

Anal Fissure

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KEYWORDS

- Anal fissure • Anorectal disease • Nonoperative treatment
- Sphincterotomy

An anal fissure is a tear in the epithelial lining of the anal canal. Although this is an extremely common condition, it is surprisingly difficult to know exactly how widespread it is. Many people avoid seeking treatment, and many fissures will resolve without intervention. Nevertheless, the combination of anal pain and bleeding is sufficiently worrisome that patients often seek medical attention. As such, anal fissure represents one of the most common, if not the single most common, anorectal problems encountered in practice. It has been cited as the cause of over 1200 office visits to a single colon and rectal surgery clinic over a 5-year period.¹

Fissures may be delineated as acute versus chronic and typical versus atypical. Acute fissures cause bright red bleeding with bowel movements and anal pain or spasm that can last for hours after the bowel movement. Physical findings include a linear separation of the anoderm, at times visible with just separation of the buttocks (**Fig. 1**). Often, elevated anal resting pressures are revealed on digital rectal examination. If tolerated by the patient, the suspected diagnosis can be confirmed by visualizing the break in the anoderm with office anoscopy after using an anesthetic lubricant. If only one area can be examined, the posterior midline should be evaluated first, as it is the site of up to 90% of typical anal fissures. The remaining minority of typical fissures are found in the anterior midline.² Acute fissures generally resolve within 4 to 6 weeks of appropriate management; therefore, chronic fissures are defined as those producing symptoms beyond 6 to 8 weeks. Chronic fissures have additional physical findings of a sentinel tag at the external apex, exposed internal sphincter muscle, and a hypertrophied anal papilla at the internal apex (**Fig. 2**). Typical fissures are usually in the posterior or anterior midline, have the characteristic findings described earlier, and are not associated with other diseases. In contrast, atypical fissures can occur anywhere in the anal canal, can have a wide variety of findings, and tend to be associated with other diseases, including Crohn's Disease, human immunodeficiency virus (HIV) infection, cancer, syphilis, and tuberculosis.

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Fig. 1. With the patient in prone jackknife position, an posterior acute anal fissure is visible once the buttocks are separated. (Courtesy of Richard P. Billingham, MD, Seattle, WA.)

PATHOGENESIS

Despite the common nature of this longstanding problem, the exact cause remains uncertain. Many patients relate the occurrence of a fissure to the passage of a large stool or anal trauma. There may be mechanical factors in the posterior midline, secondary to the anorectal angle, that creates the greatest stress at that location.³ The common finding of sphincter hypertonicity has been described in early reports of the disease and documented by manometry in multiple studies, and it is the leading hypothesis behind the pathogenesis.^{4,5} However, it remains unclear whether the elevated pressures are a direct cause of the disease or an effect.⁶ Another common theory relates to the relative ischemia at the posterior midline anoderm. This area of the anal canal has been shown to be fairly ischemic by arteriographic studies and laser



Fig. 2. With the patient in lithotomy position at the time of a surgical sphincterotomy, a chronic posterior fissure is seen, with a sentinel tag and rolled edges.

Doppler flow studies.^{7,8} The theories of hypertonicity and ischemia may be intertwined to some extent, particularly in that hypertonicity may aggravate the relative ischemia. Nevertheless, tears in the anoderm undoubtedly occur with great frequency, whether from a large stool, anorectal intercourse, or instrumentation from surgical procedures. In fact, the evolution to a chronic fissure is probably only seen in a minority of these instances. Furthermore, fissures can occur in the absence of any trauma or constipation, and may even be present in patients with diarrheal states or sphincter hypotonia.

NONOPERATIVE TREATMENT

Practice parameters from the American Society of Colon and Rectal Surgeons state that conservative therapy is safe, has few side effects, and should usually be the first step in therapy for all fissure types.⁹ The benefits of conservative management have been repeatedly demonstrated in the control groups of trials testing various interventions for fissure treatment. Jensen¹⁰ reported a randomized trial done in patients with acute anal fissures, examining the outcome of topical anesthetics versus steroid cream. The control group in this trial was instructed to take 10 g of unprocessed bran twice daily with a warm sitz bath for 15 minutes twice daily and after bowel movements, if possible. With 91% of patients able to follow the study protocol, this "control" group with fiber alone had fissure healing in 87% of patients.

A more frequent problem for the surgeon is the patient who presents with symptoms for several weeks and has failed an initial approach similar to that described by Jensen. In these patients with more chronic fissures, spontaneous healing is, unfortunately, likely to be seen in only a minority of cases. A recent Cochrane review of the nonoperative treatment of anal fissure addressed this scenario, analyzing over 50 randomized trials of various nonoperative therapies for chronic anal fissures.¹¹ Unlike the acute fissure population, the healing rate in the combined placebo group is only 34%. Therefore, these patients are felt to benefit from a more aggressive technique that may involve a stepwise approach with initial topical or local therapies. The widely held belief is that internal anal sphincter hypertonicity is a determining factor in the development and continued presence of an anal fissure. Hence, initial nonoperative treatment strategies are targeted at alleviating this internal anal sphincter smooth muscle activity, mainly through 2 topical agents, nitrates and calcium channel blockers, and 1 injectable agent, botulinum toxin A.

Nitroglycerin

Nitric oxide was reported to be the neurotransmitter mediating relaxation of the internal anal sphincter muscle in the early 1990's.¹² Since then, development and topical application of 0.2% glyceryl trinitrate ointment (GTN) has subsequently been found to result in relaxation of the anal sphincter by manometric studies.¹³ A landmark randomized trial was reported in 1997, demonstrating a healing rate of 68% with GTN treatment, compared with only 8% in the placebo group.¹⁴ Despite these initial impressive results, subsequent experience has failed to confirm these findings. In fact, a recent Cochrane analysis of 15 trials, including GTN, showed a healing rate of 48.6% with GTN treatment, compared with 37% in the placebo or control group ($P = .004$).¹¹ The most common side effect of topical GTN treatment is headache, at a reported rate of 27% in the pooled analysis, and may be as high as 50% depending on the severity.¹⁵ Although often minor and temporary, it may lead to discontinuation of therapy in 10% to 20% of patients.¹⁶⁻¹⁸ A second potential drawback is tachyphylaxis, which eventually does not respond to escalations in dose or frequency. In the United States, this indication is not approved by the Food and Drug

Administration (FDA), and the topical form of nitroglycerin is supplied as a 2% ointment. To achieve a 0.2% concentration, the prescription often needs to be filled at a compounding pharmacy. Jonas and colleagues¹⁵ reported that after application of 0.2% GTN, the reduction in mean anal resting pressure lasted only about 2 hours, which may explain some of the treatment failures seen with GTN. Despite these somewhat disappointing results, there are few major drawbacks to initial attempts with topical GTN, and it is frequently the first medication used in an escalating or stepwise plan of care. Yet, patients should be counseled to have realistic expectations of the outcomes with GTN use.

Calcium Channel Blockers

Diltiazem and nifedipine, in either oral or topical form, have been described as causing relaxation of the smooth muscle of the internal anal sphincter. Oral and topical nifedipine have also been shown to lower mean resting anal pressure¹⁹ as has diltiazem in which, however, the effect is greater with the topical rather than oral formulations.^{20,21} Because studies done with calcium channel blockers have more variability in medication, dosages, and routes, it is difficult to pool data for analysis. Yet, multiple small trials suggest healing rates at least equivalent to GTN, although with fewer side effects.^{22,23} As both are also used as blood pressure agents, there is a small chance of postural dizziness or an unanticipated drop in blood pressure, although this happens in less than 5% of patients and is almost unheard of in the topical forms. Again, although diltiazem and nifedipine are not FDA-approved for the treatment of anal fissure, there is a plethora of literature detailing their use and expected outcomes. As with GTN, there is no topical formulation available in the United States, so a compounding pharmacy needs to make a topical gel from an oral formulation (typical doses: diltiazem 2%; nifedipine 0.2%–0.5%). Patients should again be thoroughly counseled on anticipated results and the differences in side effect profile to nitrates.

Botulinum Toxin Type A

Botulinum toxins are a family of neuroparalytic proteins synthesized by *Clostridium botulinum*. They inhibit the release of acetylcholine at neuromuscular junctions.^{24,25} These agents can be used to induce a local paralysis that lasts for several months, depending on the subtype used. The toxins are labeled A through G, according to immunologic specificity, with type A being most commonly used in the United States. Although commonly associated with curing wrinkles, botulinum toxins are FDA-approved for treatment of certain spastic disorders, but not anal fissure. They have been used “off-label” in many other disorders, such as drooling, speech impediments, hair loss, headaches, phantom limb pain, and chronic anal fissures. At present, there is no uniformly recommended dose or method (unilateral vs bilateral, location at the verge) of injection. Botulinum toxin type A is supplied as a powder in 100-unit single-patient-use vials. Because most dosing regimens range from 20 to 50 IU, once reconstituted, any remaining solution must be discarded—providing a potential cost problem outside of multiple scheduled injections. After the initial report of a technique in 1994, various methods of injection, including injection into the internal or external sphincter, at single or multiple sites, and in various doses, have been described.²⁶ Relaxation of the muscle occurs within days, and lasts for 2 to 4 months. Just as in other forms of treatment, the goal is to allow the fissure to heal, followed by lifestyle changes to avoid its recurrence. Theoretically, the sphincter could become completely relaxed, resulting in alterations in continence, though this is a rarity outside of case reports. A much more common side effect, though minimal and short-lived, is local pain with injection. Even for those who may experience incontinence, this has the

theoretical advantage of allowing fissure healing while avoiding permanent fecal incontinence due to the defined half-life of the medication.

Botulinum toxin injections of the internal anal sphincter have been compared with placebo and other treatments with mixed results. In a widely referenced double-blind, placebo-controlled, randomized crossover trial of 30 patients, botulinum toxin A injection was superior to placebo, with a healing rate of 73% after 20 IU of botulinum toxin, compared with 13% with placebo at 2 months follow-up ($P = .003$).²⁷ In those placebo failures, 70% had subsequent healing of their fissures with botulinum injection. The same group then went on to compare 20 IU of botulinum toxin with 0.2% GTN over 6 weeks in another randomized controlled trial of 50 patients, demonstrating the superiority of the botulinum toxin (96% vs 60%, $P = .005$).¹⁷ A meta-analysis by Sajid and associates²⁸ including 180 patients was more tempered, demonstrating no statistically significant difference between the 2 pharmacotherapies (relative risk [RR] 1.29; 95% confidence interval [CI] 0.98–1.70), with a higher rate of total side effects and headache in the GTN cohort. Additional trials have compared botulinum toxin injection with lateral internal sphincterotomy for fissures refractory to medical management. Arroyo and colleagues²⁹ reported a randomized controlled trial of 80 patients and showed healing rates of 92.5% for the lateral internal sphincterotomy group compared with 45% in the botulinum toxin group. However, they concluded that botulinum toxin is still their preference in patients older than 50 years or at risk of incontinence due to a higher, but not statistically significant, incidence of incontinence following sphincterotomy. Other small studies support the finding of higher numbers of treatment failures, but fewer complications in the botulinum toxin group.^{30,31} Shao and Zhang³² recently attempted to answer this question in a meta-analysis encompassing 4 studies and 279 patients. They found a significant improvement in healing following sphincterotomy (RR 1.31), and lower recurrence, at the expense of a higher rate of minor anal incontinence. Unfortunately, there still remains little data regarding the long-term effectiveness of botulinum toxin, though initial data have demonstrated a higher rate of overall recurrence that may be amenable to repeat injections or sphincterotomy.³³

OPERATIVE TREATMENT

One of the earliest forms of treatment was anal dilation, first described in 1829, and studied in trials for anal fissure as recently as 2007.^{34,35} Although extensively studied, there is considerable variability in the technique along with a wide range of reported outcomes, because few well-controlled studies exist. The recent Cochrane review included an analysis of 7 randomized controlled trials meeting their inclusion standards.³⁶ The investigators demonstrated that dilation was less effective than sphincterotomy, and had a much higher rate of fecal incontinence (odds ratio [OR] = 4.03, 95% CI = 2.04–7.46). A more standardized, controlled, and objective method of anal stretch, pneumatic balloon dilation, has been reported. Renzi and colleagues³⁷ evaluated the use of balloon dilation compared with lateral internal sphincterotomy in a prospective randomized trial using a 40-mm balloon insufflated to 1.4 atmospheres for 6 minutes. Healing rates were high and no different in both groups (overall 94%). However, after 24 months of follow-up, no patients in the balloon cohort developed incontinence compared with 16% in the lateral internal sphincterotomy group ($P < .001$). Although manual dilation is now rarely indicated for anal fissure, balloon dilation may be a preferable alternative, though formal recommendations await increased experience and longer follow-up.

Although described in various forms since the early 1800s, in the 1950s, Eisenhammer³⁸ was the first person to advocate and effectively describe the anatomy and physiology behind isolated division of the internal anal sphincter muscle (sphincterotomy) for anal fissure. Although successful at healing the fissure, regrettably, his technique of posterior internal sphincterotomy at the site of the fissure led to a posterior midline “gutter” or “keyhole” deformity with subsequent fecal soiling in 30% to 40% of patients. Notaras³⁹ then described a simple modification: performing the sphincterotomy laterally, which eliminated this problem and providing similar success rates. Since then, lateral internal anal sphincterotomy has become the primary surgical intervention on failure of medical management. The procedure can be done under local anesthesia, and the authors’ preference is to perform this as a same-day surgical procedure. The variations currently include open versus closed technique and conservative versus traditional sphincterotomy. The closed technique is performed by inserting the scalpel blade in the intersphincteric groove or submucosa and then turning it to divide the distal fibers of the internal sphincter. The open technique is done through a radial incision just outside the intersphincteric groove, allowing dissection and visualization of the internal anal sphincter before division (**Fig. 3**). Division is traditionally described to the level of the dentate line, though recent reports describe a more conservative approach, with division of the muscle to either the fissure apex or until the band of hypertrophied muscle is released.

Although there are strong proponents on both sides, a Cochrane Library systematic review on the operative procedures for anal fissures was updated in 2009.³⁶ The techniques of open and closed sphincterotomy have been compared in multiple reports, including 5 randomized studies meeting inclusion criteria for the Cochrane analysis.^{40–44} Combined, these reports show no difference in either persistence of fissure or incontinence using these 2 techniques. A recent prospective cohort study evaluated 140 consecutive patients undergoing open or closed sphincterotomy.⁴⁵ Postoperative endoanal ultrasound showed that open sphincterotomy was associated with



Fig. 3. An open sphincterotomy is performed through a lateral radial incision just outside the anal verge. The hypertrophied internal sphincter muscle is isolated between the intersphincteric groove and submucosal plane before being divided under direct vision.

a significantly higher proportion of complete sphincterotomies. The rate of incontinence and treatment failure was not different between the open and closed groups; although an increasing proximal extent of sphincterotomy was associated with a significant increase in incontinence scores ($P < .001$) and decrease in recurrence rates ($P < .001$).

There remains a fine balance between minimizing incontinence and maximizing healing, though the two may be inversely proportional to the degree of division. Thus, the decision regarding the extent of sphincterotomy performed in the operating room is a controversial topic, which may explain some variation in outcomes. Excessive division increases the risk of incontinence, but inadequate division increases the risk of persistence or recurrence. Although many texts have noted division to the dentate line when describing the procedure, recent studies have examined a more conservative sphincterotomy. Mentes and colleagues⁴⁶ prospectively randomized 76 patients with chronic anal fissure to lateral internal sphincterotomy to the dentate line or to the apex of the fissure. Treatment failure was nil in the traditional dentate line group compared with 13% in the conservative group after 1 year of follow-up, with most treatment failures occurring after 2 months. There was no difference in the postoperative incontinence scores between the 2 treatment groups. However, there was a statistically significant increase in the postoperative incontinence score in the traditional group, suggesting that the study may have been underpowered to detect a possible difference. In a similar manner, Elsebae⁴⁷ prospectively randomized 92 patients to sphincterotomy to the dentate line (traditional) or sphincterotomy to the apex of the fissure (conservative). Similar to the Mentes study, there were no treatment failures in the traditional group versus 4% in the conservative group (P not significant), whereas persistent incontinence was 4% in the traditional group compared with 0% in the conservative group (P not significant). However, the follow-up period was only 18 weeks, leaving some question as to eventual outcome.

Although the techniques of division to the dentate line or to the fissure apex have objective definitions, many surgeons approach the sphincterotomy as a more subjective task. The band of hypertrophied internal anal sphincter muscle may or may not relate to either of these 2 landmarks. As such, the division of the hypertrophied muscle segment becomes more subjective. A subsequent report from Mentes and colleagues⁴⁸ attempted to evaluate this method by creating a sphincterotomy that achieves an anal caliber of 30 mm, in a prospective comparison to division to the apex of the fissure. Their findings showed that the average anal caliber was greater in the group that underwent division to the apex, the incontinence rates were higher, and there was no significant difference in treatment failure. With all these various techniques, it is imperative that surgeons thoroughly counsel patients about the different methods and expected outcomes, and that they feel confident and competent in performing the technique chosen.

The hallmark of chronic fissure is the triad of a hypertrophied internal sphincter, a hypertrophied anal papilla, and an external sentinel tag. Excision of the papilla and tag, or complete fissurectomy, are optional but particularly useful if the fissure edges appear rolled and epithelialized, because this may promote faster wound healing. In addition, many chronic fissures are associated with a small subcutaneous tract that extends into the anal canal. Interest has been expressed in the laying open of this tract, the subcutaneous fissurotomy, as primary treatment of the fissure. It is believed that unroofing this tract results in widening of the distal anal canal, thus rendering the sphincterotomy pointless.⁴⁹ Although there remains little data at this stage, the initial reports are promising with failure rates of less than 2% and no changes in incontinence. Detractors point out that the simultaneous dilation occurring in the course of

the procedure may account for some of its success. Its ultimate role in the operative management of fissures remains to be seen.

In addition to the randomized controlled trials detailing lateral internal sphincterotomy, a myriad of additional nonrandomized reports are available describing a wide range of outcomes with this procedure. Although most reports cite low rates of treatment failure, the incontinence rate is widely variable, with some studies citing rates as high as 30% to 40%.^{50,51} Part of this reflects the definition of incontinence and study design (ie, temporary vs permanent, flatus vs liquid or solid stool, prospective vs retrospective data collection), although the exact reasons for such a wide range of results remain unclear. What is clear is that this remains a significant issue. With a multimodal and often stepwise approach designed to minimize the risk of permanent incontinence, the trend seems to be to move away from lateral internal sphincterotomy and toward more medical therapy or botulinum toxin. Unfortunately, it is not clear whether this strategy will be the most effective long-term solution with respect to morbidity, cost, patient satisfaction, and, ultimately, healing. However, the disease is largely measured by the subjective experience of the patient, so they remain the best judge of which treatment is worth pursuing and which risks are worth taking. A recent review by Floyd and colleagues⁵² reported that with the increasing trend of multiple options available to patients, the ultimate time to healing is prolonged, although 72% of patients can avoid operative treatment and 97% of patients can eventually be healed. Further support for this approach was recently reported by Lysy and associates,³³ where an escalating regimen from topical agents to botulinum toxin to sphincterotomy led to a 71% cure rate at 47 months without the need for sphincterotomy. Similar to Floyd and colleagues, they also noted that the low rate of sphincterotomy comes at the price of increased recurrence before complete healing, prolonged symptoms, and of a longer time spent in treatment.

SPECIAL SITUATIONS

Fissures Without Anal Hypertonicity

The presumption that relief of anal hypertonicity leads to healing is the basis of treatments directed at relaxation of the anal sphincter, either pharmacologically or surgically. However, a subset of patients with fissure will not demonstrate hypertonicity, and hypotonicity may actually be profound. As such, concerns exist regarding the effect of further decreasing sphincter tone, leading to higher rates of incontinence. In this situation, anal advancement flap is a useful option. Giordano and colleagues⁵³ recently reported results from their prospective study of simple cutaneous advancement flaps in 51 patients over a 6-year period, for all patients regardless of hyper- or hypo- anal tone. They found the procedure to be well tolerated, with an overall 98% treatment success rate. Similarly, Nyam and colleagues⁵⁴ evaluated 21 patients with fissures and less than normal anal pressures with the use of an island advancement flap, demonstrating complete healing and no incontinence in all patients. An earlier report from St Marks in 2002 also noted favorable results with advancement flaps for fissures with hypertonicity in a small series, with successful treatment in 7 of 8 patients at a median follow-up of 7 months.⁵⁵ Although this technique may be useful for all patients with refractory fissures, it holds particular promise in addressing the fissure in the setting of a hypotonic anus.

Crohn's Disease

Fissures are commonly seen in people with Crohn's disease, affecting approximately 30% of patients.^{56,57} When they occur, they tend to be in more atypical locations,

deeper, and associated with other pathology, especially fistula. These fissures also have an atypical appearance, often creating deep ulcerations and potentially creating significant deformity. As with other manifestations of Crohn's, it is reasonable to intervene only as complications dictate. Some investigators have reported acceptable outcomes from operative procedures in these patients,^{58,59} though caution should be the rule, and sphincter salvage is prudent. Multidisciplinary care is crucial in addressing anorectal disease in the patient with Crohn's, because appropriate medical management of the disease may lead to resolution of the anorectal disorders in 50% or more of these cases.^{60,61} Careful evaluation for more proximal disease should also be done, because often, anal manifestations may herald a generalized flare.

Human Immunodeficiency Virus

HIV-related anal disease includes typical fissures and anorectal ulcers, which, similar to Crohn's, can appear as deep, broad-based, or cavitating lesions. Poor sphincter tone and diminished function is a more frequent finding than the hypertonicity that generally accompanies typical, non-HIV-related fissures. Small studies have reported successful treatment of typical fissures that may also occur in patients with HIV, though surgeons should be wary in the setting of active proctitis, poorly-controlled or advanced disease, and those with baseline continence impairment.^{62,63} Although the medical treatment of HIV continues to improve, concerns about delayed wound healing and increased infectious complications remain, especially in those with advanced disease.

SUMMARY

Anal fissure is a common disorder that is effectively treated and prevented with conservative measures in its acute form. Chronic fissures usually require medical therapy, which can be effective in a small majority of patients. Initial therapy includes bulking agents, control of constipation, and topical medications to relax the internal anal sphincter. Botulinum toxin and lateral internal sphincterotomy can both be considered for treatment of refractory anal fissures, and the popularity of botulinum toxin is increasing. Sphincterotomy remains an effective operation, with a high rate of resolution of symptoms, but at the price of an increased risk of temporary or permanent incontinence.

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