has several limitations that should be acknowledged. First, it is a retrospective, single-center analysis conducted at a tertiary referral center highly specialized in colorectal surgery. While this setting ensures standardized surgical procedures and consistent diagnostic criteria, it may limit the generalizability of the findings to other institutions with different levels of expertise and resources. Second, although the sample size is appropriate for a condition such as CAF, it may still be insufficient to detect significant differences among specific patient subgroups (e.g., based on sex, age, BMI, or defecatory habits). This could explain why no differences were observed among sex with regards to postoperative incontinence. Third, no symptom-specific scoring system for CAF was used; the only available system, the REALISE score, was published in 2021 and therefore was not available for all patients included in the current study [36]. Furthermore, the Vaizey score, while widely used and inclusive of aspects such as urgency and medication use, has limitations in capturing the quality-of-life

impact—particularly for minor symptoms such as isolated flatus incontinence. In our cohort, none of the patients with flatus incontinence (24.5% of the series) reported a noticeable impact on lifestyle, although it is important to note that “alteration in lifestyle” is a subjective, overall assessment and may not specifically reflect the burden of flatus incontinence alone. A more comprehensive understanding of patient burden would likely require the addition of a quality-of-life-specific tool, such as the Fecal Incontinence Quality of Life (FIQL) scale [37], which assesses four distinct domains: Lifestyle, Coping/Behavior, Depression, and Embarrassment. Based on these reflections, we recognize that future studies would benefit from employing both a clinical severity score and a dedicated quality-of-life measure to separately and more accurately assess these dimensions. Preoperative anorectal manometry was not performed as a mandatory test in all patients to assess pressure levels prior to LIS owing to symptom severity and the discomfort it would have caused. Lastly, the absence of a control group (e.g., patients treated with fissurectomy or other non-sphincter-cutting procedures) prevents a direct comparison of the long-term efficacy and safety of LIS with alternative surgical approaches.

## Conclusions

Our study demonstrates that fecal incontinence following traditional LIS occurs in 24.5% of patients, but most cases are mild and do not impact patients’ quality of life. These results suggest that LIS can be safely performed to definitively and timely treat CAF, preventing potential complications arising from prolonged medical treatments (e.g., abscesses and fistulas).

**Authors’ contributions** G.Gr. and G.Ga. contributed equally to this work: substantial contributions to the conception and design of the work, acquisition, analysis, and interpretation of data for the work, drafting and revising the work critically for important intellectual content, final approval of the version to be published, and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved. A.D.V. and V.D.S.: analysis and interpretation of data for the work, revising the work critically for important intellectual content, final approval of the version to be published, and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved. A.R.L., A.S., A.M., G.C., and M.T. contributed to drafting the work and revised it critically for important intellectual content, analysis and interpretation of data for the work, final approval of the version to be published, and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.

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**Data availability** Data that support the findings of this study are available from the corresponding Author upon reasonable request.

## Declarations

**Conflict of interest** All authors declare no personal conflict of interest.

**Ethical approval** This study was conducted retrospectively using fully anonymized data. In accordance with institutional policies and national regulations, ethical approval was not required.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

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