

# Anal fissure – an extensive update

## Szczelina odbytu – obszerna aktualizacja

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### ABSTRACT:

Anal fissure is one of the most common anorectal diseases resulting from a longitudinal tear in anoderm under the dentate line. It causes painful defecation and bleeding per anum. Most of the fissures heal by conservative means but a significant proportion turns chronic, leading to a negative impact upon the overall quality of life of a patient. The treatment options for chronic fissures are generally based on reducing the anal pressures and include non-surgical and surgical modalities. Lateral internal sphincterotomy still remains the gold standard for definitive management of anal fissure though anal incontinence is a serious complication of the procedure. In recent years, various modifications have evolved to minimize chances of incontinence besides the evolution of a wide range of non-surgical options of management. This review outlines the key points in the clinical presentation, etiopathogenesis, impact on the quality of life and management of anal fissure in the light of the recent updates in literature.

### KEYWORDS:

anal fissure, anal continence, fissure-in-ano, fissurectomy, internal sphincter hypertonia, sphincterotomy

### STRESZCZENIE:

Szczelina odbytu jest jedną z najczęstszych chorób odbytu i odbytnicy powstającą wskutek podłużnego pęknięcia anodermi poniżej linii zębatej. Wywołuje bolesną defekację i krwawienie z odbytu. Większość szczelin odbytu goi się po leczeniu zachowawczym, jednak w znaczącym odsetku przypadków dochodzi do rozwoju przewlekłej szczeliny, co wywiera negatywny wpływ na jakość życia pacjenta. Leczenie przewlekłych szczelin zasadniczo polega na zmniejszeniu ciśnienia w odbycie i obejmuje metody zachowawcze i operacyjne. „Złotym standardem” ostatecznego leczenia szczeliny odbytu wciąż pozostaje boczna sfinkterotomia wewnętrzna, pomimo ryzyka poważnego powikłania w postaci nietrzymania stolca. W ostatnich latach opracowano różne modyfikacje zabiegu zmniejszające ryzyko inkontynencji, poza tym rozwinięto wiele możliwości leczenia zachowawczego. W niniejszym przeglądzie przedstawiono zarys kluczowych kwestii związanych z: obrazem klinicznym, etiopatogenezą, wpływem na jakość życia oraz leczeniem szczeliny odbytu w świetle najnowszych doniesień naukowych.

**SŁOWA KLUCZOWE:** kontynencja odbytu, sfinkterotomia, szczelina odbytu, szczelina w odbycie, wycięcie szczeliny, zwiększone napięcie zwieracza wewnętrznego odbytu

## ABBREVIATIONS

**AAF** – anal advancement flap  
**ADRC** – adipose-derived regenerative cells  
**AF** – Anal fissure  
**ARM** – Anorectal manometry  
**BT** – Botulinum Toxin  
**CAF** – Chronic anal fissure  
**CT** – computed tomography  
**DRE** – digital rectal examination  
**EAS** – external anal sphincter  
**GTN** – glyceryl trinitrate  
**HRQL** – health-related quality of life  
**IAS** – Internal anal sphincter  
**LIS** – lateral internal sphincterotomy  
**MRI** – magnetic resonance imaging  
**NO** – Nitric oxide  
**PLIS** – Posterolateral internal sphincterotomy  
**PTNS** – percutaneous tibial nerve stimulation  
**QOL** – quality of life  
**SCAFA** – simple cutaneous advancement flap anoplasty  
**TENS** – transcutaneous electrical nerve stimulation  
**VAS** – visual analog scale

## INTRODUCTION

An anal fissure (AF) also termed as fissure-in-ano, is a linear or oval painful linear tear or defect in the distal anal canal, starting just below the dentate line, extending to the anal verge [1]. It was first described in 1934 by Lockhart-Mummery and globally represents about 10–15% of proctological consultations across all races [2].

The fissure is classified as per the duration, location and possible aetiology. The condition is known to negatively affect the quality of life and there is a wide range of conservative and surgical options available to address the issue. This article is written to revisit the salient features of anal fissure and thereby update the studies mentioned in the recent literature.

## METHODS

The literature dealing with the anal fissure found in PubMed, ResearchGate, Google Scholar and Web of Science after search of the keywords: Anal Fissure, Fissure-in-ano, Anal Pain, Anal Spasm and Anal Sphincterotomy. Preference was given to the literature published in English the time limit was set from January 2000 to December 2020.

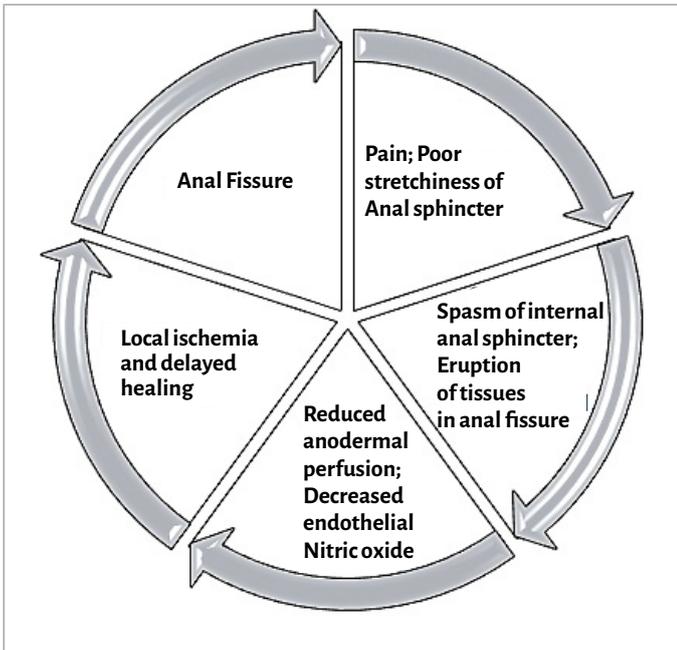


Fig. 1. Pathogenesis of anal fissure.

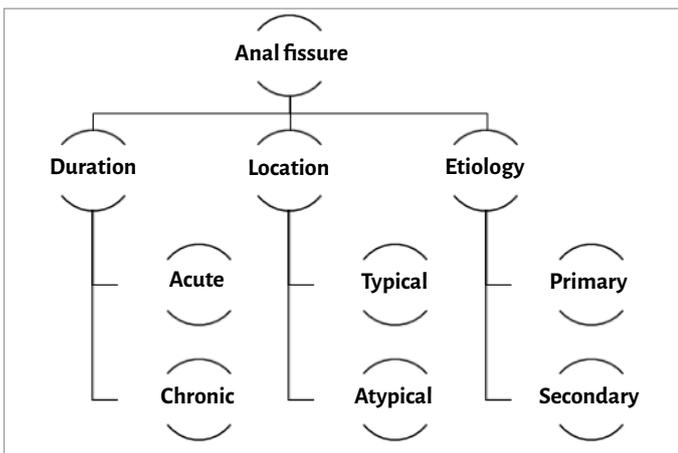


Fig. 1. Classification of anal fissure.

## EPIDEMIOLOGY

Anal fissures are a common cause of anal pain, but systematically collected data are not available on their precise incidence and prevalence. Mapel et al. [3] conducted a study on the epidemiology and treatment of anal fissures in a population-based cohort and concluded that there are approximately 342,000 new AF cases diagnosed in the United States each year which is similar to the annual incidence of appendectomies, thereby translating to an average life time risk of 7.8%, which indeed makes AF a common healthcare issue. Anal fissures are most commonly seen in middle-aged and younger patients with equal frequency in males and females. AF may also occur in children and the elderly. In children, fissures particularly recurrent should alert a physician of the possibility of sexual abuse [4].

## AETIOPATHOGENESIS

The precise aetiology is still unclear in AF unless the fissure is secondary to some disorder. The initiating factor is thought to

be trauma to the anoderm from the passage of particularly hard or large stools, local irritation from diarrhoea, anorectal surgery, and anoreceptive intercourse. Prior anal surgery is a predisposing factor because scarring from surgery may cause either stenosis or tethering of the anal mucosa, which makes it more susceptible to trauma from hard stool [1, 5].

Initial minor tears in the anal mucosa due to the hard bowel movement probably occur often but in most of the cases, they heal rapidly without any long-term sequelae. Furthermore, constipation and hard bowel movements are only reported in 13% of patients with fissures [5].

However, in patients with underlying abnormalities of the internal sphincter, these otherwise minor injuries progress to AF. Studies of the anal physiology have been performed with varied results, but the most commonly observed abnormalities are hypertonicity and hypertrophy of the internal anal sphincter (IAS), leading to elevated anal canal and sphincter resting pressures compared to the pressures in the normal controls. The internal sphincter maintains the resting pressure of the anal canal; anal-rectal manometry (ARM) can be used to measure this pressure. Most patients with AF have a persistently high internal sphincter tone which leads to chronicity of fissures and returns to normal levels after surgical sphincterotomy [5]. These changes in tone appear to be pathological and persist even after application of a local anaesthetic.

The increased internal sphincter tone induces local ischemia that prevents the fissure from healing, creating a chronic wound. The anoderm is supplied by the branches of the inferior rectal arteries after they traverse the IAS and the perfusion of the anoderm has been found to be inversely related to the pressure of the internal sphincter. Furthermore, angiography and cadaver studies have also shown the paucity of arterioles in the posterior midline anal canal which explains the propensity for fissures to occur at this location [1, 6].

Madalinski and Kalinowski [7] theorised that in chronic fissures, the stretchability of the anal sphincters is insufficient leading to eruption of tissue in the fissure region during defecation and these erupted tissues release vessel contraction mediators which have a tendency to arrest the healing process by interference with endothelial nitric oxide expression. Their description of the process of anal fissure healing is based on understanding the balance between nitric oxide (NO) concentration and the level of oxidative and nitroxidative stress in wounds, which is responsible for contraction of smooth muscles (also anal sphincters), endothelial/skeletal muscle cell remodelling and proliferation. Hypoxia in contracted anal sphincters induces vasoconstriction, in part, by decreasing endothelial NO expression (Fig. 1). Lund [8] in his study in 2006 also showed that IAS biopsies taken at the time of internal sphincterotomy for chronic anal fissure (CAF) have less NO present compared to IAS from abdominoperineal resection specimens.

The pathophysiology of anterior fissures may however be different than that of posterior fissures. Jenkins et al. [9] prospectively assessed 70 consecutive patients (54 female : 16 male) with symptomatic CAF and 39 normal controls (19 female : 20 male) without evidence of a significant ano-rectal pathology by manometry and anal endosonography. The study showed that the anterior anal fissures are associated with occult external anal sphincter injury, lower maximum squeeze pressure and impaired

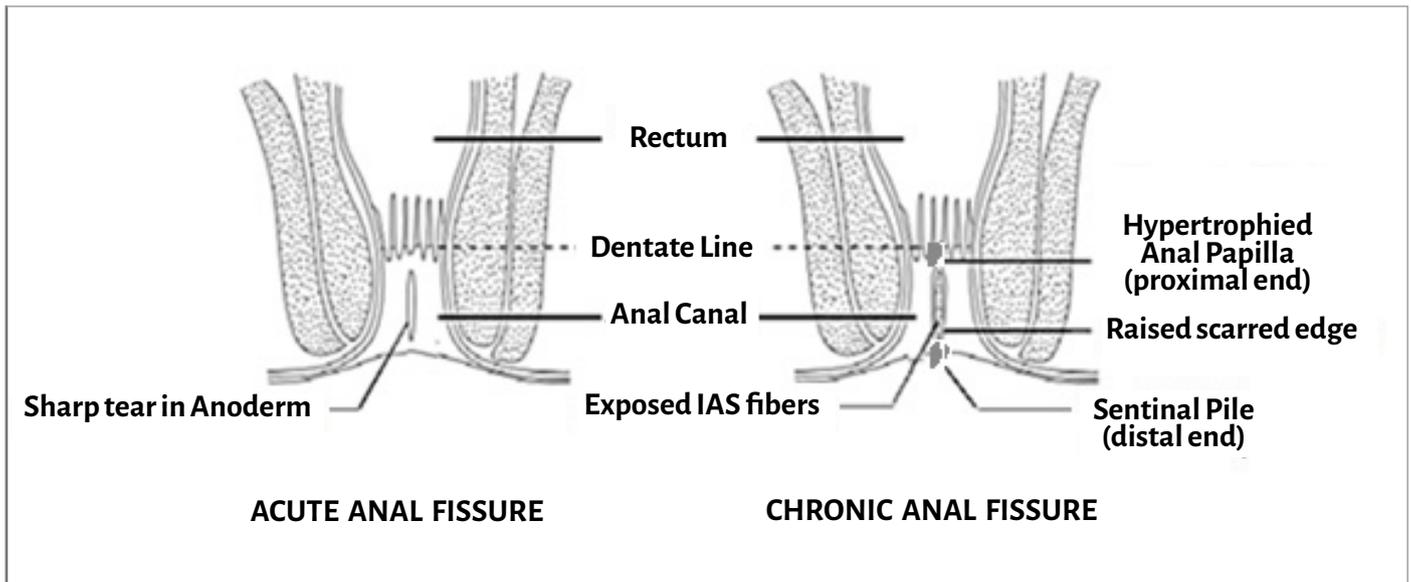


Fig. 3. Schematic diagram showing features of acute and chronic anal fissure.

external anal sphincter function compared with posterior fissures. The maximum resting pressure in anterior fissures was also found to be not significantly elevated unlike in the posterior ones. In addition, anterior fissures were identified in a younger and predominantly female group of patients, and a history of obstetric trauma was significantly associated. These findings may have important implications for the management and treatment of this common subgroup of anal fissure patients.

There are other novel reasons published in the literature for a specific set of cases. Garg [10] linked bidet-toilet to anal fissure. Bidet-toilet is an integration of a toilet and a bidet, whereby a nozzle is attached to the backside of an existing toilet for cleaning the anus and perianal region. This is commonly used in Asian countries. Repeated hitting of the anus by water stream could potentially cause injury to the anterior anal canal epithelium and lead to development of fissure-in-ano. Sauper et al. [11] in a study conducted to assess anal function in professional mountain bikers who are known to report functional and morphological problems in the anal region, found that permanent microtraumas through constant saddle vibration may lead to chronic inflammation and anal fissure resulting in anal pain and therefore high sphincter pressure. Muscle hypertrophy as a consequence may lead to defecation disorders.

Cox et al. [12] recently in 2018 presented a case of a 29-year-old woman who attended a surgical outpatient clinic with perianal fissure but on eliciting a thorough sexual history and sexually transmissible infection screening, was found to have syphilis. The management of syphilis led to healing of fissure. Jain et al. [13] conducted a study to identify the prevalence of faecal evacuation disorders in patients with anal fissure using ARM and found a significantly higher prevalence of functional evacuation disorders, dyssynergic defecation and abnormal balloon expulsion as compared to healthy controls.

## CLASSIFICATION

Anal fissures are classified on the basis of duration, location and possible aetiology.

Based upon the causative possible factors, anal fissures are termed as primary or secondary [5]. Primary fissures have no clear underlying cause and are likely to be related to local trauma such as hard stools, prolonged diarrhoea, vaginal delivery, repetitive injury or anoreceptive intercourse. Secondary fissures are found in patients with a history of previous anal surgical procedures, inflammatory bowel disease (e.g., Crohn's disease), granulomatous disorders (e.g., tuberculosis, sarcoidosis), infections (e.g., human immunodeficiency virus, syphilis, *Haemophilus ducreyi*, herpes, cytomegalovirus) chemotherapy or malignancy (leukaemia).

Anal fissures are considered to be acute if they have been present for less than six weeks [5]. They are superficial, confined to anoderm, and have sharply demarcated, fresh mucosal edges, often with granulation tissue at the base. The fissures are termed chronic if they have been present for more than six weeks and have keratinous edges, if there is a sentinel pile (skin tag) and hypertrophied anal papillae, and if the fibres of the internal anal sphincter are visible. These features of fissure chronicity are attributed to chronic infection and development of fibrotic connective tissue [1, 5].

Most fissures occur at the posterior midline (90%). Anterior midline fissures constitute about 10–25% of female fissures and 1–8% of male fissures. Anterior and posterior midline fissures can occur concomitantly in about 3% of cases. Anterior fissures are associated with younger, mostly female, patients often with injury to or dysfunction of the external anal sphincter due to parturition [14].

Anterior and/or posterior fissures are termed as typical whereas multiple or large and irregular fissures, or fissures off the midline are considered atypical. Atypical ulcers are generally secondary in nature [1, 12].

## CLINICAL FEATURES AND ASSESSMENT

History and physical examination allow the diagnosis of an anal fissure without further investigations in most patients. The symptoms are relatively specific, though AF is sometimes misdiagnosed or mistaken for other benign anal conditions like haemorrhoids.

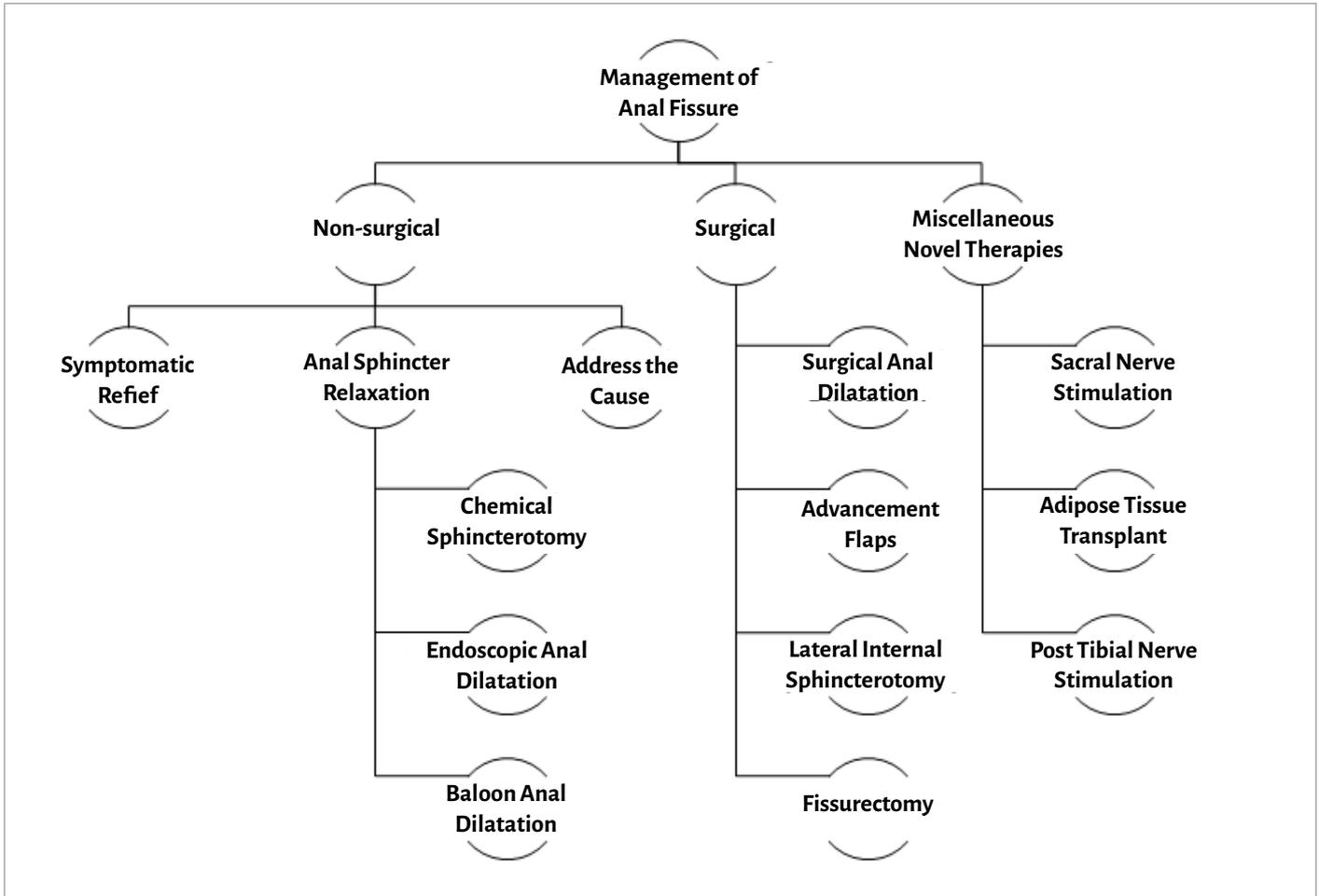


Fig. 4. Treatment options for anal fissure.

Typically, the patient reports severe tearing pain with the passage of stools (often described as 'like passing broken glass'), with the pain lasting several minutes to hours afterwards. The pain recurs with every bowel movement, and the patient commonly tends to be afraid or unwilling of having a bowel movement, which leads to a vicious cycle of worsening constipation, harder stools, and increase in anal pain. Approximately 70% of patients note a small amount of bright-red blood on the toilet paper or stool. Occasionally, a few drops may fall in the toilet bowl, but significant bleeding is not a usual feature with an anal fissure. Some patients report roughness in the anal opening, discomfort while sitting or riding, itching, irritation and a persistent thorn-like feeling in the anus. The appearance depends on duration and, as described in Fig. 3., an acute fissure is just a tear in the mucosa and chronic fissure has distinguishing features like exposed internal sphincter muscle, hypertrophied anal papillae proximally and sentinel pile distally.

Inspection is the most important step in local physical examination for possible anal fissure. Gentle separation of the buttocks typically reveals the fissure; however, spasm of the sphincter may prevent proper visualization. A digital rectal examination (DRE) is painful in acute fissures and should be deferred though the patients with chronic fissures tend to have less pain and can better tolerate the examination.

Detailed evaluation including examination under anaesthesia, anoscopy, endoscopy, biopsy and imaging (i.e., CT scan, MRI or endoanal ultrasound) may be required [5, 14] if:

- the diagnosis is unclear,
- the fissure cannot be seen,
- there is concern about an abscess/infection,
- there is significant bleeding in a patient with an increased risk for colorectal cancer,
- the fissure does not heal with appropriate therapy,
- fissure recurs after surgical therapy,
- there are features suggesting a secondary anal fissure.

## HISTOLOGICAL FINDINGS

The fissure is not usually excised; hence, no pathology specimen is available for examination. Engel et al. [15] in a small study of completely excised anal fissures, found no underlying microscopic features of inflammation in most of the specimens and anal mucosa was found to be undermined. Some fissures exhibited minimal to moderate nonspecific inflammation with fibroepithelial polyps. Compact connective tissue was present at the superficial floor of the fissures but not in the smooth muscle bundles forming the base of fissures.

## IMPACT ON QUALITY OF LIFE (QOL)

Chronic anal fissure (CAF) onset, exacerbation, and impact on the quality of life may be influenced by a host of psychological, physiological, and social factors. Arisoy et al. [16] in 2017 investigated

the difference in psychopathology and stress between normal and CAF groups. Thirty CAF patients and 20 age-sex matched healthy controls were evaluated for Axis I psychopathology, depression, anxiety, and stress with Hamilton and Hospital Depression-Anxiety Scales, Perceived Stress Scale, and SF-36. As many as 83.3% of CAF patients were female, at a mean age of 39.5 years. The study concluded that there is a high comorbidity of psychopathology in the CAF patients and depression and anxiety severities show a negative impact on the quality of life. Stress acts as both a triggering and an exacerbating factor in CAF. Pain and bleeding severity have a negative impact on the overall role in daily life.

Studies assessing the physical and mental health of fissure patients before and after treatment found that the successful treatment of CAF leads to symptomatic improvement and beneficially affects health-related quality of life [17]. Ortiz et al. [17] prospectively evaluated alterations in continence and quality of life produced by lateral internal sphincterotomy with each patient acting as his or her own control and found that the patients with CAF showed an improvement in quality of life 6 months after internal lateral sphincterotomy. Patients with postoperative continence disturbances showed improvement in fewer scales of the Short-Form 36 (SF-36) Health Survey questionnaire than those without changes in continence.

Sit et al. [18] in 2014 consecutively enrolled one hundred patients with anal fissure with no psychiatric comorbidity along with an equal number of healthy controls to assess the prevalence of type D personality in patients with anal fissure and to investigate whether the presence of type D personality would affect HRQL in patients with anal fissure. It was concluded that type D personality was associated with increased perceived bodily pain and social roles in patients with anal fissure. Type D personality construct may be an important consideration when assessing health-related quality of life (HRQL) outcomes. A multidimensional approach may be valuable in the assessment of patients presenting with anal fissure, because a subgroup with type D personality might benefit from psychological therapies.

## TREATMENT

Majority (87%) of acute anal fissures resolve with conservative intervention. However, when chronic fissures develop, healing is more difficult and only 50% respond to conservative management [14, 19] and there is a need to adopt other management options as depicted in Fig. 4.

### Non-surgical management

The objectives of non-surgical management are straightforward and consist of three components, as follows:

#### *Symptom Relief*

This component consists of reducing the symptoms of AF and it includes measures like Sitz bath, dietary modifications, local ointments and self-anal massage. Sitz bath comes from the German word "sitzen", which means "to sit". So sitz bath means "sitting bath". They have long been a part of the treatment algorithm for anal fissures. Proposed benefits include an improvement in

perineal hygiene, relaxation of the hypertonic internal anal sphincter via somatoanal reflex through the activation of non-adrenergic non-cholinergic neural release of NO and thereby decreased pain [20]. Manometry has also shown resting anal canal pressures to decrease significantly from baseline after immersion at 40°C. Lang et al. [21] in 2011 however found that sitz baths merely improve patient satisfaction in acute anal fissures without any significant impact on the healing and overall pain relief.

To reduce pain, local anaesthetics are used as additional measures but only for short periods of time due to the risk of skin sensitization. Lignocaine is the most common anaesthetic used mostly in combination with many other drugs like minoxidil, nitrates, local antibiotics (metronidazole), and steroids including hydrocortisone and betamethasone [14].

Gaj et al. [22] supports the use of anal self-massage with a finger to induce a better resolution of acute anal fissure. Anal self-massage requires the introduction of the patient's own index finger into the anal canal (with lubricant cream) for 10 min twice a day for the first 2 days of treatment; the patient was then instructed to perform a circular motion with the finger for 10 min twice a day for further 5 days. The hypothesis is that the massage of the anal sphincter, in addition to the passive dilatation obtained by the finger, induces relaxation of the hypertrophic and hyper-contracted anal sphincter, through a negative central feedback mechanism. Similarly, passive dilation with graduated anal dilators enhances resolution of acute fissures.

#### *Anal sphincter relaxation*

The internal anal sphincter dilatation may be achieved by chemical or else mechanical means as explained below:

#### *Chemical sphincterotomy*

In the most recent guidelines topical anal sphincter relaxants including nitrates and topical calcium channel blockers are mentioned among the pharmacological therapy options. The goal is to achieve a temporary reduction of pressure of the anal canal, to facilitate the healing of the fissure ("reversible chemical sphincterotomy"), thereby reducing muscle tone. Various mechanisms that are mentioned in literature include: increasing NO concentration, direct depletion of intracellular calcium, stimulation of muscarinic receptors, inhibition of alpha-adrenergic receptors, or stimulation of beta-adrenergic receptors [5, 14, 23].

#### 1. Topical nitrates

Topical nitrates, predominantly glyceryl trinitrate (GTN), have attained the role of the first-line therapy for CAF in many clinical contexts, ever since the discovery of the role of NO as an inhibitor of internal anal sphincter tone and been reported to reduce the number of surgical procedures for anal fissure, especially in several European countries. A Cochrane review in 2012 [23] reported that topical glyceryl trinitrate is better than placebo in healing anal fissures (healing rates 49% vs 36%). However, late recurrence occurred in around 50% of those initially cured.

The dose of GTN has not been shown to affect healing in studies that compared doses of GTN ranging from 0.05 to 0.4% and the

most commonly prescribed dose is 0.2%, applied topically two to three times a day. The significant drawbacks of topical GTN are intolerance due to its side effects and the overall poor patient compliance. Systemic absorption of topically applied GTN can result in vasodilation and severe headaches resulting in discontinuation of therapy in up to 20% of patients.

## 2. Calcium Channel Blockers

Topical Calcium Channel Blockers (CCBs) have emerged in recent years as an acceptable choice for the medical management of CAF 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. In one long-term study with a 19-month follow-up by Katsinelos et al. [24], the healing rate with 0.5% topical nifedipine was 93%. Khan et al. [25] achieved 80.4% healing rate with 2% topical diltiazem proving it to be better than GTN in terms of healing and side-effect profile. Side effects, mainly pruritis ani, may occur in 10 percent of patients but are generally tolerated. Recurrence is also a problem with topical calcium channel blockers. In one of the few long-term trials by Nash et al. [26], more than 60% of the patients experienced recurrence within 2 years after the end of therapy. Topically applied 0.5% minoxidil is another option and studies including a randomized, double-blind, clinical trial by Alvandipour et al. [27] in 2018 have shown it to be of equal efficacy as diltiazem in the treatment of CAF with a lower frequency of adverse effects. In the literature, it is recommended that therapy be administered for at least 6–8 weeks and a reduction in pain is generally reported within 2 weeks from the start of the therapy.

## 3. Botulinum Toxin (BT)

Botulinum toxin (BT) is an exotoxin produced by the bacterium *Clostridium botulinum*. When injected locally, this toxin binds to presynaptic nerve terminals at the neuromuscular junction preventing the release of acetylcholine and thereby resulting in temporary muscle paralysis. Studies in recent years have shown its efficacy in pain reduction which along with its non-permanent and minor side effects support its role in the resolution of CAF [28]. Patients need to be warned regarding the risk of transient anal incontinence associated with BT.

The available evidence suggests that these injections probably have at least similar efficacy to both topical glyceryl trinitrate and calcium channel blockers with the reported fissure healing rates of 60–80% and although recurrence can occur in up to 42% of patients, repeated injections lead to a similar healing rate. Common adverse effects include temporary incontinence of flatus (in up to 18%) and stool (in up to 5%).

Bobkiewicz et al. [29] in 2016 undertook a meta-analysis to determine the exact efficient dose of BT, number of injections per session and injection sites, and surprisingly, the study concluded that there was no dose-dependent efficiency, and the postoperative incontinence rate was not related to the BT dosage regardless of the type of formulation of botulinum neurotoxin used. Moreover, no difference in healing rate was observed regarding the site and number of injections per session. Pilkington et al. [30] in 2018 after a randomised single-centre trial comparing bilateral (either side of fissure) to unilateral injection concluded that the

injection-related pain was similar in bilateral and unilateral injection groups. Unilateral injection was as effective as bilateral injections in healing and improving fissure pain without any deterioration in continence.

BT injection can be done safely as an Office-Based Procedure, or alternatively it can be performed on an outpatient basis with sedation when debridement of the fissure may be conducted simultaneously. Of note, the local effects of BT typically wear off after about 3 months, so if the underlying issues like constipation that led to the anal fissure have not been addressed, then there is a high risk of recurrence.

### *Endoscopic anal dilatation*

In recent years, various less invasive techniques of anal dilatation have been devised that neither require surgical operating facilities nor general anaesthesia. One technique is endoscopic anal dilatation wherein the procedure is performed with a two-valved anoscope under local anaesthesia in an ambulatory setting by physicians with no specific surgical training. Santander et al. [31] evaluated the use of ARM to select patients for controlled endoscopic anal dilatation in a prospective study on patients with CAF who did not have a good response to conservative treatment. Those with increased anal resting pressure were treated with controlled anal dilatation using a two-valved anoscope. A second ARM was indicated after controlled anal dilatation. Anal healing of CAF and a significant decrease in maximum resting pressure recorded by manometry confirmed the success of the procedure.

### *Balloon anal dilatation*

Balloon dilatation is another effective and safe alternative to surgical intervention with a high cure rate, no risk of faecal incontinence and without endosonographically detectable significant sphincter damage.

Renzi et al. [32] prospectively studied the clinical, anatomic, and functional pattern in a group of 33 patients treated by pneumatic balloon dilation. Anal manometry and ultrasonography were performed prior to and 6 to 12 months after pneumatic dilation which was accomplished by means of an endoanal 40-mm balloon inflated with a pressure of 1.4 atmospheres that was left in situ for six minutes under local anaesthesia. The CAF healed between the third and fifth week in 94%, who became asymptomatic 2.5 +/- 1.4 days after pneumatic balloon dilation. None of them reported anal pain two years after the treatment.

### *Address the underlying cause*

This component aims at removal of any underlying factor that has some role in the creation of the fissure. This often means the alleviation of constipation and straining, as well as avoidance of other causes of anal trauma like anal intercourse. According to the practice parameters set by the American Society of Colon and Rectal Surgeons (3<sup>rd</sup> revision), increased fluid and fiber ingestion and, if necessary, the use of stool softeners, is safe, and hence should be the initial therapy for all patients with anal fissure [33]. In the patients with healed anal fissure, Brillantino et al. [34] found that the maintenance therapy with partially hydrolysed guar gum (5g/day) for 10 months seems to significantly reduce the recurrence

rate and significantly increase the success rate at 1-year follow-up. Abdominal distension and flatulence represent potential negative effects of dietary fibers and these symptoms may even cause interruption of treatment [34].

## Surgical Management

Surgical options should be adopted for those cases in whom non-surgical treatment for over 6–8 weeks does not produce desirable results. The patient must be clearly informed of the risk of faecal incontinence associated with the adopted option when informed consent is sought. These options include:

### *Surgical anal dilatation*

The concept of sphincter stretching under general anaesthesia was in vogue for decades employing Lord's procedure which involved inserting four fingers of each hand into the anal canal and stretching over the course of 3 to 4 minutes. This procedure has however, been mostly abandoned in recent times due to the advent of non-surgical measures, an unacceptably high risk of faecal incontinence (about 52%), as well as its overall inferiority to lateral internal sphincterotomy.

Gupta [35] has innovated a new technique of finger fragmentation of the fibers of the internal sphincter at the left lateral side of the anal canal and termed it "internal anal sphincterolysis". In a series of 301 patients with CAF treated with this technique, fissure healing and relief of symptoms was observed in 97% of patients at the first follow-up at 4 weeks. Mean resting pressure before the procedure was 89.5 mmHg and it was recorded as 47.3 +/- 4.3 at 6-month follow-up ( $P < 0.001$ ).

### *Lateral internal sphincterotomy*

Lateral internal sphincterotomy (LIS) is the surgical treatment of choice for refractory anal fissures and may be offered as the first-line management option, according to the practice parameters by the American Society of Colon and Rectal Surgeons. However, cutting the sphincter predisposes to sphincter dysfunction which can manifest as various degrees of incontinence of gas, liquid, or stool. A systematic review and meta-analysis by Garg et al. [36] in 2013 showed that the overall continence disturbance rate can go up to 5–14% though some recent studies [37] have achieved the incontinence rate of as low as 0.4%. Before selecting any particular surgical option, it is essential to build a complete history, including specific information on details of continence, such as soiling of undergarments, incontinence to flatus, and accidental bowel movements.

Due to the concern regarding disturbed postoperative continence, in the last two decades, various modifications of LIS have been innovated and terms like "calibrated", "tailored", "conservative", or "controlled" LIS have been introduced. The extent of sphincterotomy is recorded as percentage of the sphincter divided or else as distance below or above the dentate line and multiple studies have been conducted to study its impact on outcomes. Predictably, division of more sphincter correlates with a higher incidence of impaired continence; division of less sphincter produces a higher fissure recurrence rate.

Davies et al. [38] conducted a retrospective study to investigate the long-term outcomes after lateral anal sphincterotomy, focusing specifically on postoperative incontinence. The study enrolled 25 men and 13 women, with a median age of 49 years (range 16–82 years). The success rate for fissure healing following surgery was 92%, being significantly more likely in patients with textbook symptoms ( $P = 0.016$ ) and those with chronic disease ( $P = 0.006$ ). The overall complication rate was 13.2%. Long-term objective and symptomatic incontinence was reported by two (5.6%) patients, one of whom required a colostomy. The study stressed that the careful patient selection based on symptoms and disease chronicity may improve results further. The study also suggested that the patients with predisposing risk factors for the development of incontinence, particularly multiparous women, should be better treated with non-surgical options.

The procedure may be conducted by an open or closed technique. Open LIS was popularized by Eisenhammer and is performed with a radial incision in the anoderm laterally exposing the internal sphincter muscle fibers followed by sharp division under direct vision, with scalpel or scissors. The wound can be closed primarily or else left open. Closed LIS also termed as lateral subcutaneous sphincterotomy was introduced by Notaras and the procedure involves introduction of a narrow-bladed scalpel such as a beaver, cataract knife, or 11-blade, 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 reaches the dentate line, the internal sphincter is divided by cutting medial to lateral or else lateral to medial.

Cho [39] recommends that the precise length of the sphincterotomy be "tailored" or controlled as per the length of the anal fissure though many surgical texts still describe the length of division of the internal sphincter during closed lateral sphincterotomy as "to just distal to the dentate line". The technique of controlled lateral sphincterotomy has been found to be safe, effective, and preserving more of the anal sphincter. Montes et al. [40] in a randomized, prospective study compared the results of controlled lateral internal sphincterotomy by using anal calibrators with those of sphincterotomy up to the fissure apex and found that the controlled sphincterotomy provided a faster relief of pain, and it was associated with a lower rate of early postoperative disturbance of continence and an insignificantly lower rate of treatment failure compared with sphincterotomy up to the fissure apex. Garces-Albir et al. [41] published the results of a study in 2012 that had been undertaken to quantify the longitudinal division of the internal anal sphincter (IAS) and external anal sphincter (EAS) after fistulotomy using three-dimensional endoanal ultrasound (3D-EAUS) and correlate the results with postoperative faecal incontinence. The study concluded that in patients without risk factors, division of the EAS during fistulotomy limited to the lower two thirds of the EAS is associated with excellent continence and cure rates.

Liang and Church [42] in 2015 presented the results of a prospective study that was designed to confirm the role of redo lateral internal sphincterotomy in the treatment of surgically recurrent CAF. Most of the redo procedures were performed on an outpatient basis achieving a fissure healing rate of 98% and only 4% developed minor incontinence postoperatively. Overall satisfaction was  $9.7 \pm 0.9$  out of 10 with a significant improvement in the quality of life from  $5.7 \pm 2.4$  out of 10 to  $9.3 \pm 1.4$  out of 10 ( $P < .001$ ).

thereby proving that the judicious repeat lateral sphincterotomy cures recurrent chronic fissures with a minimal risk of incontinence.

Alawady et al. [43] recently in 2018 after a randomized controlled trial proposed posterolateral (PLIS) over lateral internal sphincterotomy (LIS) as the time to complete healing was significantly shorter and the pain score was significantly lower after PLIS than after LIS which can be due to more reduction in the resting anal pressure after PLIS. Continence disturbances occurred after PLIS less frequently than after LIS; however, no significant differences between the two techniques were noted.

Lateral internal sphincterotomy (LIS) has been compared with virtually all other available non-surgical and surgical options and has acquired the status of gold standard in the management of CAF due to its short- and long-term impact.

### *Advancement Flaps*

Endorectal advancement flaps have also been utilized in the treatment of CAF, particularly in patients with 'low-pressure' fissures. The procedure typically involves creation of a subcutaneous flap with an incision made from the anal verge extending caudally and then advancement into the anal canal to cover the anal fissure. Giordano et al. [44] in a prospective outcome study of 51 consecutive patients treated with simple cutaneous advancement flap anoplasty (SCAFA) showed that all fissures healed in the short term with salvageable flap dehiscence in only 6% and the continence remained unaffected. The authors proposed that the simple cutaneous advancement flap anoplasty should be considered as the first-line surgical treatment of CAF, irrespective of patient gender and anal tone.

Patti et al. [45] evaluated the manometric modifications and the incidence of anal incontinence after fissurectomy and anoplasty with advancement skin flap in chronic fissures with hypertonia of the internal anal sphincter (IAS) and they achieved high healing rate without surgical sequelae or anal incontinence, with reduction of IAS pressure in the same manner as surgical sphincterotomy or forceful dilatation. Hancke et al. [46] found the dermal flap procedure to be efficacious without an increased risk of incontinence and with results comparable to lateral internal sphincterotomy. They recommended the dermal flap procedure for patients with failed conservative fissure treatment, without the potential risk of anal incontinence.

Recently in 2018, a systematic review and meta-analysis compared the efficacy of lateral internal sphincterotomy (LIS) with anal advancement flap (AAF) in the treatment of CAF and found that AAF is associated with less incontinence, but similar wound complications as well as a similar rate of unhealed fissures compared to LIS [47].

### *Fissurectomy*

Fissurectomy involves the excision of the floor of the fissure with chronic granulation tissue, hypertrophied papilla, and scar. The raw area thus created is either left open or closed primarily. Zeitoun et al. [48] in a recent study published in 2018 assessed the long-term outcome of fissurectomy as a surgical treatment

for CAF and found that fissurectomy is associated with rapid pain relief and a high success rate even though complete healing may often be delayed. Moreover, it appears to have no adverse effect on continence.

Many recent innovative studies have combined fissurectomy with other modalities. Andicoechea Agorria et al. [49] in 2019 found that botulin toxin A injection associated with fissurectomy is a safe and effective procedure in patients with CAF with a potential to avoid the need of LIS in a high percentage of patients. Sobrado Junior et al. [50] after fissurectomy conducted anoplasty with the use of sentinel pile tissue and found it to be a safe technique that results in improvement in pain without change of faecal continence and with high satisfaction rates.

## **Miscellaneous Novel Therapies**

### *Sacral Nerve Stimulation*

Sacral nerve stimulation is an effective though novel treatment option for CAF in patients who choose not to pursue more invasive surgical interventions. In a pilot study by Yakovlev et al. [51] five patients underwent uneventful placement of one temporary 8-electrode Octad lead for sacral nerve root stimulation and the stimulation was conducted for 20 minutes 3 times per day. The lead was removed after 3 weeks of stimulation. The patients experienced an immediate improvement in perineal pain after the initiation of sacral nerve stimulation and the pain relief effect lasted 10 to 12 hours, so stimulation was conducted for short episodes to ensure patient comfort and to extend the battery life of the external neurostimulator. For all patients, the CAF healed by the end of the third week and there was no recurrence of anal fissure 1 year after treatment.

### *Autologous Adipose Tissue Transplant*

Recent evidence suggests that autologous adipose tissue transplant promotes healing in different lesions associated with local ischemia. Taking a cue from these recent advances, Lolli et al. [52] tried this technique in CAF eight patients in whom other medical and surgical options of treatment had failed. Purified autologous fat was retrieved from the hypogastrium and transplanted into the fissure. They achieved complete healing and pain remission in 6 patients (75%). Andjelkov et al. [53] extracted autologous adipose-derived regenerative cells (ADRC) from fat retrieved by liposuction and injected subcutaneously into the edge of the fissure and into the internal anal sphincter. Complete healing of the anal fissure and the disappearance of symptoms was achieved in all patients. The average time to complete pain cessation was  $33.7 \pm 15.0$  days. All fissures healed after 3 months and remained healed 12 months after the procedure. There were no complications related to the procedure. The study concluded that the application of ADRC may be an alternative to lateral sphincterotomy and a reliable procedure which avoids faecal incontinence.

### *Posterior Tibial Nerve Stimulation*

Recent studies have shown that sacral nerve stimulation might be an effective treatment option for CAF. Altunrende et al. [54] conducted a prospective study by enrolling ten patients of CAF, to evaluate the efficacy of transcutaneous electrical nerve stimulation (TENS) by stimulating the sacral nerve in the ankle via the

posterior tibial nerve. TENS was applied for 10 days in addition to conventional medical treatment in ten patients. Pain and bleeding resolved in all patients 2 days after the treatment, and mucosal healing was observed in six patients 10 days after the treatment. Wexner's constipation and visual analog scale (VAS) scores for pain, Hamilton anxiety and depression scores recorded a significant decrease. The study concluded that TENS application to the posterior tibial nerve has the potential to be an alternative treatment option for CAF patients who seek non-invasive treatment modality. Aho et al. [55] in a recent study in 2019 termed this technique as percutaneous tibial nerve stimulation (PTNS) and found it to enhance healing of chronic anal fissure and reduce pain and bleeding with an associated improvement in bowel function. Ruiz-Tovar et al. [56] compared the compliance rate of the patients receiving glyceryl trinitrate treatment for chronic anal fissure with that of the patients receiving PTNS and found the PTNS to be safer and superior. Youssef et al. [57] after a randomized clinical trial of transcutaneous electrical posterior tibial nerve stimulation versus lateral internal sphincterotomy (LAS) for treatment of CAF concluded that transcutaneous electrical posterior tibial nerve stimulation for treatment of CAF is a novel, non-invasive procedure and has no complications but due to the higher rate of clinical improvement and fissure healing and the lower rate of

fissure recurrence, LAS remains the gold standard for treating chronic anal fissure (CAF).

## CONCLUSION

Anal fissure is a common healthcare problem, vexing to both patients and physicians. Even though the majority of fissures heal by conservative intervention, a significant proportion turn chronic and negatively impact the quality of life.

The gold standard of management of chronic fissures is internal anal sphincterotomy but the procedure has been associated with a potential complication of faecal incontinence. In the recent years, various modifications of this procedure have emerged to make it safe. Furthermore, a wide range of non-surgical innovative procedures have also evolved to treat the fissure without subjecting the patient to blade. Before selecting any particular option, it is essential to assess the patient completely with particular stress upon the features of incontinence and thereby, the most optimum treatment should be selected after providing the patient with complete information about the method, cure rates, complications, and alternate options.

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