

Anal Fissure

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Abstract

Anal fissure (fissure-in-ano) is a very common anorectal condition. The exact etiology of this condition is debated; however, there is a clear association with elevated internal anal sphincter pressures. Though hard bowel movements are implicated in fissure etiology, they are not universally present in patients with anal fissures. Half of all patients with fissures heal with nonoperative management such as high fiber diet, sitz baths, and pharmacological agents. When nonoperative management fails, surgical treatment with lateral internal sphincterotomy has a high success rate. In this chapter, we will review the symptoms, pathophysiology, and management of anal fissures.

Keywords

- ▶ anal fissure
- ▶ sphincterotomy
- ▶ anal pain

Anal fissure is a linear or oval shaped tear in the anal canal starting just below the dentate line extending to the anal verge (→Fig. 1). It was first described in 1934 by Lockhart-Mummery.^{1,2} Anal fissures can be acute or chronic. Acute fissures are a shallow tear in the anoderm. Symptoms associated with acute fissures include anal pain, spasm, and/or bleeding with defecation. Chronic fissures are present for more than 6 to 8 weeks. Features of a chronic fissure are exposed fibers of internal anal sphincters at the base, hypertrophied anal papilla proximally, and a skin tag or sentinel pile distally.

Etiology

The exact cause of an anal fissure is not entirely clear, but it is thought to result from trauma to the anal canal. This includes trauma to the anoderm during the passage of hard or large bowel movements, local irritation from diarrhea, anorectal surgery, and anoreceptive intercourse. As a response to the fissure, patients typically experience increased pressure within the anal canal. Several studies have shown that the resting pressure of the internal anal sphincter is higher in patients with fissures compared with normal controls.^{3–9} This hypertonicity of the anal sphincter is responsible for some of the pain and spasm experienced with defecation, and it also has a deleterious effect on wound healing by reducing blood flow to the traumatized anoderm.

In patients with anal fissures, there is evidence that the rectoanal inhibitory reflex is followed by an abnormal increased contraction. This could explain the sphincter spasm and pain that patients with anal fissure experience with defecation.¹⁰

Fissures are seen with equal frequency in males and females. Fissures are most commonly seen in middle-aged and younger patients, with mean age of onset 39.9 years.¹ Fissures may also occur in children and the elderly. The most common site for males and females is the posterior midline, greater than 75% occur in this location. Approximately 25% of fissures are in the anterior location and these are more common in women.¹ Less than 1% of all fissures are located off of the midline position and these are considered atypical fissures.¹ Etiology of atypical fissures includes Crohn's disease, ulcerative colitis, anal cancer, tuberculosis, HIV, syphilis, herpes, and leukemia.

The most common site for primary anal fissure is the posterior midline, and several theories exist regarding this phenomenon. One possible cause is the elliptical arrangement of the external sphincter posteriorly, which leads to less support for the anal canal.¹¹ Another possible cause is the relative ischemia of the posterior commissure of the anal canal. Postmortem angiographic studies have shown less blood supply to the posterior commissure of the anal canal, which may also explain the increased frequency of posterior

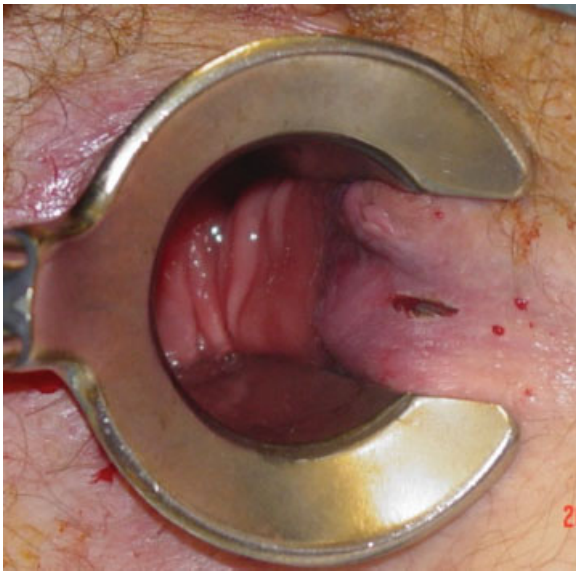


Fig. 1 Classic anal fissure (Courtesy of W. Brian Sweeney, MD).

midline fissure.¹¹ There may also be contusion of the blood vessels passing vertically through the internal sphincter muscle in the posterior midline, leading to compromise the blood supply with increased anal tone.¹² Doppler laser flowmetry combined with anal manometry has shown that the blood flow to the posterior midline is less than other parts of the anal canal and an inverse relationship between blood flow to the posterior commissure and increase sphincter tone was also noted.¹³

Symptoms and Diagnosis

Pain is the most common symptom of an anal fissure, present in 90.8% of patients with fissure in a review of 876 patients.¹ Patients complain of pain with defecation and describe the pain as sharp or tearing, which may be present only during the defecation or it may last for several minutes to hours after defecation. Bleeding is also a common symptom of anal fissures, found in 71.4% of patients.¹ Bright red blood may be noted on the toilet paper or streaked on the stool. Occasionally, blood may drip into the toilet bowl. Some patients may have a tender sentinel pile and often these patients feel the pile is the source of their pain.

Anal fissure diagnosis is usually straightforward and can often be made on the patient's history alone. A physical examination confirms the suspicion of anal fissure and rules out other pathology. Inspection is the most important step in the evaluation for possible anal fissure. Gentle separation of the buttocks typically reveals the fissure; however, spasm of the sphincter may prevent adequate visualization. Once a fissure has been diagnosed, digital exam and anoscopic exam may be delayed due to pain. A thorough examination should be performed once the patient is pain free to exclude other pathology. However, if the diagnosis is unclear or there is concern for an abscess, then a digital exam is appropriate to ensure that there is no underlying infection.

Most patients believe the pain they are experiencing is due to hemorrhoids, and they may be reluctant to accept the diagnosis of fissure. Education by the diagnosing clinician is paramount to understanding fissure management and achieving a good outcome.

In addition, great care should be taken to evaluate for other etiologies of anal pain. These include pruritus ani, condyloma, abscess, anal fistula, cancers, sexually transmitted diseases, Crohn's disease, ulcerative colitis, tuberculosis, leukemia, HIV, syphilis, and AIDS. If atypical fissures, non-midline fissures, painless fissures, or multiple fissures are encountered, further evaluation is warranted. Exam under anesthesia with biopsies and cultures is indicated to exclude other pathologies.

Nonoperative Management

The majority of acute anal fissures resolve without surgical intervention. When chronic fissures develop, healing is more difficult to achieve. The goals of nonoperative therapy are straightforward and consist of three components. The first component is to remove the underlying pathology responsible for the creation of the fissure. This often means the alleviation of constipation and straining, as well as avoidance of other causes of anal trauma. The second component involves the relaxation of the internal anal sphincter to improve blood flow and allow healing. This can be achieved through an assortment of therapies listed below. The third component consists of reducing the symptoms from the fissure, which are typically bleeding and pain.

It is estimated that half of chronic anal fissures will heal with nonoperative measures, such as sitz baths and psyllium fiber supplementation with recurrence rates of 18.6%.¹ The practice parameters by the American Society of Colon and Rectal Surgeons recommend increased fluid and fiber ingestion, sitz baths, and the use of stool softeners (if needed) to treat anal fissures. The practice parameters conclude that these measures are safe, have few side effects, and should be the initial therapy for all patients with anal fissure.¹⁴

Fiber

In a randomized controlled trial (RCT), treatment with 10 g of unprocessed bran fiber twice daily and warm sitz baths for 15 minutes twice daily and after each bowel movement resulted in quicker symptomatic relief and better healing at 3 weeks (88%) compared with 2% lignocaine (lidocaine hydrochloride) ointment or 2% hydrocortisone cream.¹⁵ In another study by Jensen,¹⁶ treatment with 15 g of unprocessed bran divided into three doses daily was shown to have significantly fewer recurrences (16%) compared with patients receiving 7.5 g of bran fiber daily (60%) ($p < 0.01$).

Sitz Baths

Sitz baths have long been a part of the treatment algorithm for anal fissures. Proposed benefits include an improvement in hygiene, decreased pain, and a decrease in the hypertonicity of the anal canal. Dodi et al¹⁷ used manometry to study the benefits of warm water baths on the anal pressures at room temperature (23°C) in normal controls and in patients with

fissures, symptomatic hemorrhoids, and proctalgia fugax. Recordings were made while the anus was immersed in water at varying temperatures (5, 23, and 40°C). Resting pressures were recorded for an additional 30 minutes after immersion at 40°C for 5 minutes. In all subjects, resting anal canal pressures decreased significantly from baseline after immersion at 40°C, but remained unchanged in subjects after immersion at 5 and 23°C.

Topical Nitrates

Nitric oxide is the predominant nonadrenergic, noncholinergic neurotransmitter in the internal anal sphincter. Release of nitric oxide results in relaxation of the internal anal sphincter, which theoretically improves blood flow to the fissure and promotes healing. In a Cochrane Review of 53 RCTs of nonsurgical therapies for anal fissures and 15 RCTs that specifically looked at glyceryl trinitrate (GTN) versus placebo, GTN was found to be marginally but significantly better than placebo in healing anal fissures (49 vs. 37%, $p < 0.004$).¹⁸ However, late recurrence was shown to be common (> 50%) in those initially cured.¹⁸ The dose of GTN has been studied extensively and dose has not been shown to effect healing in three studies that compared doses of GTN ranging from 0.05 to 0.4%.^{19–21} The most commonly studied dose is 0.2% applied topically two to three times a day. In a prospective randomized double-blind, placebo-controlled study with 0.2% GTN applied twice daily, measurements of maximum anal pressure fell significantly from 116 to 76 cm of H₂O with no change seen in placebos.²¹ After 8 weeks, healing was achieved in 68% of patients and only 8% of controls.

The biggest drawbacks to topical GTN are intolerance due to side effects and overall poor patient compliance. Systemic absorption of the compound can result in vasodilation and severe headaches. Headaches are a problematic side effect from topical GTN and up to 20% of patients had to discontinue therapy due to severe headaches.²²

Calcium Channel Blockers

Topical and oral calcium channel blockers (CCBs) act in a manner similar to GTN, but without the associated headaches. In an initial study by Chrysos et al after sublingual nifedipine, a CCB, anal resting pressure as measured by manometry was decreased by almost 30%.²³ This led to a host of studies evaluating oral and topical nifedipine. One study evaluating oral nifedipine 20 mg twice daily resulted in healing in 60% of patients.²⁴ In one long-term study with 19-month follow-up, the healing rate with 0.5% topical nifedipine was 93% and healing rate with internal sphincterotomy was 100%.²⁵ Jonas et al performed an RCT to evaluate whether the route of diltiazem administration affects healing rates.²⁶ They found only 38% healing rate with oral diltiazem versus 65% healing rate with topical diltiazem. In addition, there were less side effects with topical diltiazem.

Thus, topical CCBs are an acceptable choice for medical management of chronic anal fissures with reasonable healing potential and low side-effect profile. Typical dosing regimens include nifedipine 0.3 to 0.5% topical three times daily, and diltiazem 2% topical three times daily. The main side effect encountered with topical CCB therapy is itching, which occurs

in 15% of patients, but is less likely to lead to discontinuation of therapy.

Botulinum Toxin

Botulinum toxin (BT) is an exotoxin produced by the bacterium *Clostridium botulinum*. When injected locally the toxin binds to presynaptic nerve terminals at the neuromuscular junction, thereby preventing release of acetylcholine and resulting in temporary muscle paralysis. In 1993, Jost and Schimrigk first reported injecting BT directly into the anal sphincter as new mode of treatment for anal fissures.²⁷

Subsequently, the dosing of BT and the injection site have been evaluated in multiple trials. In one randomized double-blind trial, Siproudhis et al reported that a single 20 U injection of BT was not superior to that of placebo.²⁸ Brisinda and colleagues randomized 150 patients to initial treatment with 20 U BT followed by 30 U BT for fissure persistence, or initial treatment with 30 U of BT followed by 50 U BT for persistence.²⁹ One month after BT injections, greater success was noted with higher doses, with little increase in complications or side effects, likely related to the diffusion of the toxin to the external sphincter.²⁹ Maria et al performed a study evaluating the location of BT.³⁰ They found that injection on either side of the anterior midline lowered anal resting pressures and resulted in higher healing rates compared with injection of BT on either side of posterior midline.³⁰

In a review of four prospective RCTs that included a total of 279 patients, Shao et al concluded that lateral internal sphincterotomy was more effective than BT injection for healing chronic anal fissures.³¹ Recurrence rates were also higher in the BT group. Injection into the internal anal sphincter allows healing in 60 to 80% of fissures.^{30,32–34} Recurrences may occur in up to 42% of cases.^{29,30}

A recent 2015 randomized trial of 99 patients compared lateral internal sphincterotomy with combined BT and topical diltiazem in the treatment of chronic anal fissure.³⁵ Overall healing rates were 65% in the BT–diltiazem group and 94% in the lateral internal sphincterotomy group. There was no statistical difference between these groups.

Side effects from BT injections include increased urinary residual volume, heart block, skin and allergic reactions, muscle weakness, postural hypotension, and changes in heart rate and blood pressure.³⁶ The most common side effects are temporary incontinence to flatus in 18% and stool in 5%.^{29,30,32,37,38} Injections of BT have led to perianal hematomas in 20% of patients and rare cases of perianal thrombosis.^{27,39}

Most recently, the U.S. Food and Drug Administration (FDA) issued a boxed warning that cautions that the effects of BT may spread from the area of injection to other areas of the body.⁴⁰ This may result in symptoms similar to those of botulism, including potentially life-threatening swallowing and breathing difficulties and even death. These symptoms have mostly been reported in children with cerebral palsy being treated with BT for muscle spasticity, and the use of the drug in these circumstances has not been approved by the FDA.⁴⁰

Brisinda and colleagues reported their experience with over 1,000 patients treated with BT and none of their patients had systemic complications or severe side effects.³⁶

The practice parameters from the American Society of Colon and Rectal Surgeons (ASCRS) 2010 update on fissure management state BT injection has been associated with healing rates superior to placebo.^{14,37} Topical nitrates appear to potentiate the effects of BT in patients with refractory anal fissure.^{27,41} There is inadequate consensus on dosage, precise site of administration, number of injections, or efficacy.¹⁴ In general, the toxin is reconstituted in a small volume of sterile saline, and injected directly into the internal anal sphincter, in doses ranging from 20 to 100 units.

The exact role of BT injection in the treatment algorithm for anal fissure is not known. Proposed benefits include its temporary nature, making it appealing in female patients at risk for future issues with incontinence, and for patients with high levels of anxiety preventing them from consenting to lateral internal sphincterotomy.

BT injection can be done safely in the office, or alternatively it can be performed as an outpatient procedure with sedation. Advocates for performing this procedure as an outpatient surgery argue that adding debridement of the fissure to the procedure may potentiate healing, although this has not been subjected to rigorous study.

Of note, the local effects of BT typically wear off after 3 months, so if the underlying issues that led to the anal fissure have not been addressed, then there is a high risk for recurrence.

Operative Management

Surgical intervention for definitive management of chronic anal fissures is considered when conservative therapy fails.

Anal Dilation

The concept of sphincter stretching was first described by Recamier in 1838 for the treatment of proctalgia fugax and anal fissure.⁴² Despite extensive studies, there has been significant variability in reported outcomes due to lack of standardization and reproducibility of techniques employed.

The stretch is also credited to Lord in 1968 as he noted that patients with hemorrhoidal disease tend to have higher resting pressures in the anal canal. He introduced this in Great Britain; his indications were second-degree internal hemorrhoids and anal fissures. His technique involved inserting four fingers of each hand into the anal canal and stretching over the course of 3 to 4 minutes.⁴³

Sohn et al more precisely performed anorectal sphincter dilation with a Parks retractor opened up to 4.8 cm or with pneumatic anal balloon blown up to 40 mm Hg.⁴⁴ The dilations were sustained for exactly 5 minutes. The cure rates were 93 and 94%, respectively. There were two episodes of fecal incontinence in the 105 patients in Parks dilation group and no incontinence in the pneumatic balloon group.

In a 1964 paper by Watts et al, they reported of 99 patients treated for anal fissure with sphincter stretch.⁴⁵ The patients were all followed for at least 5 months and 75% had symptomatic relief within 48 hours. They report satisfactory early relief of symptoms in 95% of patients, with fissure recurrence noted in 16% of patients. In a study with 17-year follow-up of random-

ized, prospective trial, 138 patients were treated with Lord's method of anal sphincter stretch, of which 52% of patients had varying degrees of incontinence after Lord's procedure.⁴³

Sphincter defects after anal dilation have been visualized on anal ultrasound.^{46,47} Internal sphincter defects were visualized in 65% with 12.5% reporting incontinence. External sphincter defects were also found in 11/18 patients with incontinence.⁴⁶

A Cochrane Review was performed of seven RCTs comparing anal stretch with internal sphincterotomy. The results significantly favored sphincterotomy over anal stretch for efficacy (OR = 3.35; 95% CI = 1.55–7.26; here, OR: odds ratio, CI: confidence interval) and incontinence to flatus or feces (OR = 4.03; 95% CI = 2.04–7.46).¹⁸

The Lord's procedure has been mostly abandoned in recent times due to an unacceptably high risk of fecal incontinence, as well as its overall inferiority to lateral internal sphincterotomy.

Lateral Internal Sphincterotomy

Historically, Brodie first documented an anal sphincterotomy in 1839; however, Miles is credited with the operation in a paper in 1939.⁴⁸ Originally, the sphincter division was in the posterior midline. Bennett and Goligher reported a high incidence of impairment for flatus with posterior internal sphincterotomy (34%) and a 15% incidence of incontinence with a 93% cure rate.⁴⁹ This approach often resulted in large wounds in the posterior midline with "key-hole deformity."

Eisenhammer is credited with popularizing lateral internal sphincterotomy (LIS), dividing one-half of the internal anal sphincter in an open fashion.⁵⁰ Lateral internal sphincterotomy is performed with a radial incision in the anoderm laterally exposing the internal sphincter muscle fibers. Then, under direct vision, the distal four-fifths of the internal anal sphincter muscle is divided sharply with scalpel or scissors. The wound can be left open or closed primarily (→ Fig. 2).

In 1969, Notaras described a technique that he called lateral subcutaneous sphincterotomy, also known as a closed lateral internal sphincterotomy.⁵¹ This resulted in even

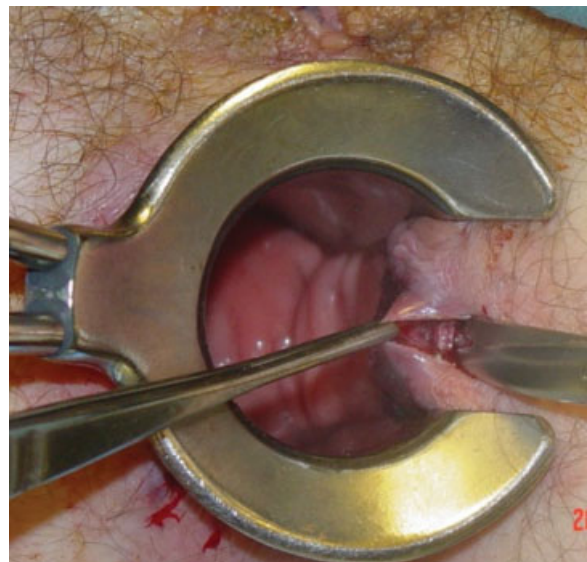


Fig. 2 Open lateral sphincterotomy (Courtesy of W. Brian Sweeney, MD).

smaller wounds and fecal incontinence rates dropped to 6%. This technique involves a narrow-bladed scalpel such as a beaver, cataract knife, or 11-blade, which is introduced through the perianal skin on the lateral side and pushed subcutaneously upward between the internal sphincter and the skin lining the anal canal. When the point of the blade is at the dentate line, the internal sphincter is divided by cutting medial to lateral.

A lateral-to-medial approach to closed lateral internal sphincterotomy is also described. In this operation, the scalpel is inserted into the intersphincteric groove and directed up to the dentate line. At this point, the internal sphincter is divided cutting laterally to medially toward the surgeon's finger in the anal canal.⁵¹⁻⁵³

Littlejohn and Newstead reported a retrospective review of 287 patients who underwent "tailored" sphincterotomy, division of the internal anal sphincter for the length of the fissure, rather than to the dentate line as originally described.⁵⁴ They showed a 99% initial healing rate, 0.7% incidence of urgency, 1% incidence of gas incontinence, and 35% incidence of minor staining. There were no reports of incontinence to solid or liquid stool in either group. Elsebae conducted a study evaluating fecal incontinence rates related to chronic anal fissure before and after lateral internal sphincterotomy and studied the relationship to the extent of internal anal sphincter division.⁵⁵ The author concluded that a mild degree of fecal incontinence may be related to the underlying pathology rather than the sphincterotomy.

A recent review using three-dimensional anal ultrasonography to determine the proportion of internal anal sphincter that may be divided during lateral internal sphincterotomy in women concluded that it is the safest to divide less than 25% of the sphincter, which in women corresponds to less than 1cm. No incontinence was observed in these patients.⁵⁶ With the advent of more limited sphincterotomies, it is important to ensure the sphincter is actually divided during the lateral internal sphincterotomy. In a study by Farouk et al, ultrasound evaluations of patients with persistent fissures after sphincterotomy demonstrated a lack of internal sphincter division in almost 70% of patients.⁵⁷

Multiple studies have evaluated the difference between open and closed sphincterotomies and there is no significant difference.⁵⁸⁻⁶² The healing rates are similar for open (93-95%) and closed (90-97%) techniques. There does not appear to be a difference in incontinence that ranges from 2 to 5%.^{63,64} A meta-analysis of operative techniques for anal fissure also demonstrated no difference for persistence or incontinence between the open and closed techniques.¹⁸

Several studies have evaluated adjuncts to surgical procedures, for example, one study reported higher patient satisfaction rates when hypertrophied anal papillae and fibrous anal polyps were removed at the time of lateral internal sphincterotomy (LIS).⁶⁵ In this randomized trial, satisfaction rate was excellent or good after removal of these structures in 84% of patients, compared with 58% of patients whose papillae were left in place.

Other complications from internal sphincterotomy include ecchymosis, which is frequently noted around the edge of the

wound. Hematoma and hemorrhage are exceptionally rare. Perianal abscess occurs after 1% of closed internal anal sphincterotomy and is almost always associated with anal fistula.⁶⁴ Fistulas associated with postlateral internal sphincterotomy scenarios are typically very distal and may be submucosal or intersphincteric.

Lateral internal sphincterotomy is the surgical treatment of choice for refractory anal fissures and may be offered without pharmacologic treatment failure according to the practice parameters by the American Society of Colon and Rectal Surgeons.¹⁴

Advancement Flaps

Endorectal advancement flaps have also been utilized in the treatment of chronic anal fissure. The procedure typically involved a subcutaneous flap with an incision made from the anal verge extending caudally. The skin flap is then advanced into the anal canal and positioned to cover the anal fissure and sutured in place. Two independent studies showed a 98% success rate with advancement anoplasty for the treatment of chronic anal fissure, irrespective of anal tone.^{66,67} One prospective randomized trial of lateral internal sphincterotomy versus advancement flap found no significant difference in healing rates (100% in the sphincterotomy group vs. 85% in the flap group).⁶⁸ Incontinence was not observed in either group. The advancement flap is an appropriate alternative to lateral internal sphincterotomy and may be particularly helpful in patients with low-pressure fissures. More data are needed before it can be recommended as first-line therapy.

Fissurectomy

Fissurectomy entails excision of the chronic granulation tissue, hypertrophied papilla, and scar, and is either left open or closed primarily.⁶⁹ In one clinical trial by Mousavi et al, fissurectomy was considered inferior to lateral internal sphincterotomy.⁷⁰ Another study by Lindsey et al combined fissurectomy with BT injection and had a 93% healing rate with only transient incontinent to flatus in 7%.⁷¹ Badejo reported 100% healing rate at 2 weeks with no complications and no recurrences at 1-year follow-up.⁷² These results have not been duplicated in any other study. In general, fissure excision does not improve healing rates when combined with sphincterotomy, and may lead to unnecessary risks of incontinence.

Novel Therapies

In a pilot study of eight patients, autologous adipose tissue transplant has shown 75% healing of anal fissure and 80% resolution of anal stenosis in patients with chronic anal fissure who failed previous medical and surgical therapy.⁷³

In a recent pilot study five patients with chronic anal fissure underwent one temporary 8-electrode Octad lead for sacral nerve root stimulation. Stimulation was conducted for 20 minutes three times per day. The lead was removed after 3 weeks of stimulation. All patients had healing of the fissure by the end of the third week and no recurrence at 1-year follow-up.⁷⁴

Special Considerations

Crohn's Disease

Perianal symptoms are very common in the setting of Crohn's disease. In one review of 306 patients with Crohn's disease, symptomatic anal pathology was present in 42.4% of patients.⁷⁵ Historically, anorectal surgery has been contraindicated in Crohn's disease. Most clinicians advocate for medical management of Crohn's fissures with measures to decrease diarrhea, bulk the stool, and topical medications, which typically lead to a healing rate of 50 to 61% of patients.^{75,76} The fear with anorectal surgery in Crohn's patients is the need for eventual proctectomy. In one small study of surgery in Crohn's patients with fissures by Wolkomir et al, very few patients went on to require a proctectomy.⁷⁷ Fleshner and colleagues demonstrated 88% healing rate after surgical intervention with fissurectomy, closed lateral internal sphincterotomy, or a combination of both.⁷⁶ D'Ugo and colleagues recently studied 41 patients with Crohn's disease and anal fissures.⁷⁸ A total of 14 patients went on to have surgery for anal fissure, 8 had BT injection with or without fissurectomy, and 6 had lateral internal sphincterotomy. The complication rate was 57.1%, which prompted their conclusion to continue to focus on nonoperative management and their recommendation for additional randomized studies. Medical management should be optimized prior to surgical consideration for anal fissure in Crohn's patients.

Human Immunodeficiency Virus

Anal fissures that occur in human immunodeficiency virus positive (HIV+) patients must be distinguished from idiopathic AIDS-related anal ulcers and ulcerating syphilis or herpes simplex virus. In this population, anal fissures are visibly indistinguishable from those in the general population.⁷⁹ Benign anal fissures are typically narrow and located low in the anal canal. In contrast, HIV-associated anal ulcers are usually broad-based, deep, or cavitating lesions associated with low anal sphincter pressure.⁸⁰ The initial treatment is the same with conservative measures and surgery reserved for treatment failures with severe symptoms.^{81,82} In one case series of HIV-associated anal fissures, symptomatic improvement was noted in 92% of patients treated with surgical sphincterotomy.⁸⁰ A study performed at the University of Southern California HIV clinic evaluated the presence of HIV-associated anorectal pathology after the introduction of highly active antiretroviral therapy (HAART).⁸³ Results from this study demonstrated no impact on the prevalence of anorectal pathology with HAART. Anal fissures in the HIV patient remain a challenging problem and should be approached cautiously, especially in the setting of baseline incontinence or advanced disease.

Low-Pressure Fissures

Incontinent patients may have anal fissures; these are typically low-pressure fissures and are typically in the postpartum patient.⁶ In a prospective study of 209 primigravid women who underwent anorectal manometry before and after delivery, 9% went on to develop fissures. In those

patients who went on to develop fissures, manometric measurements were similar between pre and postpartum.⁸⁴ Initial therapy for these patients is similar to any patient with a fissure. If conservative management fails, the optimal treatment in this situation is not entirely clear. Anorectal manometry and ultrasound should be considered part of the evaluation process to help guide management. Island flaps or endoanal advancement flaps have been evaluated with no postoperative incontinence and are a viable option in this challenging patient population.⁸⁵

Conclusion

Anal fissures are very common with pathophysiology associated with elevated sphincter pressures. The initial step in treatment is correctly diagnosing the problem and ruling out additional pathology. Conservative measures are employed and result in healing in up to 70% of fissures; however, this can be associated with high recurrence rates. Medical management includes high fiber diet, sitz baths, topical CCB, or topical nitrates. When conservative management fails, BT injection may be considered with minimal side effects and acceptable cure rates. The gold standard of surgical intervention is the limited lateral internal sphincterotomy with no difference between open or closed techniques. Fecal incontinence associated with limited lateral internal sphincterotomy is very low and usually transient. Care should be taken in patients with low-pressure fissures and these patients should have ultrasound and manometry prior to any surgical intervention. Advancement or island flaps should be considered in these patients. In patients with Crohn's disease or HIV, careful work-up and maximizing medical therapy are the mainstays of treatment. Small studies suggest that limited lateral internal sphincterotomy may be performed in these patients cautiously.

References

- Hananel N, Gordon PH. Re-examination of clinical manifestations and response to therapy of fissure-in-ano. *Dis Colon Rectum* 1997; 40(2):229-233
- Lockhart-Mummery JP. *Diseases of the Rectum and Colon and Their Surgical Treatment*. London: Baillere; 1934
- Abcarian H, Lakshmanan S, Read DR, Roccaforte P. The role of internal sphincter in chronic anal fissures. *Dis Colon Rectum* 1982; 25(6):525-528
- Farouk R, Duthie GS, MacGregor AB, Bartolo DCC. Sustained internal sphincter hypertonia in patients with chronic anal fissure. *Dis Colon Rectum* 1994;37(5):424-429
- Lund JN, Scholefield JH. Aetiology and treatment of anal fissure. *Br J Surg* 1996;83(10):1335-1344
- Jenkins JT, Urie A, Molloy RG. Anterior anal fissures are associated with occult sphincter injury and abnormal sphincter function. *Colorectal Dis* 2008;10(3):280-285
- Sauper T, Lanthaler M, Biebl M, Weiss H, Nehoda H. Impaired anal sphincter function in professional cyclists. *Wien Klin Wochenschr* 2007;119(5-6):170-173
- Garg P. Water stream in a bidet-toilet as a cause of anterior fissure-in-ano: a preliminary report. *Colorectal Dis* 2010;12(6):601-602
- Nzimbala MJ, Bruyninx L. Chronic anal fissure from suspected adult sexual abuse in a traumatic anal sex practice patient. *Acta Chir Belg* 2007;107(5):566-569

- 10 Nothmann BJ, Schuster MM. Internal anal sphincter derangement with anal fissures. *Gastroenterology* 1974;67(2):216–220
- 11 Gordon PH, Nivatvongs S. Principles and Practice of Surgery for the Colon, Rectum and Anus. 2nd ed. St. Louis, MO: Quality Medical Publishing, Inc.; 1999:218
- 12 Klosterhalfen B, Vogel P, Rixen H, Mittermayer C. Topography of the inferior rectal artery: a possible cause of chronic, primary anal fissure. *Dis Colon Rectum* 1989;32(1):43–52
- 13 Schouten WR, Briel JW, Auwerda JJ. Relationship between anal pressure and anodermal blood flow. The vascular pathogenesis of anal fissures. *Dis Colon Rectum* 1994;37(7):664–669
- 14 Perry WB, Dykes SL, Buie WD, Rafferty JF; Standards Practice Task Force of the American Society of Colon and Rectal Surgeons. Practice parameters for the management of anal fissures (3rd revision). *Dis Colon Rectum* 2010;53(8):1110–1115
- 15 Jensen SL. Treatment of first episodes of acute anal fissure: prospective randomised study of lignocaine ointment versus hydrocortisone ointment or warm sitz baths plus bran. *Br Med J (Clin Res Ed)* 1986;292(6529):1167–1169
- 16 Jensen SL. Maintenance therapy with unprocessed bran in the prevention of acute anal fissure recurrence. *J R Soc Med* 1987;80(5):296–298
- 17 Dodi G, Bogoni F, Infantino A, Pianon P, Mortellaro LM, Lise M. Hot or cold in anal pain? A study of the changes in internal anal sphincter pressure profiles. *Dis Colon Rectum* 1986;29(4):248–251
- 18 Nelson R. Non surgical therapy for anal fissure. *Cochrane Database Syst Rev* 2006;(4):CD003431
- 19 Carapeti EA, Kamm MA, McDonald PJ, Chadwick SJ, Melville D, Phillips RK. Randomised controlled trial shows that glyceryl trinitrate heals anal fissures, higher doses are not more effective, and there is a high recurrence rate. *Gut* 1999;44(5):727–730
- 20 Bailey HR, Beck DE, Billingham RP, et al; Fissure Study Group. A study to determine the nitroglycerin ointment dose and dosing interval that best promote the healing of chronic anal fissures. *Dis Colon Rectum* 2002;45(9):1192–1199
- 21 Scholefield JH, Bock JU, Marla B, et al. A dose finding study with 0.1%, 0.2%, and 0.4% glyceryl trinitrate ointment in patients with chronic anal fissures. *Gut* 2003;52(2):264–269
- 22 Brisinda G, Maria G, Bentivoglio AR, Cassetta E, Gui D, Albanese A. A comparison of injections of botulinum toxin and topical nitroglycerin ointment for the treatment of chronic anal fissure. *N Engl J Med* 1999;341(2):65–69
- 23 Chryso E, Xynos E, Tzovaras G, Zoras OJ, Tsiaoussis J, Vassilakis SJ. Effect of nifedipine on rectoanal motility. *Dis Colon Rectum* 1996;39(2):212–216
- 24 Ağaoğlu N, Cengiz S, Arslan MK, Türkyılmaz S. Oral nifedipine in the treatment of chronic anal fissure. *Dig Surg* 2003;20(5):452–456
- 25 Katsinelos P, Papaziogas B, Koutelidakis I, et al. Topical 0.5% nifedipine vs. lateral internal sphincterotomy for the treatment of chronic anal fissure: long-term follow-up. *Int J Colorectal Dis* 2006;21(2):179–183
- 26 Jonas M, Neal KR, Abercrombie JF, Scholefield JH. A randomized trial of oral vs. topical diltiazem for chronic anal fissures. *Dis Colon Rectum* 2001;44(8):1074–1078
- 27 Jost WH, Schimrigk K. Use of botulinum toxin in anal fissure. *Dis Colon Rectum* 1993;36(10):974
- 28 Siproudhis L, Sébille V, Pigot F, Hémyer P, Juguet F, Bellissant E. Lack of efficacy of botulinum toxin in chronic anal fissure. *Aliment Pharmacol Ther* 2003;18(5):515–524
- 29 Brisinda G, Maria G, Sganga G, Bentivoglio AR, Albanese A, Castagneto M. Effectiveness of higher doses of botulinum toxin to induce healing in patients with chronic anal fissures. *Surgery* 2002;131(2):179–184
- 30 Maria G, Brisinda G, Bentivoglio AR, Cassetta E, Gui D, Albanese A. Influence of botulinum toxin site of injections on healing rate in patients with chronic anal fissure. *Am J Surg* 2000;179(1):46–50
- 31 Shao WJ, Li GC, Zhang ZK. Systematic review and meta-analysis of randomized controlled trials comparing botulinum toxin injection with lateral internal sphincterotomy for chronic anal fissure. *Int J Colorectal Dis* 2009;24(9):995–1000
- 32 Menteş BB, İrkörcü O, Akin M, Leventoğlu S, Tatlıcioğlu E. Comparison of botulinum toxin injection and lateral internal sphincterotomy for the treatment of chronic anal fissure. *Dis Colon Rectum* 2003;46(2):232–237
- 33 Lindsey I, Jones OM, Cunningham C, et al. Botulinum toxin as second-line therapy for chronic anal fissure. *Dis Colon Rectum* 2003;46(3):361–366
- 34 Minguez M, Herreros B, Espi A, et al. Long-term follow-up (42 months) of chronic anal fissure after healing with botulinum toxin. *Gastroenterology* 2002;123(1):112–117
- 35 Gandomkar H, Zeinoddini A, Heidari R, Amoli HA. Partial lateral internal sphincterotomy versus combined botulinum toxin A injection and topical diltiazem in the treatment of chronic anal fissure: a randomized clinical trial. *Dis Colon Rectum* 2015;58(2):228–234
- 36 Brisinda D, Maria G, Fenici R, Civello IM, Brisinda G. Safety of botulinum neurotoxin treatment in patients with chronic anal fissure. *Dis Colon Rectum* 2003;46(3):419–420
- 37 Colak T, Ipek T, Kanik A, Aydin S. A randomized trial of botulinum toxin vs lidocain pomade for chronic anal fissure. *Acta Gastroenterol Belg* 2002;65(4):187–190
- 38 Richard CS, Gregoire R, Plewes EA, et al. Internal sphincterotomy is superior to topical nitroglycerin in the treatment of chronic anal fissure: results of a randomized, controlled trial by the Canadian Colorectal Surgical Trials Group. *Dis Colon Rectum* 2000;43(8):1048–1057, discussion 1057–1058
- 39 Tilney HS, Heriot AG, Cripps NP. Complications of botulinum toxin infections for anal fissure. *Dis Colon Rectum* 2001;44:1721–1724
- 40 U.S. Food and Drug Administration. Center for Drug Evaluation and Research. Early communication about an ongoing safety review. Botox and Botox Cosmetic (Botulinum toxin type A) and Myobloc (Botulinumtoxin type B). Available at: www.fda.gov/cder/drug/early_comm/botulinum_toxins.htm. Accessed October 22, 2009
- 41 Arroyo A, Perez F, Serrano P, Candela F, Calpena R. Long-term results of botulinum toxin for the treatment of chronic anal fissure: prospective clinical and manometric study. *Int J Colorectal Dis* 2005;20(3):267–271
- 42 Recamier JCA. Extension, massage et percussion cadence dans le traitement des contractures musculaires. *Rev Med* 1838;1:74–89. [For translation, see: *Dis Colon Rectum* 1980;23:362–367]
- 43 Konsten J, Baeten CG. Hemorrhoidectomy vs. Lord's method: 17-year follow-up of a prospective, randomized trial. *Dis Colon Rectum* 2000;43(4):503–506
- 44 Sohn N, Eisenberg MM, Weinstein MA, Lugo RN, Ader J. Precise anorectal sphincter dilatation—its role in the therapy of anal fissures. *Dis Colon Rectum* 1992;35(4):322–327
- 45 Watts JM, Bennett RC, Goligher JC. Stretching of anal sphincters in treatment of fissure-in-ano. *BMJ* 1964;2(5405):342–343
- 46 Nielsen MB, Rasmussen OO, Pedersen JF, Christiansen J. Risk of sphincter damage and anal incontinence after anal dilatation for fissure-in-ano. An endosonographic study. *Dis Colon Rectum* 1993;36(7):677–680
- 47 Burnett SJD, Speakman CT, Kamm MA, Bartram CI. Confirmation of endosonographic detection of external anal sphincter defects by simultaneous electromyographic mapping. *Br J Surg* 1991;78(4):448–450
- 48 Brodie C. Lectures on diseases of the rectum; lecture III; preternatural contraction of the sphincter ani. *Lon Med Gaz* 1835;16:26–31
- 49 Bennet RC, Goligher JC. Results of internal sphincterotomy for anal fissure. *Br J Surg* 1962;2:1500–1503
- 50 Eisenhammer S. The evaluation of the internal anal sphincterotomy operation with special reference to anal fissure. *Surg Gynecol Obstet* 1959;109:583–590

- 51 Notaras MJ. Lateral subcutaneous sphincterotomy for anal fissure—a new technique. *Proc R Soc Med* 1969;62(7):713
- 52 Hoffmann DC, Goligher JC. Lateral subcutaneous internal sphincterotomy in treatment of anal fissure. *BMJ* 1970;3(5724):673–675
- 53 Arroyo A, Pérez F, Serrano P, Candela F, Calpena R. Open versus closed lateral sphincterotomy performed as an outpatient procedure under local anesthesia for chronic anal fissure: prospective randomized study of clinical and manometric long term results. *J Am Coll Surg* 2004;199(3):361–367
- 54 Littlejohn DR, Newstead GL. Tailored lateral sphincterotomy for anal fissure. *Dis Colon Rectum* 1997;40(12):1439–1442
- 55 Elsebae MM. A study of fecal incontinence in patients with chronic anal fissure: prospective, randomized, controlled trial of the extent of internal anal sphincter division during lateral sphincterotomy. *World J Surg* 2007;31(10):2052–2057
- 56 Murad-Regadas SM, Fernandes GOS, Regadas FSP, et al. How much of the internal sphincter may be divided during lateral sphincterotomy for chronic anal fissure in women? Morphologic and functional evaluation after sphincterotomy. *Dis Colon Rectum* 2013;56(5):645–651
- 57 Farouk R, Monson JR, Duthie GS. Technical failure of lateral sphincterotomy for the treatment of chronic anal fissure: a study using endoanal ultrasonography. *Br J Surg* 1997;84(1):84–85
- 58 Abcarian H. Surgical correction of chronic anal fissure: results of lateral internal sphincterotomy vs. fissurectomy—midline sphincterotomy. *Dis Colon Rectum* 1980;23(1):31–36
- 59 Hsu TC, MacKeigan JM. Surgical treatment of chronic anal fissure. A retrospective study of 1753 cases. *Dis Colon Rectum* 1984;27(7):475–478
- 60 Lewis TH, Corman ML, Prager ED, Robertson WG. Long-term results of open and closed sphincterotomy for anal fissure. *Dis Colon Rectum* 1988;31(5):368–371
- 61 Usatoff V, Polglase AL. The longer term results of internal anal sphincterotomy for anal fissure. *Aust N Z J Surg* 1995;65(8):576–578
- 62 Hyman N. Incontinence after lateral internal sphincterotomy: a prospective study and quality of life assessment. *Dis Colon Rectum* 2004;47(1):35–38
- 63 Kortbeek JB, Langevin JM, Khoo RE, Heine JA. Chronic fissure-in-ano: a randomized study comparing open and subcutaneous lateral internal sphincterotomy. *Dis Colon Rectum* 1992;35(9):835–837
- 64 Nelson RL. Meta-analysis of operative techniques for fissure-in-ano. *Dis Colon Rectum* 1999;42(11):1424–1428, discussion 1428–1431
- 65 Gupta PJ, Kalaskar S. Removal of hypertrophied anal papillae and fibrous anal polyps increases patient satisfaction after anal fissure surgery. *Tech Coloproctol* 2003;7(3):155–158
- 66 Giordano P, Gravante G, Grondona P, Ruggiero B, Porrett T, Lunniss PJ. Simple cutaneous advancement flap anoplasty for resistant chronic anal fissure: a prospective study. *World J Surg* 2009;33(5):1058–1063
- 67 Chambers W, Sajal R, Dixon A. V-Y advancement flap as first-line treatment for all chronic anal fissures. *Int J Colorectal Dis* 2010;25(5):645–648
- 68 Leong AF, Seow-Choen F. Lateral sphincterotomy compared with anal advancement flap for chronic anal fissure. *Dis Colon Rectum* 1995;38(1):69–71
- 69 Engel AF, Eijsbouts QAL, Balk AG. Fissurectomy and isosorbide dinitrate for chronic fissure in ano not responding to conservative treatment. *Br J Surg* 2002;89(1):79–83
- 70 Mousavi SR, Sharifi M, Mehdikhah Z. A comparison between the results of fissurectomy and lateral internal sphincterotomy in the surgical management of chronic anal fissure. *J Gastrointest Surg* 2009;13(7):1279–1282
- 71 Lindsey I, Cunningham C, Jones OM, Francis C, Mortensen NJ. Fissurectomy-botulinum toxin: a novel sphincter-sparing procedure for medically resistant chronic anal fissure. *Dis Colon Rectum* 2004;47(11):1947–1952
- 72 Badejo OA. Outpatient treatment of fissure-in-ano. *Trop Geogr Med* 1984;36(4):367–369
- 73 Lolli P, Malleo G, Rigotti G. Treatment of chronic anal fissures and associated stenosis by autologous adipose tissue transplant: a pilot study. *Dis Colon Rectum* 2010;53(4):460–466
- 74 Yakovlev A, Karasev SA, Dolgich OY. Sacral nerve stimulation: a novel treatment of chronic anal fissure. *Dis Colon Rectum* 2011;54(3):324–327
- 75 Fleshner PR, Schoetz DJ Jr, Roberts PL, Murray JJ, Collier JA, Veidenheimer MC. Anal fissure in Crohn's disease: a plea for aggressive management. *Dis Colon Rectum* 1995;38(11):1137–1143
- 76 Sweeney JL, Ritchie JK, Nicholls RJ. Anal fissure in Crohn's disease. *Br J Surg* 1988;75(1):56–57
- 77 Wolkomir AF, Luchtefeld MA. Surgery for symptomatic hemorrhoids and anal fissures in Crohn's disease. *Dis Colon Rectum* 1993;36(6):545–547
- 78 D'Ugo S, Franceschilli L, Cadeddu F, et al. Medical and surgical treatment of haemorrhoids and anal fissure in Crohn's disease: a critical appraisal. *BMC Gastroenterol* 2013;13:47
- 79 Weiss EG, Wexner SD. Surgery for anal lesions in HIV-infected patients. *Ann Med* 1995;27(4):467–475
- 80 Viamonte M, Dailey TH, Gottesman L. Ulcerative disease of the anorectum in the HIV+ patient. *Dis Colon Rectum* 1993;36(9):801–805
- 81 Brar HS, Gottesman L, Surawicz C. Anorectal pathology in AIDS. *Gastrointest Endosc Clin N Am* 1998;8(4):913–931
- 82 Bernstein M. Anal fissure and the human immunodeficiency virus. *Semin Colon Rectal Surg* 1997;8:40–45
- 83 Gonzalez-Ruiz C, Heartfield W, Briggs B, Vukasin P, Beart RW. Anorectal pathology in HIV/AIDS-infected patients has not been impacted by highly active antiretroviral therapy. *Dis Colon Rectum* 2004;47(9):1483–1486
- 84 Corby H, Donnelly VS, O'Herlihy C, O'Connell PR. Anal canal pressures are low in women with postpartum anal fissure. *Br J Surg* 1997;84(1):86–88
- 85 Nyam DC, Wilson RG, Stewart KJ, Farouk R, Bartolo DC. Island advancement flaps in the management of anal fissures. *Br J Surg* 1995;82(3):326–328