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Management of Chronic Anal Fissures: Review Article

Mohammed Salem Ali Awn, Moustafa Baiomy Mohamed, Ahmed Shafik El hefnawy and Amr Ahmed Fouad Mohammed Abdelghani

General Surgery Department, Faculty of Medicine, Zagazig University, Egypt

***Corresponding author:** Mohammed Salem Ali Awn

Abstract:

Chronic anal fissure is a common and distressing anorectal condition characterized by severe pain, bleeding during defecation, and impaired quality of life. Unlike acute fissures, chronic fissures are associated with persistent internal anal sphincter hypertonia, ischemia, and secondary structural changes such as sentinel piles and hypertrophied anal papillae. Multiple therapeutic strategies have been proposed, ranging from conservative medical therapy to surgical interventions, with ongoing debate regarding the optimal balance between healing efficacy and the risk of complications, particularly fecal incontinence. This review aimed to review and evaluate current medical and surgical management options for chronic anal fissures, focusing on their effectiveness, safety profiles, and clinical outcomes.

Keywords: Chronic anal fissure; lateral internal sphincterotomy; botulinum toxin; topical nitrates; calcium channel blockers; anal sphincter hypertonia; anorectal disorders.

Introduction:

Anal fissures can be managed with dietary modifications, sitz baths, and pharmacological or surgical treatments. Fiber supplementation and sitz baths have been shown to reduce pain in comparison with topical anesthetics. According to the 2016 clinical practice guidelines of the American Society of Colon and Rectal Surgeons (ASCRS), these non-operative therapies can be the first line of treatment for acute anal fissures (strong recommendation based on moderate-quality evidence) **(1)**.

The majority of acute anal fissures get resolved with treatments like topical vasodilators and muscle relaxants. The three components of pharmacological and surgical therapies are straightforward. The initial step is to treat the underlying condition that led to the fissure's formation. This frequently comprises easing the straining and constipation as well as avoiding additional anal trauma triggers. To enhance blood flow and promote healing, the second element includes relaxing the internal anal sphincter. This can be accomplished using a variety of therapies to reduce the symptoms of the fissure, which are often discomfort and bleeding, which makes up the third part. Topical nitrates are also considered a strong recommendation by ASCRS but their efficacy is limited by a few side effects on the other side calcium channel blockers show similar efficacy with a better profile of side effects making them suitable for first-line of treatment (Strong recommendation) **(2)**.

Other medical methods for treating fissures include oral nifedipine, topical vasodilators, the use of muscle relaxants, endoscopic anal dilatation, and chemical cauterization. Pharmacological treatments can heal around 50% of chronic anal fissures, with recurrence rates of 18.6%. In case of severity, complications, recurrence, and failure of medical therapy, surgical interventions may be necessary **(3)**.

Conservative therapy:

A. Diet therapy:

Diet therapy was the first proposed therapy for the care of fissures. It is still in use and should be proposed and continued in all the patients presenting with a fissure associated with a severe and also mild constipation. The diet consists of a high residue of fibre and increased fluid ingestion in order to obtain easier spontaneous defaecation and to avoid evacuation of hard stools. The use of stool softeners (e.g. psyllium, lactulose, docusate sodium or calcium) could be useful in conservative treatment. With diet therapy the overall recovery rate is87% in acute fissure, but almost 30% of the patients experienced recurrent fissures **(4).**

B. Symptomatic treatment:

1. Warm Sitz Bath:

Sitz baths have long been a part of the treatment algorithmfor anal fissures. Proposed benefits include an improvement in hygiene, decreased pain, and a decrease in the hypertonicity of the anal canal. **Dodi et al. (5)** 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 anuswas immersed inwater 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.

2. Adequate analgesia:

It is necessary to break the vicious cycle of pain viz. Avoidance of defecation for prolonged periods leading to hard stools resulting in further tearing of the anoderm and thereby inviting increased pain. A suitable dose of analgesic consumed half an hour before defecation gives a good amount of post defecation pain relief.

3. Topical local anaesthetic agents and steroids:

Local anaesthetic agents such as xylocaine or lidocaine gel (2%), may provide symptomatic benefit, particularly in acute fissure-in-ano, but allergy can occur in 2% of patients. Steroid preparations may be used to reduce inflammation and promote spontaneous healing. Proctosedyl (containing cinchocain and hydrocortisone) with soframycin may achieve 80% healing within 3 weeks in patients with an acute fissure **(6).**

Combination of local anaesthetic and hydrocortisone in one ointment used for treatment of acute anal fissure give overall healing ling rate or 80% (hydrocortisone act as anti inflammatory so decrease hyperaemia and swelling). Also those patients in whom constipation was relived had a better outcome. Local anaesthetic has been combined with a proteolytic enzymes derived from mammalian pancreas in the treatment of acute fissure. Healing was noted in all patients but all also had stool softener and warm sitz baths **(7).**

4. Sclerotherapy:

Using sodium tetradecyl sulphate after local anaesthetic application has been reported to give healing rate of 8o%, but may complicated by abscess formation **(8).**

Medical therapy:

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 **(2)**.

The goal of medical treatment for anal fissure is to achieve a temporary reduction of pressure of the anal canal, to facilitate the healing of the fissure ("reversible sphincterotomy"), thereby reducing muscle tone. Various mechanisms can be used: increasing nitric oxide (NO), direct depletion of intracellular calcium, stimulation of muscarinic receptors, inhibition of alpha-adrenergic receptors, or stimulation of beta-adrenergic receptors **(9).**

A.First-line specific therapy: Chemical sphincterotomy:

Under the term chemical sphincterotomy, it includes all the medical procedures which determine a relaxing effect on the internal smooth muscle sphincter. The internal sphincter tone is maintained by sympathetic alpha-adrenergic stimulation and sphincter relaxation is mediated by parasympathetic stimulation, sympathetic beta-adrenergic receptors and direct inhibition of calcium entry into the muscle cells. All medical drugs counteracting the first action or supporting the second could potentially be helpful in achieving anal relaxation, in order to obtain anal fissure healing, without permanent damage to the sphincter **(4).**

a) 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 nonsurgical therapies for anal fissures 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%) **(10)**.

However, late recurrence was shown to be common (> 50%) in those initially cured **(10)**. **Scholefield et al. (11)** have studied the dose of GTN and dose has not been shown to affect healing, comparing doses of GTN ranging from 0.05 to 0.4%. 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 H20 with no change seen in placebos. After 8 weeks, healing was achieved in 68% of patients and only 8% of controls **(11)**.

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 GTNand up to 20% of patients had to discontinue therapy due to severe headaches **(12)**.

b) 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. (13)** after sublingual nifedipine, a CCB, anal resting pressure as measured by manometry was decreased by almost 30%. This led to a host of studies evaluating oral and topical nifedipine. **Ağaoğlu et al. (14)** evaluated oral nifedipine 20 mg twice daily and resulted in healing in 60% of patients. 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% **(15)**.

Jonas et al. (16) performed an RCT to evaluate whether the route of diltiazem administration affects healing rates. 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 **(2)**.

B. Second-line therapy when pharmacological agents fail: 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. **Jost and Schimrigk (17)** first reported injecting BT directly into the anal sphincter as new mode of treatment for anal fissures. Subsequently, the dosing of BT and the injection site have been evaluated in multiple trials. In one randomized double blind trial, **Siproudhis et al. (18)** reported that a single 20 U injection of BT was not superior to that of placebo.

Brisinda et al. (19) 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 UBT for persistence. 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.

Maria et al. (20) performed a study evaluating the location of BT. 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.

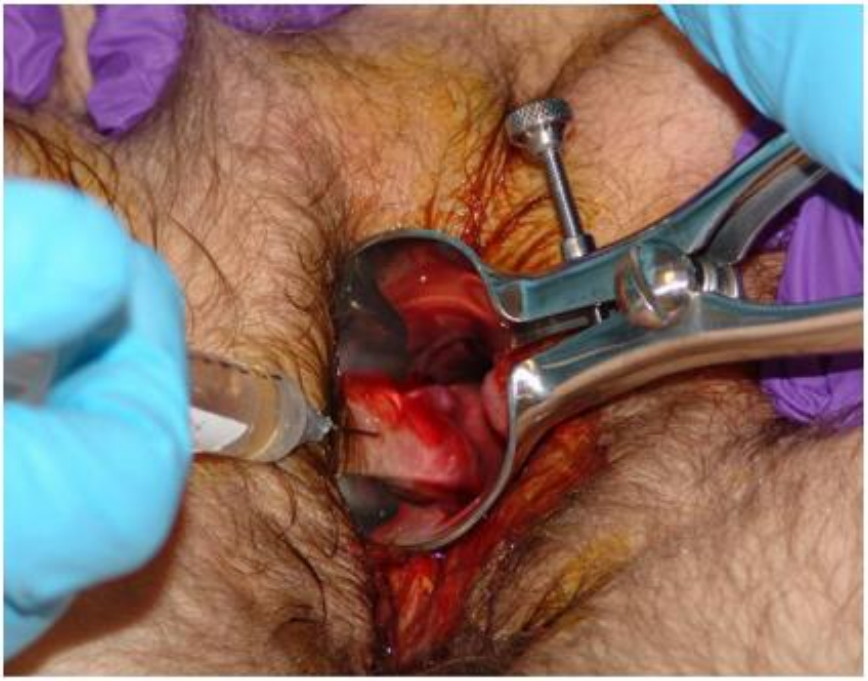

Figure (1): Botulinum toxin injection for anal fissure **(21)**

In a review that included a total of 279 patients, **Shao et al. (22)** concluded that lateral internal sphincterotomy was more effective than BT injection for healing chronic anal fissures. Recurrence rates were also higher in the BT group. Injection into the internal anal sphincter allows healing in 60 to 80% of fissures. Recurrences may occur in up to 42% of cases.

Gandomkar et al. (23) compared lateral internal sphincterotomy with combined BT and topical diltiazem in the treatment of chronic anal fissure. 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. The most common side effects are temporary incontinence to flatus in 18% and stool in 5%. Injections of BT have led to perianal hematomas in 20% of patients and rare cases of perianal thrombosis **(24)**.

The U.S. Food and Drug Administration (FDA) (25) issued a boxed warning that cautions that the effects of BT may spread from the area of injection to other areas of the body. 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 childrenwith 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. **Brisinda et al. (24)** reported their experience with over 1,000 patients treated with BT and none of their patients had systemic complications or severe side effects.

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. Topical nitrates appear to potentiate the effects of BT in patients with refractory anal fissure. There is inadequate consensus on dosage, precise site of administration, number of injections, or efficacy. 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 **(26)**.

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 **(2)**.

Surgical treatment:

Operative intervention is recommended for individuals who do not respond to conventional medical therapy or experience recurrence after initial healing. It provides rapid relief and eliminates the need for additional treatment. The major goals of fissure surgery are to relieve internal anal sphincter spasms, reduce maximum anal resting pressure, cure ischemia, and heal ulcers **(27)**.

I. Preoperative preparation:

The administration of 2 Fleet enemas on the morning of surgery is sufficient bowel preparation for this procedure. If the anal fissure is too painful, the enemas may be omitted. No other preoperative preparation is necessary unless the patient has significant comorbidities that require attention.

II. Operative procedures:

A. Surgical anal dilatation:

For decades, the Lord's operation, which entailed putting four fingers from each hand into the anal canal and extending for three to four minutes, was the preferred method for sphincter-stretching under general anesthesia. Due to the development of non-surgical treatments, an intolerably high risk of fecal incontinence (around 52%), and other factors, this technique has, however, been largely abandoned in recent years **(27)**.

B. Excision of anal fissure:

This operation was popularized chiefly by **Gabriel (28)**, who believed that in a fissure it is important to remove a broad triangle of perianal skin along with the lesion itself. The advantage of so doing, according to him, was that the apical part of the wound corresponding to the site of the former fissure was given a chance to epithelialize before the basal portion could close; ao, that there was a little respect of being left within an unhealed area of granulation tissue in the posterior wall of the anal canal. Also, the wound was said to promote fire external drainage and avoid any accumulation of discharge which impair healing.

However, **Gabriel (28)** also took two additional steps of considerable therapeutic significance. He divided the rounded inferior margin of the internal sphincter and he also usually stretched the anal sphincters. He advised that the triangular excision of the skin should be precisely triangular in shape and of size not less than 4 ¡cm from apex to middle of base. The main criticism leveled, that it leaves the patient with a large, rather uncomfortable, external wound which takes a long while to heal **(29).**

C. Internal sphincterotomy:

By partially dividing the internal anal sphincter, the spasm associated with anal fissures is relieved. This encourages blood flow to the ischaemic anal ulcer, inducing healing. Several techniques for sphincterotomy are available.

POSTERIOR MIDLINE SPHINCTEROTOMY:

It consists of division under direct visualization of the internal sphincter muscle from its distal aspect up to the level of the dentate line. This may be combined with the excision of the indurated fissure tissue, hypertrophied anal papilla and sentinel piles as well**. (29)**.

Unfortunately, this procedure leaves a large posterior anal wound which is quite slow to heal, and a residual posterior midline defect in the anal canal, known as a keyhole deformity, may occur, sometimes causing persistent difficulties with continence .Also, the disadvantage of this operation is the prolonged healing time, usually not less than three weeks and often if longer, and occasionally, a mild, persistent and permanent mucous discharge **(30).**

LATERAL INTERNAL ANAL SPHINCTEROTOMY:

It was described by Eisenhammer in 1951 and 1959. He noted less functional disturbance when the internal sphincterotomy was conducted in the lateral aspect than the posterior aspect. He observed that lateral wounds healed more rapidly than the posterior wounds **(31).** The majority of the surgeons in the United States perform lateral internal sphincterotomy either opened or closed technique **(32).**

Lateral internal sphincterotomy has shown to have advantages over other forms of surgical treatments, such as anal dilatation and mid-posterior internal sphincterotomy performed through the floor of the fissure. It has rapidly gained acceptance as it may be performed as an out patient procedure under local or A general anesthesia. Its main advantage are that it avoid an open A intra-anal wound, the divided internal sphincter is bridged by skin, there is minimal anal wound care, post-operative anal dilatation is not necessary and relief from symptoms is almost immediate, with the fissure becoming painless and healing A within 3 weeks**.** The healing rate associated with anal fissure treated by lateral internal sphincterotomy in most series is reported as greater than 98% **(33).**

Indications:

Patients who have failed a course of medical management including topical muscle relaxants (nitroglycerine, nifedipine, or diltiazem) and/or botulinum toxin injections are eligible candidates for sphincterotomy. Alternatively, patients desiring more immediate relief of symptoms are potential surgical candidates **(34).**

Contraindications:

Patients with preoperative incontinence problems should not undergo lateral internal sphincterotomy and relative contraindications include those with irritable bowel syndrome or diabetes and elderly or postpartum women. Women with a prior obstetric injury and a nonhealing fissure present a difficult problem and it is inadvisable to proceed with lateral internal sphincterotomy in such patients without satisfactory preoperative anal manometry and endoanal ultrasound **(35).**

Positioning and anaesthesia:

The procedure can be done either in the lithotomy or prone-jackknife position. Anaesthesia is either general , local anal block or spinal **(36).**

Open technique:

It is usually performed under general anesthesia as a day procedure, alternatively regional or topical local anesthesia can be used, and general anesthesia is preferred to avoid muscle relaxants and to employ alight inhalation anesthesia so as to facilitate identification of intersphinctertic plane .No bowel preparation is necessary ,and the operation may be performed in the left lateral position, lithotomy, or Jack-Knife position **(10).**

If local anesthesia is used, it is advisable to place a butterfly needle into a peripheral vein; so that diazepam or pethidine can also be administrated if there is undue pain or anxiety during the operation. It is also advisable to smear some lignocaine gel around the fissure if local infiltration is used, and to infiltrate around the fissure as well as the operation site **(37).**

Local anesthesia is done by local perianal injection of lidocaine 1% with 1:100,000 epinephrine combined with equal parts bupivacaine 0.5% with 1:200,000 starts posteriorly, then either in four quadrants or behind the three primary hemorrhoids **(38)**.

A Park's self retaining retractor is inserted with the blades in the 6 and 12 o'clock positions. The intersphincteric groove is palpated laterally (many prefer right lateral to avoid the hemorrhoid plexus, but if done on the left, the hemorrhoid can be taken if desired). A 1 cm lateral circumferential incision is made just inside the cutaneous margin of the anal canal at the site of infiltration. Subcutaneous tissues are gently mobilized away from the sphincter and the transverse fibers of the internal sphincter are picked up with an Allis clamp. The lower third of the internal sphincter is divided superficially by knife, cautery, or scissors. After sphincterotomy, the fibers of the internal sphincter will be seen to have aside leaving the external sphincter visible. The ability to insert an extra large Hill-Ferguson retractor signifies completeness. Hemostasis and complete division are accomplished with gentle pressure. The incision can be closed with absorbable chromic sutures or left open**.**

Patients are prescribed bulk laxatives and analgesics. They are usually discharged from hospital on the day of operation. Follow up is generally unnecessary unless the symptoms recur **(38).**

Several important technical and physiological points should be considered when performing a sphincterotomy. The sphincterotorny site should be well away from the fissure site, so that the intact anoderm overlies the sphincterotomy. All fibers of the distal anal sphincter must be divided, because any residual fibers will go into intense spasm to compensate for the divided muscle tissue. When performing an internal sphincterotomy by the closed method, care must be taken not to disrupt the anoderm proximally. Creation of a proximal defect may result in the establishment of a submucosal fistula **(39).**

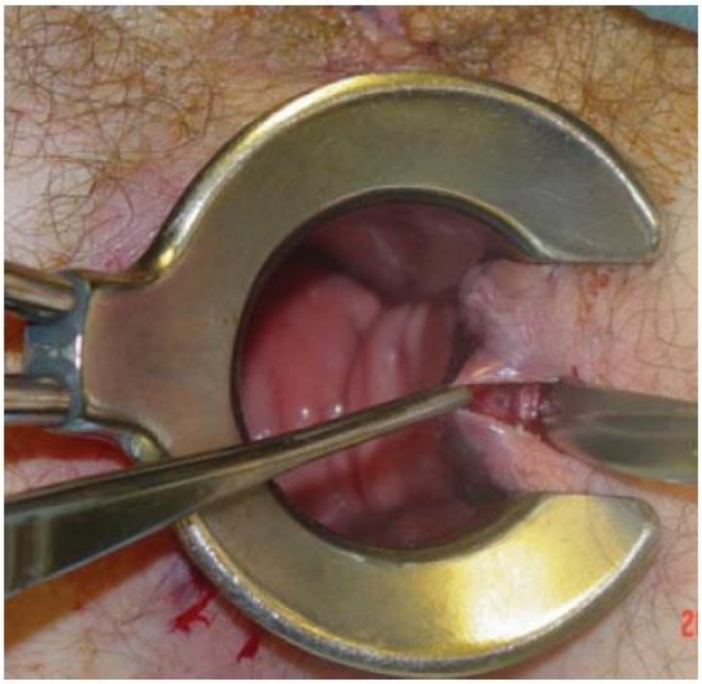

Figure (2): Open lateral sphincterotomy

Closed technique (subcutaneous lateral internal sphincterotomy):

The advantage of subcutaneous sphincterotomy compared with open sphincterotomy is that there is no incision, so there is less postoperative pain and a more rapid return to full activity. The operation can readily be performed in the office or in the outpatient department under local anaesthesia. Furthermore, there is a lower incidence of incontinence compared with open sphincterotomy. No bowel preparation is required. If a general anaesthesia is preferred, the patient is admitted to a day unit. The lithotomy position is preferred, when using general anaesthesia, but it is less embarrassing and more comfortable for the patient if the left lateral position is used for local anaesthetic techniques. The procedure can even be performed under anal ultrasound control **(6).**

The internal sphincter muscle is divided without incising the overlying anoderm. This operation is guided by the surgeon's nondominant index finger, which is inserted into the anus. An anal speculum such as the Pratt bivalve or Parks retractor is inserted; when the blades are opened, the anus is placed in a slight stretch. The intersphincteric groove is palpated and the index finger of the nondominant hand is inserted into the anal canal. A generous amount of 1% lidocaine is injected into the intersphincteric groove following which a No. 11 scalpel is inserted with the blade parallel to the fibers of the internal sphincter. The blade is advanced to the dentate line, approximately 1.5 cm, or to the level of the apex of the fissure, and the scalpel is rotated 90 degree toward the mucosa. The knife is then advanced toward the inserted index finger with a sawing motion until the internal sphincter is transected without penetrating the mucosal surface. The scalpel is removed and any remaining fibers are transected when the area is palpated. This may be repeated on the opposite side of the anal canal if a deficiency cannot be palpated. Pressure is to be applied to any bleeding. A foam sponge is then inserted into the anus to prevent hematoma formation, which will fall out during the patient's next bowel movement. Dry gauze over the

wound is removed the first postoperative. The patient may be discharged on the day of the procedure and should be instructed to continue taking bulk laxatives as well as provided with adequate pain control **(36).**

A fistula in a sentinel tag (when present) should be laid open. The tract passes through the superficial fibers of the lower border of the internal sphincter. It is tempting also to perform a complete internal sphincterotomy through the fissure and the rest of the sphincter above the sentinel tag, but results are better if surgeon confines him self to laying open the fistula and then performing a lateral subcutaneous sphincterotomy. This avoids the developing of a key-hole deformity in the mid-posterior position, which may lead to perianal soiling **(40).**

Lateral sphincterotomy is usually carried out up to the dentate line, but may be alternatively carried out by dividing the whole sphincter, dividing the lower part of the sphincter up to the cranial end of the fissure, the so-called tailored sphincterotomy, performing a conservative (short) sphincterotomy, performing the sphincter division on the basis of the anal hypertonia measured at preoperative manometry, the so-called spasm-related sphincterotomy which may decrease postoperative soiling when compared with the standard sphincterotomy at the dentate line in a randomized prospective study **(4).**

Postoperative care:

Postoperatively, all patients should be provided with adequate pain control. Additionally, all patients should be instructed to begin a fiber supplement. This will add bulk to the stool, which will ensure stretching of the anal musculature. Any wounds that were left open should be kept clean and dry. Finally, warm sitz baths can be used for comfort and to aid in perianal hygiene **(36)**.

Complications:

Early postoperative complications include anesthetic complications, urinary retention, bleeding, pain, and perianal abscess. The most significant late postoperative complication of sphincterotomy is fecal incontinence. Postoperative incontinence rates have been reported to occur in 0 and 35% of patients **(34)**.

This complication is more common in women than in men. Most patients suffering postoperative incontinence will return to their preoperative status over time. Furthermore, many of these patients will experience minor symptoms only (incontinence to flatus). The rate of major fecal incontinence in selected patients undergoing sphincterotomy by experienced surgeons is actually estimated to be less than 5% **(34)**. In the study by **Aysan et al. (41)**, there was a significantly faster healing rate of 15.05±5.60 days with wound closure versus 33.94±6.67 days when wounds were left open.

Patients should be monitored for bleeding and abscess formation. Bleeding is typically minor and will resolve spontaneously. Worsening pain, swelling, and purulent drainage are symptoms of abscess and should prompt a return to the surgeon for evaluation. Fecal incontinence in the immediate postoperative period should be treated conservatively with bulking agents. After complete healing of the surgical wound as well as the fissure, formal evaluation of anorectal function may be required **(34)**.

To avoid these side effects, segmental lateral internal sphincterotomy (a new technique) was used for treatment of chronic anal fissure **(42)**.

Laser sphincterolysis:

Conventional surgical procedures for anal fissures are associated with several limitations, including recurrence, fecal incontinence, scarring, and postoperative infections. Consequently, minimally invasive laser-based techniques have been introduced to reduce surgical morbidity while maintaining therapeutic efficacy. Laser therapy offers significant advantages such as reduced postoperative pain, minimal bleeding, faster recovery, and a negligible risk of fecal incontinence. Owing to the thin and sensitive nature of anal skin, laser treatment represents a suitable non-contact modality that enhances patient comfort and clinical outcomes **(43)**.

The use of CO_2 laser in chronic anal fissure surgery provides superior operative field visualization due to minimal blood loss. Laser sphincterotomy and fissurectomy can be safely performed as outpatient procedures, predominantly under local anesthesia, with high patient acceptability and favorable cost-effectiveness **(44)**. Postoperatively, hospitalization is rarely required, and most patients resume normal activities within one to two days, with complete fissure healing typically achieved within one to two weeks **(45)**.

Reported postoperative complications are generally mild and transient, mainly limited to pain, temporary fecal impaction, or minimal discharge, with no significant incidence of anal stenosis, hemorrhage, or fecal incontinence. The fine diameter of the CO_2 laser beam allows precise tissue targeting while preserving surrounding structures. Additionally, laser energy promotes tissue regeneration through stimulation of fibroblast activity, collagen deposition, neovascularization, and epithelial growth, thereby enhancing wound healing **(46)**.

Minimally invasive laser electrocoagulation techniques have also demonstrated promising results. In a large clinical study, laser electrocoagulation of chronic anal fissures, combined with topical vasodilators, preserved the internal anal sphincter while facilitating gradual tissue regeneration. This approach resulted in rapid recovery, same-day discharge, and absence of recurrence or continence disturbances **(47)**. Overall, laser therapy has been shown to effectively alleviate clinical symptoms, shorten recovery time, and improve patient compliance due to its minimally painful nature **(48)**.

As illustrated in Figure 6, the patient was placed in the lithotomy position, and a lubricated proctoscope was inserted into the anus. The procedure began with a tiny incision made at the mucocutaneous junction. A diode laser probe was then placed there, operating at a power of 8 W and a wavelength of 1470 nm. After that, laser fibers were injected into the intersphincteric plane. The anal mucosa is palpated and saved by the application of one finger from behind to avoid injury or burn of the mucosa, then starting to cut the internal sphincter by the laser fibers until feeling release of the sphincter fibers. A laser beam did a Fissurectomy. Remove the sentinel pile if it is present, Ice packing is then applied for 10 seconds to minimize the harmful effect of heat. The aim of surgery is to create a smooth, dry wound with less tissue heat damage. Other objectives include effective pain management after the procedure, quick, useful, elastic, and stable healing, and the avoidance of any relapses **(49)**.

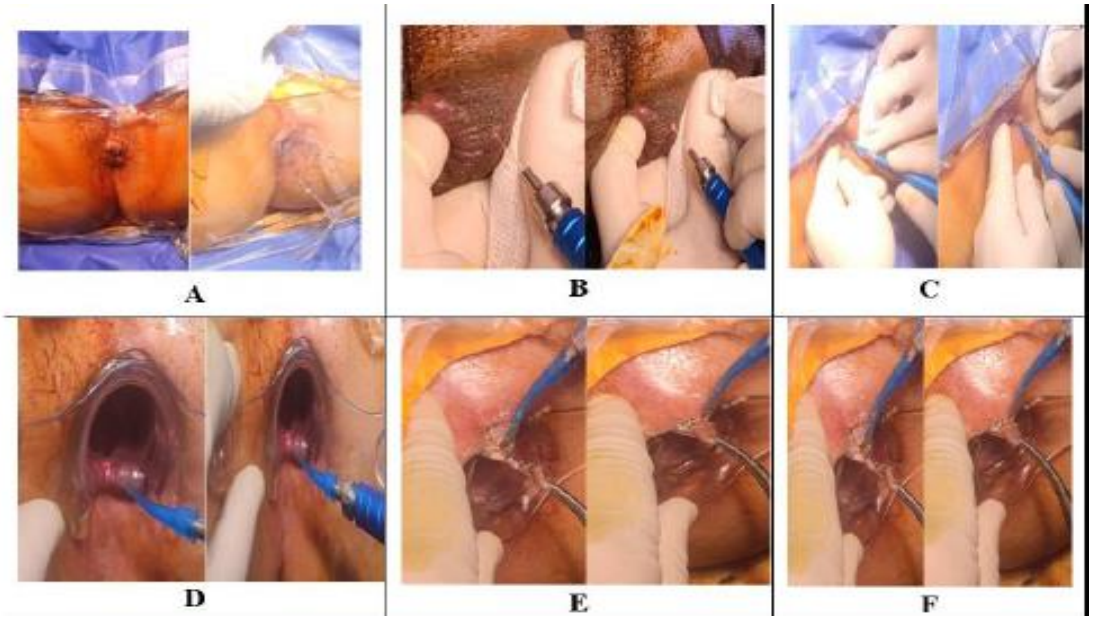

Figure (3) laser sphincterolysis (49)

Laser surgery represents a minimally invasive approach that reduces hospital stay, postoperative pain, edema, and overall complications, while promoting faster and more effective wound healing (50). Laser therapy has been shown to be a simple, rapid, and effective treatment for anal fissures, improving local blood supply and reducing pain, with high patient satisfaction and minimal side effects (51). However, successful implementation requires adequate surgical training and strict adherence to safety protocols. Recent evidence confirms that laser treatment for chronic anal fissures is safe and effective, offering minimal postoperative discomfort, early return to daily activities, and short hospitalization, with high cost remaining its main limitation (49).

Novel therapies:

Sacral nerve stimulation:

This technique can prove to be a promising technique in cases where surgical procedures need to be avoided. In pilot research from 2011, patients had painless temporary 8-electrode octad lead implantation for sacral nerve root stimulation, which was carried out for 20 minutes three times each day. After stimulation for three weeks, the lead was taken out. Sacral nerve stimulation began to relieve the patient's perineal pain right away, and the pain reduction effect persisted for 10 to 12 hours. Because of this, stimulation was carried out in brief sessions to keep the patients comfortable and prolong the life of the external neurostimulator's battery. All patients' chronic anal fissures were cured by the third week, and a year following treatment, there were no cases of recurrence **(43)**.

Autologous adipose tissue transplant:

This technique is useful when there is no response to the surgical treatments as well or there are repeated recurrences of anal fissures. The hypogastrium's purified autologous fat is removed and then injected into the fissure. In 75% of patients, total recovery and pain relief was observed **(44)**.

In another trial from 2017, subcutaneous injections of autologous adipose-derived regenerative cells (ADRC) from fat removed by liposuction were made and administered to the internal anal sphincter and the edge of the fissure. In all patients, the anal fissure completely healed, and all signs and symptoms disappeared. It took 15-30 days on average to completely stop experiencing pain. After 3 months, all fissures healed, and they continued to heal 12 months after the treatment. The surgery had no associated problems. Applying ADRC may be a safe alternative to lateral sphincterotomy and a method to prevent fecal incontinence **(52)**.

Posterior tibial nerve stimulation:

To evaluate the efficacy of transcutaneous electrical nerve stimulation (TENS), a retrospective study was conducted by stimulation of the sacral nerve in the ankle through the posterior tibial nerve. 10 patients were treated with TENS in addition to standard medical care for ten days. Two days after therapy, all patients' pain and the bleeding stopped, and six patients' mucosal healing was visible ten days later. Posterior tibial nerve stimulation is a promising technique for chronic anal fissures treatment as a non-invasive therapy **(53)**.

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