JAMA | Review

Hemorrhoidal Disease
A Review

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IMPORTANCE Hemorrhoidal disease, pathology of the tissue lining of the anal canal, affects approximately 10 million individuals in the US. Hemorrhoidal disease may impair quality of life due to bleeding, pain, anal irritation, and tissue prolapse.

OBSERVATIONS Hemorrhoids are classified as internal, external, or mixed (concurrent internal and external hemorrhoidal disease). Internal hemorrhoids originate above the dentate line, the boundary between the upper and lower anal canal, and may cause rectal bleeding, discomfort, and tissue prolapse from the anal canal. Internal hemorrhoid prolapse is classified as grade I (into anal canal), grade II (beyond the anus with spontaneous reduction), grade III (requiring manual reduction), and grade IV (irreducible). External hemorrhoids, arising below the dentate line, cause rectal pain when engorged or thrombosed. Initial treatment of all hemorrhoidal disease involves increasing intake of dietary fiber and water and avoiding straining during defecation. Phlebotonics (eg, flavonoids [thought to improve venous tone]) reduce bleeding, rectal pain, and swelling, although symptom recurrence reaches 80% within 3 to 6 months after treatment cessation. If dietary modification and phlebotonics are ineffective, grade I to grade III internal hemorrhoidal disease can be treated with office-based interventions. Rubber band ligation—placing a band around the base of hemorrhoid tissue during anoscopy to restrict blood flow—resolves symptoms in 89% of patients, but repeated banding is needed in up to 20%. Sclerotherapy, which induces fibrosis with a sclerosant injection, is efficacious in the short term (weeks to months) among 70% to 85% of patients, but long-term remission occurs in only one-third of patients. Infrared coagulation uses heat to coagulate hemorrhoidal tissue, yielding 70% to 80% success in reducing bleeding and prolapse. Excisional hemorrhoidectomy, for disease unresponsive to office-based therapy or for mixed hemorrhoidal disease, achieves low recurrence (2%-10%), although with longer recovery (9-14 days). External hemorrhoidal disease rarely requires surgery unless acutely thrombosed. Outpatient clot evacuation within 72 hours of onset of a thrombosed external hemorrhoid is associated with decreased pain and reduced risk of repeat thrombosis. Patients presenting more than 72 hours after external hemorrhoid acute thrombosis should receive medical treatment (eg, stool softeners, oral and topical analgesics such as 5% lidocaine).

CONCLUSIONS AND RELEVANCE Hemorrhoidal disease affects 10 million people in the US. First-line treatment is increased fiber intake, avoidance of straining during defecation, and phlebotonics. In-office rubber band ligation for grade I to III internal hemorrhoid disease is first-line procedural treatment for persistent symptoms despite conservative therapies. Excisional hemorrhoidectomy is recommended for grade III to IV prolapse, thrombosis, or mixed hemorrhoidal disease that does not improve with less invasive approaches.

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Hemorrhoids, which are vascular and connective tissue structures lining the anal canal, are present in all individuals, although the term is commonly used to refer to a diseased state. The symptomatic, pathological condition that requires medical attention is better described as *hemorrhoidal disease*.

In the US, hemorrhoidal disease is the fourth-leading outpatient gastrointestinal diagnosis, accounting for 4 million annual ambulatory care visits[1,2] and annual health care expenditures of $1.3 billion.[2] Although not a life-threatening condition, hemorrhoidal disease reduces quality of life due to anal bleeding, pruritus, rectal pain and pressure, and sensation of tissue prolapse. Treatment decisions are based on symptom severity, and asymptomatic hemorrhoidal disease does not require treatment. This review summarizes current evidence on the epidemiology, pathophysiology, diagnosis, and treatment of hemorrhoidal disease.

Methods

A literature search was conducted to identify studies published from January 1, 2000, to March 28, 2025, about hemorrhoids. PubMed and Cochrane Library searches included the following search terms: *hemorrhoid*, *hemorrhoids*, or *hemorrhoid treatment*. Studies published before 2000 were included if relevant. Search criteria identified 2711 studies, of which 77 were included, comprising 13 randomized clinical trials (RCTs), 18 meta-analyses/systematic reviews, 5 national or international guidelines, and 41 population-based observational studies.

Epidemiology and Risk Factors

The exact prevalence of hemorrhoids is unknown because many patients with hemorrhoidal symptoms do not seek care or are diagnosed with hemorrhoidal disease when other pathology such as anal fissures or malignancy is present. An analysis of 1989 US National Health Interview Survey data (weighted N = 179 529), the most recent nationally representative self-reported patient data available, estimated that 23 million adults were newly diagnosed with hemorrhoids in the prior year, 36 million adults (20% of the US population) had a diagnosis of hemorrhoids, and an estimated 7.7 million adults reported having undergone a surgical procedure for hemorrhoid symptoms.[3] In a cross-sectional study of 2813 participants from the US and Puerto Rico who underwent a colonoscopy in a colorectal adenoma prevention trial, hemorrhoids were reported in 38%.[4]

Evidence about risk factors for hemorrhoidal disease is limited.[4] Factors commonly thought to increase the risk for hemorrhoidal disease, such as heavy lifting and family history of hemorrhoidal disease, have not been well studied.

Pregnancy

A prospective cohort study of 280 pregnant women, of whom 80.5% underwent vaginal delivery, reported that 121 (43.2%) developed hemorrhoidal disease.[5] Risk factors included personal history of hemorrhoids and anal fissures (odds ratio [OR], 11.93 [95% CI, 2.18-65.30]), constipation (OR, 18.98 [95% CI, 7.13-50.54]), straining during delivery for more than 20 minutes (OR, 29.75 [95% CI, 4.00-221.23]), and birthweight of newborn greater than 3800 g (OR, 17.99 [95% CI, 3.29-98.49]). Hemorrhoidal disease was most common during the third trimester (61%) and decreased to 34.1% after delivery and 3.3% 1 month postpartum.[5] Two other studies reported no association between prior pregnancies and hemorrhoidal disease, suggesting that hemorrhoidal disease resolves postpartum.[4,6]

Constipation

An observational study of 976 patients (380 with symptomatic hemorrhoids) enrolled in a national colorectal cancer screening program in Austria reported the median constipation score was higher in patients with hemorrhoidal disease compared with patients without hemorrhoidal disease (2.5 points vs 3 points [range, 0-19; score of ≥15 indicates a diagnosis of functional constipation requiring pharmaceutical treatment]; $P = .01$).[6] A cross-sectional study of 2813 patients undergoing screening colonoscopy (38% with hemorrhoidal disease on colonoscopy report) reported that more patients with hemorrhoidal disease reported straining during bowel movements (13% vs 8%; $P < .001$), incomplete bowel emptying during defecation (13% vs 10%; $P = .04$), and hard stools (16% vs 13%; $P = .03$) compared with patients without hemorrhoidal disease.[4] Additionally, a greater proportion of patients with hemorrhoidal disease met Rome I criteria for constipation (2 or more of the following: straining >25% of the time, hard/lumpy stools >25% of the time, feelings of incomplete evacuation >25% of the time, and/or <3 bowel movements/week) than patients without hemorrhoidal disease (12% vs 8%; $P = .002$).[4]

Cirrhosis

Anorectal varices can be misdiagnosed as hemorrhoids in patients with cirrhosis and portal hypertension. Anorectal varices and hemorrhoids can coexist, but are distinct anatomic structures that require differentiation by clinical examination. Anorectal varices appear as tortuous, bluish nonprolapsing veins in the distal rectum, whereas hemorrhoidal tissues are soft, reddish purple swollen veins inside or outside of the anal canal. In a prospective study of 100 patients with cirrhosis, 63% had hemorrhoids and 44% had anorectal varices, with an increased prevalence of hemorrhoids in patients with cirrhosis and portal hypertension (59%) compared with patients with cirrhosis without portal hypertension (19%).[7]

Diarrhea

A case-control study from the Milwaukee Veterans Affairs Medical Center (N = 168) found that diarrhea was associated with the presence of hemorrhoids in patients undergoing proctoscopy (28.7% of patients with hemorrhoids vs 15.8% of controls; OR, 2.1 [95% CI, 1.2-3.7]).[8] Another case-control study of 100 patients diagnosed with hemorrhoidal disease in the Veterans Affairs system reported that patients with hemorrhoids were more likely to have colitis, intestinal malabsorption, and intestinal bypass compared with patients without hemorrhoidal disease (29.7% vs 21.4%; OR, 1.30 [95% CI, 1.27-1.33]).[9]

Anatomy and Pathophysiology

Hemorrhoids are cushions of vascular and connective tissue lining the anal canal. They are part of the normal anorectum and fill with blood during defecation, facilitating continence and protecting the anal sphincter from injury during defecation.[10]

Hemorrhoids are categorized according to their location in the anal canal relative to the dentate line, which is approximately 3 to 4 cm cephalad to the anal opening. Internal hemorrhoids are located

Figure 1. Conditions Commonly Mistaken for Hemorrhoidal Disease

Condition	Clinical appearance	Presentation	Signs and symptoms	Treatment
Anal fissure		Linear tear or cut in anal lining, usually posterior If chronic, may appear as an ulcer	Bleeding during defecation Sharp pain during and after defecation	Topical nitrates Botulinum toxin Internal sphincterotomy
Anal abscess		Tender erythematous anal mass	Painful erythematous swelling of anus, often with purulent drainage	Incision and drainage of abscess
Anal fistula		Perinanal opening or tract with purulent drainage Often with history of anal abscess	Chronic pain and discharge Irritation Wetness of perianal region	Operative drain placement with subsequent fistulotomy or fistula closure
Anal mass		Mass of perianal region	Pain or painless Bleeding independent of defecation Feelings of mass	Biopsy for diagnosis Treatment based on pathology
Internal hemorrhoidal disease		Hemorrhoid prolapse Bright bleeding with defecation	Painless bleeding Feelings of tissue protrusion from anus	Dietary and lifestyle modifications Phlebotonics (grade I or II) Office-based procedures (grade I, II, or III) Hemorrhoidectomy (grade III or IV, mixed)
Thrombosed external hemorrhoidal disease		Tender, tense blue or purple swelling	Acute severe pain with or without bleeding	≤72 h of onset: office-based excision >72 h of onset: stool softeners, analgesics, and sitz baths
Nonthrombosed external hemorrhoidal disease		Soft, nontender bluish tissue	Asymptomatic Difficulty cleaning if extra tissue	No treatment if asymptomatic Excision of external hemorrhoidal tissue in rare circumstances (ie, surgical removal if severe hygiene issues)

above the dentate line and are covered with columnar epithelium. The internal hemorrhoid plexus is responsible for approximately 15% of resting anal tone, aiding the anal sphincter to prevent fecal incontinence.[11]

Anatomic studies show that in patients with internal hemorrhoidal disease, the anchoring muscular support of internal hemorrhoids loses its integrity, leading to engorgement and abnormal dilation of the internal hemorrhoid venous plexus, resulting in bleeding. Loss of structural support also results in downward displacement or prolapse of internal hemorrhoidal tissue into or out of the anal canal.[12]

External hemorrhoids are located below the dentate line. They are covered with squamous epithelium, innervated by the cutaneous branches of the pudendal nerve, formed from ventral rami of the sacral spinal nerves S2, S3, and S4. In patients with external hemorrhoidal disease, veins beneath the skin dilate causing painless hemorrhoidal swelling. However, thrombosis of these veins causes acute pain.

Clinical Presentation

Internal hemorrhoidal disease presents with painless bleeding and/or prolapse of internal hemorrhoidal tissue prompted by a bowel movement or other Valsalva-inducing activities such as coughing or straining. Typical hemorrhoidal bleeding results in blood adherent to the outside of formed stool or dripping into the toilet during defecation. Blood mixed with stool or melena indicates a more proximal gastrointestinal source of bleeding. Prolapsing internal hemorrhoids can deposit mucous secretions on the perianal skin, causing wetness and itching. A multicenter observational study of 3505 patients presenting with internal hemorrhoidal disease (grades I-IV) reported that 94.9% had anal pain, 89.4% had anal discomfort,

Box 1. Key Points of Managing Hemorrhoidal Disease

All patients with symptoms of hemorrhoids (anal pain, bleeding, mass) should undergo external anal inspection, digital rectal examination, and anoscopy to obtain an accurate diagnosis before treatment.

Hemorrhoids with no bothersome symptoms do not require treatment. When hemorrhoid symptoms occur, most can be managed without operative measures.

Symptomatic internal hemorrhoids usually cause bleeding (and prolapse).

Symptomatic external hemorrhoids usually cause pain (and thrombosis).

Rubber band ligation is first-line treatment for in-office treatment of hemorrhoids unresponsive to medical therapy.

Excisional hemorrhoidectomy is first-line therapy for recurrent or prolapsing hemorrhoids or for control of external disease.

60.8% had perianal itching, 60.6% had swelling, and 57.9% had rectal bleeding.[13] An Austrian prospective cohort study of 976 patients reported that, of the 38.9% of patients noted to have prominent hemorrhoidal tissue at the time of colonoscopy, 44.7% had hemorrhoidal symptoms consistent with hemorrhoidal disease and 55.3% were asymptomatic.[6] Rarely, the anal sphincter may trap prolapsing hemorrhoids outside of the anus, limiting blood circulation and resulting in hemorrhoidal strangulation and necrosis.

External hemorrhoids are located at the external anal orifice. Because external hemorrhoids may be irregularly shaped, they can be difficult to clean after a bowel movement, leading to pruritus from prolonged exposure of perianal skin to fecal material. External hemorrhoids can develop thrombosis within their vascular tissue, resulting in acute onset of sharp pain and swelling at the anal opening. Patients with a thrombosed external hemorrhoid present with severe anal pain and a bluish-purple, firm perianal mass easily seen on examination. Thrombus erosion through hemorrhoidal tissue may cause bright red bleeding. After resolution, thrombosed external hemorrhoids can leave a painless skin tag that is irritating and may impede anal hygiene. Mixed hemorrhoids involve abnormalities of both internal and external hemorrhoid tissue and may present with a combination of characteristic symptoms.

Assessment and Diagnosis

For individuals presenting with anorectal pain, pressure, bleeding, irritation, or a sensation of tissue prolapse, clinicians should inquire about the characteristics, frequency, and severity of symptoms.[14] The history may suggest other anal diseases such as anal fissure or anorectal cancer, which can mimic the common hemorrhoidal symptoms of pain, pressure, and bleeding. Sharp, burning pain after a bowel movement typically indicates an anal fissure, while bleeding independent of bowel movements is concerning for anorectal cancer. An observational study from a high-volume hemorrhoid clinic of 500 patients presenting with a chief concern of hemorrhoid reported that only 50% had diseased hemorrhoidal tissue.[15] Daily fiber and water intake, toileting habits such as straining during bowel movements, and conditions such as constipation and chronic diarrhea should also be assessed.

On physical examination, external hemorrhoids can be visualized at the anal orifice after spreading the buttocks. Chronically prolapsed internal hemorrhoids (grade III-IV) appear as fleshy mucosal tissue protruding through the anal canal, sometimes causing excoriation and deposits of fecal material and mucus on the perianal skin. External inspection of the anus may also reveal nonhemorrhoidal causes of pain or bleeding, such as anal fissures, which are most commonly located in the posterior anal canal and appear as a tear or ulceration. Anal abscesses and fistulae present with purulent drainage accompanied by localized erythema and edema in the surrounding tissues (**Figure 1**).

Clinicians should perform a digital rectal examination to determine the tone and thickness of the anal sphincters at rest and during voluntary contraction, with the patient squeezing a gloved finger. A gaping or patulous anal canal or anal muscles that do not contract strongly around a gloved finger may indicate risk of fecal incontinence (**Box 1**).

Patients presenting with anorectal symptoms unexplained by external examination should undergo diagnostic anoscopy, typically performed by gastroenterologists, colorectal surgeons, and some primary care clinicians, to visualize the anus and distal rectum.[16,17] If anoscopy findings are normal, a colonoscopy is recommended,[18] especially in individuals with a family history of colorectal cancer, changes in bowel habits, or abdominal pain.[19,20] A population-based study of 76 186 patients undergoing colonoscopy for hematochezia reported hemorrhoids (64.4%), diverticulosis (38.6%), polyp (38.8%), and malignancy (2%) during colonoscopy.[18]

Internal hemorrhoids identified during anoscopy are classified based on the extent of prolapse from the anus, which helps determine appropriate treatment. Grade I indicates prolapse into the anal canal; grade II, prolapse during straining but retract spontaneously; grade III, prolapse out of the anal canal and require manual reduction; and grade IV, prolapse out of the anus and cannot be manually returned to their proper position.[21] The above-mentioned prospective study of 976 patients undergoing colonoscopy in an Austria nationwide colorectal cancer screening program reported that 38.9% of patients had internal hemorrhoidal disease. At colonoscopy, 72.9% had grade I internal hemorrhoids, 18.4% had grade II, 8.2% had grade III, and 0.53% had grade IV.[22]

Patients with rectal bleeding not associated with bowel movements should undergo colonoscopy to evaluate for colorectal cancer.[23,24] The utility of colonoscopy for patients with rectal bleeding who have a clear anorectal source of bleeding, such as bleeding internal hemorrhoid tissue or anal fissure, is unclear. A meta-analysis of 8 cross-sectional and 1 case-control study that included 4162 patients with rectal bleeding undergoing colonoscopy reported that the prevalence of neoplastic lesions (adenomas, carcinomas) was 10% in patients younger than 50 years and 7% in patients younger than 40 years.[24] A single-center cross-sectional study of colonoscopy (n = 12 408) for screening and diagnostic purposes (hematochezia, abnormal bowel habits, abdominal pain) reported that patients with hemorrhoids had more adenomas compared with patients without hemorrhoids (mean of 1.16 vs 0.76; OR, 1.24 [95% CI, 1.2-1.23]).[25] Based on evidence of moderate quality, the American Society for Gastrointestinal Endoscopy recommends flexible sigmoidoscopy for patients younger than 40 years with scant intermittent hematochezia (occasional small amounts of bright red

blood, often noted after defecation, without significant volume) who do not have risk factors for colorectal cancer and colonoscopy for patients 50 years and older or for patients of any age with symptoms concerning for colorectal cancer (such as blood mixed with stool, iron deficiency anemia, or an unexplained change in bowel habits from baseline).[26]

Management

Clinical practice guidelines (American College of Gastroenterology and American Society of Colorectal Surgeons) state that patients with asymptomatic hemorrhoids do not require treatment.[17,26] Patients with symptoms affecting quality of life have a variety of treatment options depending on symptoms, location of hemorrhoidal disease, and individual preference. Typically, the least invasive treatment options should be used first. Noninvasive treatments for hemorrhoids are provided by primary care clinicians, gastroenterologists, or surgeons. (**Box 2**)

Box 2. Commonly Asked Questions

What is the differential diagnosis for hemorrhoidal disease?
The differential diagnosis for hemorrhoidal disease includes anal fissure (sharp anal pain after bowel movement), anal abscess (gradual onset of anal pain, warm induration), anal fistula (perianal purulent drainage), anal cancer (palpable mass), and anorectal varices (rectal bleeding in a patient with cirrhosis and portal hypertension).

What dietary and lifestyle modifications are recommended for patients with hemorrhoidal disease?
All patients with hemorrhoidal disease should eat a high-fiber diet (20-30 g of fiber daily), drink adequate amounts of water (5-6 glasses of water daily), and avoid straining or prolonged toilet time during a bowel movement.

What patients with hemorrhoids should be referred for surgery?
Surgical consultation is recommended for patients experiencing persistent, bothersome hemorrhoidal disease symptoms that interfere with quality of life, such as prolapsing anal tissue or anal bleeding, that do not improve with treatment of constipation, dietary modifications, or nonoperative treatments such as phlebotonics. In addition, patients with abnormal anorectal findings such as stricture, anal mass, or anal pain without a clear source should undergo surgical evaluation.

Dietary and Lifestyle Modifications

Modifying hemorrhoidal risk factors, such as straining, can improve symptoms and reduce need for further treatment.[4] Increased water and fiber intake also reduces hemorrhoidal disease symptoms. In a prospective observational study, 102 patients referred for surgery for grade III and IV hemorrhoidal disease participated in a TONE program (T, 3 minutes to defecate; O, once-a-day defecation; N, no straining during passing movements; E, enough fiber [5-6 teaspoons psyllium husk daily]). In this study, hemorrhoidal prolapse improved in 56.5% of patients and remained unchanged in 25.9%, and 12.9% underwent a surgical procedure for hemorrhoidal symptoms. The percentage of patients with bleeding decreased from 71.8% before the intervention to 29.4% at 40 months after the intervention.[27]

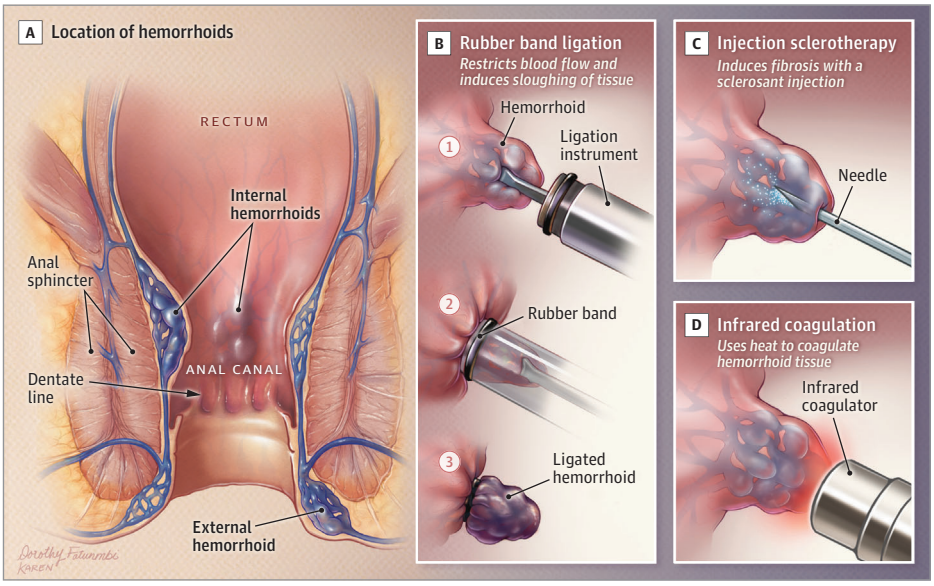
A systematic review and meta-analysis (7 RCTs with 378 participants with symptomatic hemorrhoids) reported fiber supplementation (7-20 g per day of various insoluble fiber sources) reduced the risk of rectal bleeding compared with placebo (RR, 0.50 [95% CI, 0.28-0.89]), with persistent bleeding ranging from 7% to 31% for fiber and 38% to 76% for placebo.[28] However, fiber intake did not improve hemorrhoidal prolapse, pain, or itching.[28] For patients with hemorrhoidal disease, the American College of Gastroenterology recommends intake of 20 to 30 g of oral fiber (in the form of fibrous foods such as fruits, vegetables, and whole grains or with fiber supplementation such as psyllium husk) and 5 to 6 glasses of water daily to pass soft stool regularly (daily) with minimal to no straining.[26] A sitz bath, which involves sitting in warm water for 10 to 20 minutes, is commonly recommended to alleviate discomfort from hemorrhoidal disease, despite lack of evidence to support its use to reduce hemorrhoid-associated pain.[29]

Medical Therapy

Topical therapies for hemorrhoidal disease, including creams, suppositories, and astringents, are available over the counter and by prescription. An analysis of a 2014 US commercial claims database including 227 638 hemorrhoid-related claims reported that 52% of patients with at least 1 hemorrhoidal-related claim received 1 or more prescription medication, most commonly topical hydrocortisone (98%).[30] Over-the-counter medication use may be more frequent, although there is no high-quality evidence about their use or benefit. Guidelines from the American Society of Colon and Rectal Surgeons and the Italian Society of Colon-Proctology conditionally support topical therapies as first-line medical therapy because they are low-risk, can provide symptom relief for mild hemorrhoidal bleeding, and may help avoid or delay surgery by temporarily alleviating symptoms.[17,31] A prospective observational study of 88 pregnant women with hemorrhoidal disease during the third trimester prescribed hydrocortisone acetate with pramoxine hydrochloride (an anesthetic) reported, on a scale ranging from 0 (no improvement) to 10 (maximal improvement), reduced hemorrhoid-related pain (pre- vs posttreatment: 6.4 vs 1.7), decreased pruritus (4.9 vs 1.3), and reduced swelling (6.8 vs 2.7) ($P < .001$ for all comparisons; scale not validated).[32]

Phlebotonics (eg, calcium dobesilate), medications used for venous insufficiency that include plant extracts such as flavonoids, may improve some hemorrhoidal symptoms. A meta-analysis studying a variety of symptoms (2-5 RCTs for each symptom with 149-368 patients each) reported that, compared with placebo, individuals receiving phlebotonics had less pruritus (143 vs 33 patients per 1000; OR, 0.23 [95% CI, 0.07-0.79]), decreased bleeding (115 vs 25 per 1000; OR, 0.12 [95% CI, 0.04-0.37]), decreased rectal leakage (266 vs 67 per 1000; OR, 0.12 [95% CI, 0.04-0.42]), and improvement in overall symptoms (566 vs 938 per 1000; OR, 15.99 [95% CI, 5.97-42.84]) with no adverse effects. However, the effect of phlebotonics was not significant for complete pain relief (527 vs 111 per 1000; OR, 0.11 [95% CI, 0.01-1.11]).[33]

Figure 2. Rubber Band Ligation of Internal Hemorrhoid Tissue



Office-Based Procedures for Internal Hemorrhoidal Disease

In-office procedures, including rubber band ligation, injection sclerotherapy, and infrared coagulation, can be used for grade I, grade II, and select grade III internal hemorrhoidal disease if dietary, lifestyle, and medical interventions are ineffective. Although these office-based procedures have less durable effects than excisional hemorrhoid surgery, they provide symptom relief and avoid adverse effects associated with surgery.[17] In a 2005 Cochrane review of 3 RCTs (n = 202), compared with rubber band ligation, surgical hemorrhoidectomy was associated with increased pain (100% [60/60] vs 20% [12/60]; RR, 1.94 [95% CI, 1.62-2.33]) and more delayed complications (anal stenosis, flatus, incontinence, anal skin tags: 7.9% [8/101] vs 0% [0/103]).[34]

The 3 office-based procedures use different strategies to treat diseased internal hemorrhoidal tissue. Rubber band ligation is performed during in-office anoscopy or colonoscopy using a special applicator.[35] An elastic band is placed around the base of internal hemorrhoid tissue, causing tissue necrosis and sloughing within 7 to 14 days (**Figure 2**), followed by scarring that prevents prolapse and tissue engorgement. Applied above the dentate line, rubber band ligation avoids the somatic nerves, minimizing pain while causing mild, transient pressure lasting minutes to hours (**Video**). Improper band placement below the target site causes pain during the procedure and requires removal of the band. Rubber band ligation can be repeated for recurrent or new internal hemorrhoid disease with minimal risk of pain and bleeding, offering a treatment option for recurrence.[36]

A single-center prospective study of 2635 patients with grade I to IV internal hemorrhoids reported that 86.7% were asymptomatic at week 8 after rubber band ligation.[37] At 2 years, 15.5% of participants had recurrent hemorrhoidal disease and underwent either repeat rubber band ligation or surgical hemorrhoidectomy.[37] Rubber band ligation may also be considered for patients with mixed hemorrhoidal disease. In the abovementioned study, 28% (738 of 2635) of patients with mixed hemorrhoidal disease underwent rubber band ligation targeting the internal hemorrhoids. At 2-year follow up, 84.5% were asymptomatic.[37]

The frequency of complications after rubber band ligation ranges from 3% to 23%. A prospective observational study of 2635 patients with grade II to IV internal hemorrhoids treated with rubber band ligation reported a short-term frequency of complications of 22.5%, most commonly rectal pain (16.2%) and bleeding (2.9%). Moderate bleeding (not requiring blood transfusion) was observed in 0.3% of patients.[37] Patients taking anticoagulants (ie, warfarin) may have an increased bleeding risk during rubber band ligation.[38,39] A study with 805 patients, of whom 48 were using antithrombotic agents, reported bleeding in 25% (2/8) taking warfarin and 7.5% (3/40) taking aspirin/nonsteroidal anti-inflammatory drugs vs 2.8% (22/765) in patients who were not receiving anticoagulation ($P < .001$).[39] A retrospective study of 364 patients who discontinued antithrombotic and anti-inflammatory medication (aspirin, nonsteroidal anti-inflammatory drugs, clopidogrel, coumadin) 7 to 10 days before rubber band ligation reported bleeding in 3.7% of patients.[40] Pelvic sepsis, a rare complication after rubber band ligation, presents as fever and perineal pain and may cause a necrotizing infection if not promptly treated with antibiotics and abscess drainage or debridement.[41]

Injection sclerotherapy delivers sclerosants (ie, phenol in 5% almond oil [contraindicated in patients with tree nut allergies] or polidocanol foam) into hemorrhoidal tissue during anoscopy, inducing fibrosis to reduce bleeding and prolapse (**Figure 3**B). A systematic review and meta-analysis (6 RCTs, 3 cohort studies; n = 1569) reported that compared with rubber band ligation, sclerotherapy was less effective for controlling bleeding (66.4% vs 93.1%; RR, 1.34 [95% CI, 1.12-1.60]) and prolapse (78.7% vs 89.1%; RR, 1.17 [95% CI, 1.02-1.34]), but was associated with less postprocedural pain (14% vs 24%; RR, 0.58 [95% CI, 0.44-0.76]).[42]

Infrared coagulation delivers energy within the infrared wavelength spectrum via a probe during anoscopy, targeting insensate hemorrhoidal tissue above the dentate line. A controlled pulse of 1 to 1.5 seconds induces necrosis and scarring, reducing hemorrhoidal bleeding and tissue prolapse (Figure 3A).

A meta-analysis of 18 RCTs with 1617 participants compared rubber band ligation with injection sclerotherapy or infrared coagulation for treatment of internal hemorrhoids. Rubber band ligation was superior to injection sclerotherapy for improvement in bleeding and pain (83% vs 70%; $P = .005$) and for hemorrhoids stratified by grade (grades I to II: 90% vs 72%; $P = .007$; grade III: 95% vs 92%; $P = .04$), with no difference in frequency of complications ($P = .35$). A total of 30.8% of patients treated with infrared coagulation needed additional interventions to manage hemorrhoidal symptoms vs 11.4% of those treated with rubber band ligation ($P = .001$).[43]

Evidence-based guidelines recommend rubber band ligation as the first-line in-office treatment for internal hemorrhoid disease.[17,26]

Figure 3. Prolapsing Grade IV Internal Hemorrhoid Tissue With Prominent External Component Before and After Excisional Hemorrhoidectomy

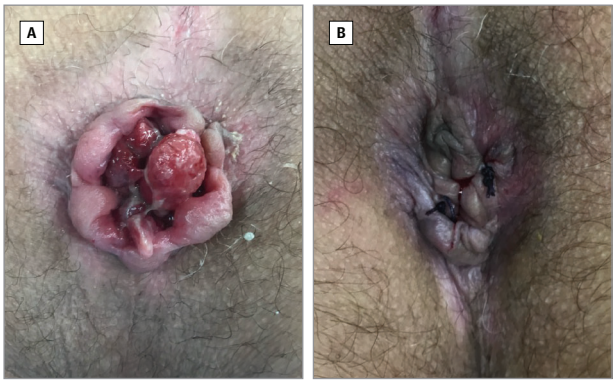
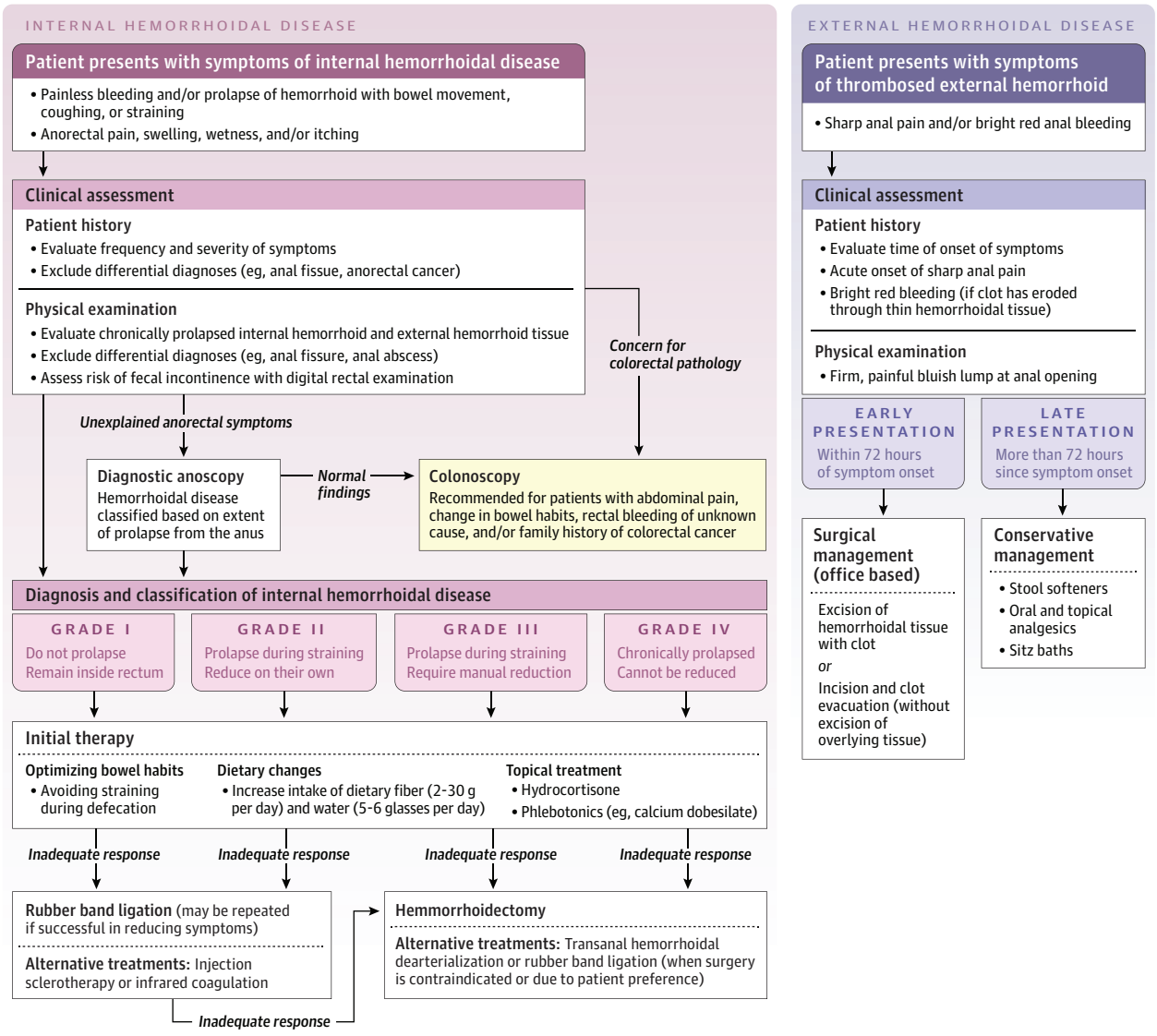


Figure 4. Hemorrhoid and Thrombosed External Hemorrhoid Treatment Algorithm



Algorithms are based on expert opinion and have not been tested in randomized trials.

Injection sclerotherapy and infrared coagulation are alternatives for patients seeking to decrease postprocedure discomfort.[17]

External Hemorrhoidal Thrombosis

Treatment of a thrombosed external hemorrhoid varies based on timing after symptom onset: within 72 hours, in-office clot evacuation reduces pain and risk of repeat thrombosis; after 72 hours, conservative management (stool softeners, oral/topical analgesics such as 5% lidocaine, sitz baths) is preferred but may not prevent recurrence.[44-46]

A retrospective study of 231 patients with thrombosed external hemorrhoids reported that, compared with conservative management, surgical treatment, performed in 48.5% of patients in the group, resolved symptoms (pain, bleeding, lump) faster (3.9 days vs 24 days; $P < .001$) and was associated with decreased recurrence (6.3% vs 25.4%; $P < .005$).[46] Another retrospective study of nonoperative management of external hemorrhoid thrombosis (n = 504) reported median symptom improvement at 5 (range, 1-23) days and median symptom resolution at 8 (range, 1-45) days.[47]

Surgical Treatment of Hemorrhoidal Disease

Guidelines from the American College of Gastroenterology recommend surgical referral for patients with large grade III/IV internal hemorrhoidal disease not improved with office-based treatments, such as rubber band ligation, or mixed hemorrhoidal disease. Surgery should also be considered for individuals unable or unwilling to undergo an office-based procedure while awake (eg, positioning difficulties, anxiety).[26]

Approximately 10% of patients with hemorrhoidal disease undergo surgery.[48] Excisional hemorrhoidectomy, which is first-line surgical treatment, involves excision of abnormal hemorrhoidal tissue under anesthesia using a closed procedure (wound sutured) or open procedure (wound left open to heal) (**Figure 4**).[49-52] A meta-analysis of 11 RCTs (n = 1326) comparing the most common techniques of excisional hemorrhoidectomy (open vs closed hemorrhoidectomy) reported a similar overall risk of hemorrhoidal symptom recurrence (5.8%-6.5% over 2-24 months) and overall complications (16.4%-19.5%) associated with both techniques of excisional hemorrhoidectomy.[53]

A Cochrane review reported that open hemorrhoidectomy may be more effective than rubber band ligation in achieving complete remission of hemorrhoid symptoms (89.3% vs 50.0%; RR, 1.68 [95% CI, 1.00-2.83]), with fewer patients requiring repeated treatment (10.7% vs 50.0%; RR, 0.20 [95% CI, 0.09-0.40]).[34] An analysis based on hemorrhoidal grading showed that excisional hemorrhoidectomy was more effective than rubber band ligation for grade III hemorrhoidal disease (RR, 1.23 [95% CI, 1.04-1.45]) but not for grade II disease (RR 1.07 [95% CI, 0.94-1.21]). However, time taken off from work was longer with excisional hemorrhoidectomy.[34]

Adverse effects after excisional hemorrhoidectomy include postoperative pain,[54-63] bleeding,[64-66] urinary retention,[67,68] and alterations in bowel habits (ie, fecal incontinence).[69-72] A systematic review of 98 RCTs (n = 7827) reported postoperative complications after excisional hemorrhoidectomy, including bleeding in 6.2% (95% CI, 4.5%-8.0%), fecal incontinence in 4.8% (95% CI, 2.9%-6.7%), and urinary retention in 3.4% (95% CI, 2.1%-4.7%).[73] Bleeding occurs within 7 to 10 days of the surgical procedure due to suboptimal hemostasis or wound breakdown. Postoperative urinary retention, which is more prevalent in males, is transient but may require temporary urinary catheterization.[74] Fecal incontinence after excisional hemorrhoidectomy may be temporary due to postoperative inflammation and edema that interferes with proper approximation of sphincter muscles or persistent due to sphincter injury, particularly in patients with preoperative incontinence.[75]

Transanal hemorrhoidal dearterialization is a minimally invasive procedure that involves ligating the arteries supplying blood to the diseased internal hemorrhoidal tissue, thereby reducing blood flow and promoting regression over time. This technique does not involve tissue removal and thus may produce less pain than traditional excisional surgery. The American Society of Colon and Rectal Surgeons conditionally recommends transanal hemorrhoidal dearterialization as a treatment option for internal hemorrhoid disease because it produces less discomfort than excisional hemorrhoidectomy, but has higher recurrence rates.[17] A multicenter RCT (6 centers; n = 80) reported that patients who underwent excisional hemorrhoidectomy received more pain medication (87.8% vs 53.8%; $P = .002$) in postoperative week 2 compared with patients who received transanal hemorrhoidal dearterialization.[76] Another RCT (n = 98) reported higher recurrence of prolapse at 1 year with transanal hemorrhoidal dearterialization compared with excisional hemorrhoidectomy (59% vs 31%; $P = .008$), with similar Hemorrhoidal Disease Symptom Score results.[77]

Limitations

This review has several limitations. First, it is not a systematic review and the quality of evidence was not formally evaluated. Second, articles may have been missed during the literature search. Third, this review included a small number of RCTs due to the limited availability of high-quality, relevant trials.

Conclusions

Hemorrhoidal disease affects 10 million people in the US, with initial treatment consisting of increased fiber intake, avoidance of straining during defecation, and phlebotonics. For persistent grade I to III internal hemorrhoid disease, rubber band ligation is recommended as a first-line treatment. Excisional hemorrhoidectomy is reserved for grade III/IV internal hemorrhoidal disease, thrombosis, or mixed hemorrhoidal disease refractory to less invasive approaches.

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