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Key Concepts

- Hemorrhoids represent a sizeable source of patient morbidity, with a broad array of associated symptoms.
- Knowledge of anorectal and hemorrhoid anatomy is critical to selecting the appropriate treatment.
- Minimizing straining, improving hydration, and increasing fiber intake are the first step for patients with symptomatic hemorrhoids.
- Most office procedures are best suited for symptomatic grade I–III internal hemorrhoids or thrombosed external hemorrhoids.
- One's armamentarium should include a variety of techniques for symptomatic hemorrhoids to optimize outcomes and provide individualized therapy.
- Complications of hemorrhoid surgery include urinary retention, bleeding, infection, stenosis, incontinence, and recurrence.
- Special considerations include pregnant patients, as well as those with Crohn's disease, immunocompromise, or portal hypertension.

Epidemiology

Although hemorrhoids have been described since Biblical times, they continue to mystify most providers and patients [1]. Accordingly, they are one of the most common health conditions searched on the Internet [2, 3]. Hemorrhoidal disease is estimated to affect approximately 4% of the US population [4]. The true incidence of symptomatic hemorrhoids is likely underestimated due to limitations in establishing a

clear diagnosis and under-reporting of symptoms to health care providers. Hemorrhoidal disease accounts for over three million outpatient office visits per year, at an estimated cost of over 770 million dollars [5]. Hemorrhoid symptoms affect men and women with equal frequency, with the highest incidence between age 45 and 65 [6]. Symptomatic hemorrhoids are more common in individuals from higher socioeconomic backgrounds and in whites [7].

Anatomy

As anatomic structures, hemorrhoids are part of normal human anatomy. Hemorrhoids are arteriovenous structures that lie in the submucosal layer within the anal canal. Their three primary locations (left lateral, right anterior, right posterior) receive arterial inflow from the terminal branches of the superior hemorrhoidal and middle hemorrhoidal arteries (Fig. 11.1). Venous outflow is from the superior, middle, and inferior hemorrhoidal veins, which drain into the internal pudendal vein and then the inferior vena cava.

Hemorrhoids are classified as either internal or external based on their anatomic relationship to the dentate line. Internal hemorrhoids are proximal to the dentate line, and external hemorrhoids are distal (Fig. 11.2). The term "mixed" hemorrhoids applies to a hemorrhoid complex containing both an internal and external component. Internal hemorrhoids have overlying columnar mucosa, whereas external hemorrhoids have overlying modified squamous epithelium (anoderm).

Internal hemorrhoids are graded based on the degree of prominence and prolapse [8]. The grading system is useful clinically for characterizing the hemorrhoids and selecting appropriate treatments (Fig. 11.2). *Grade I* hemorrhoids are visibly engorged but do not prolapse below the dentate line. *Grade II* hemorrhoids prolapse below the dentate on Valsalva or defecation but spontaneously reduce. *Grade III* hemorrhoids prolapse but require manual reduction. *Grade IV* are prolapsed and not reducible.

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Fig. 11.1 Hemorrhoid anatomy

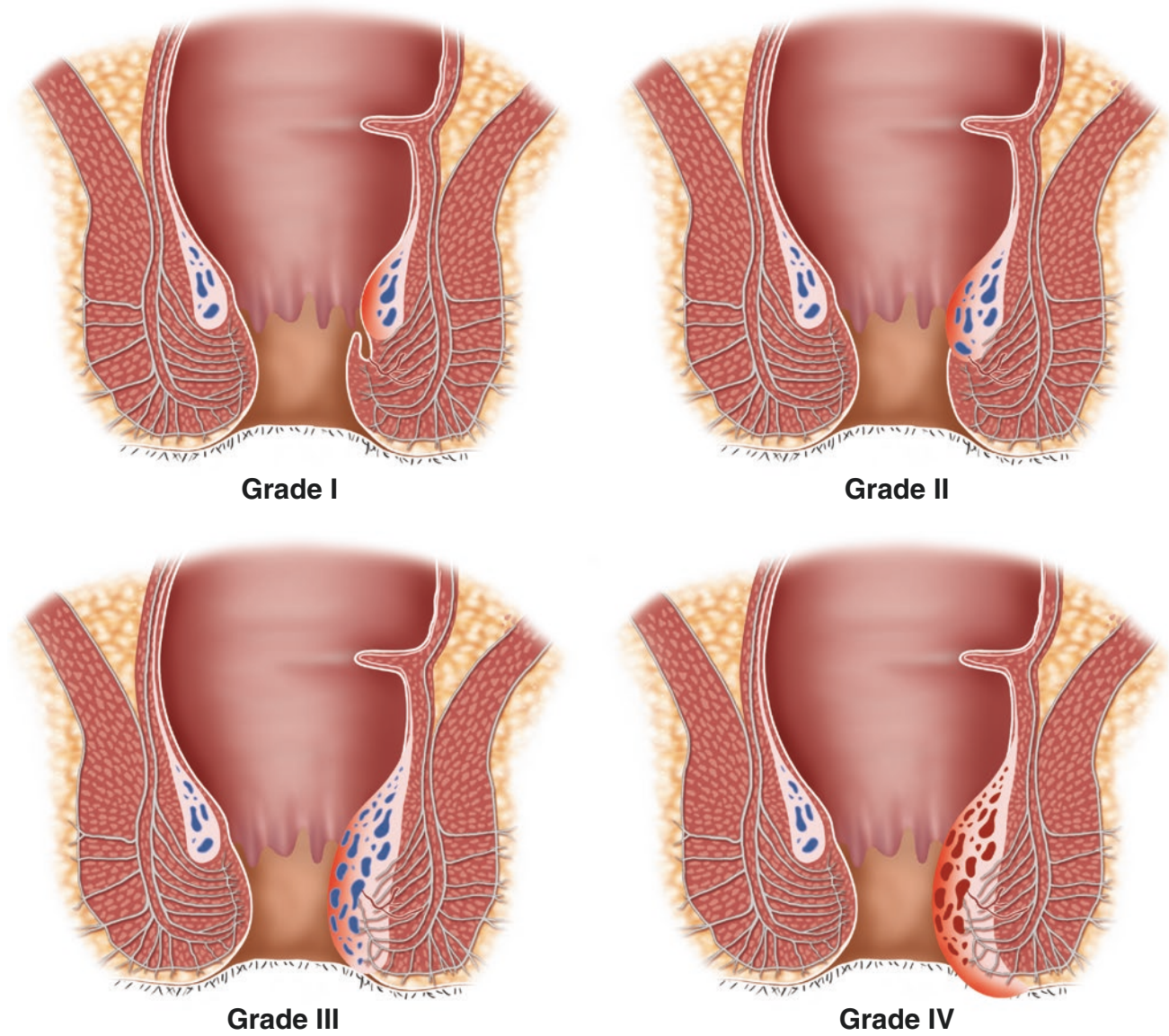
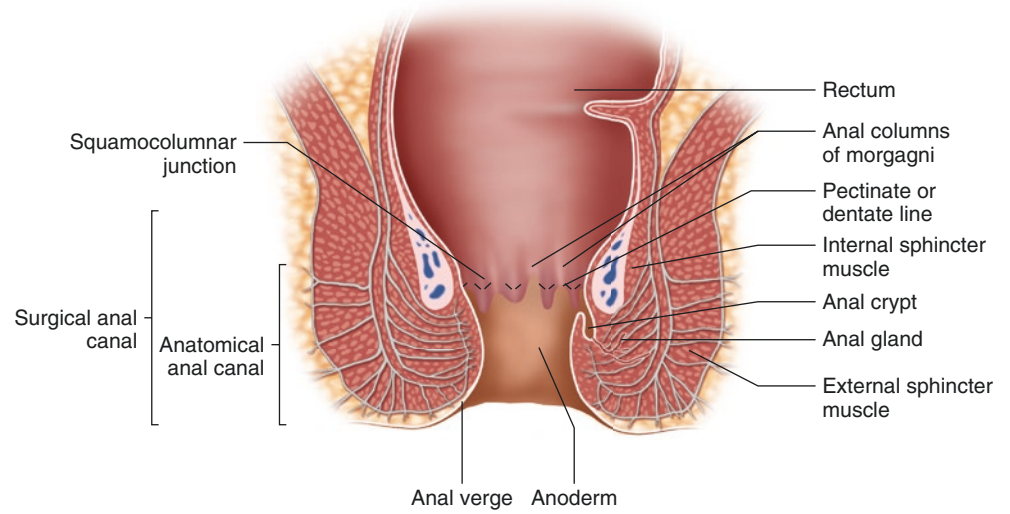


Fig. 11.2 Hemorrhoid classification and grading system

Other clinically important descriptions of hemorrhoids include “strangulated” hemorrhoids, which are grade IV that have become edematous to the point of compromised blood supply, leading to necrosis or gangrene in extreme cases (Fig. 11.3). Thrombosed hemorrhoids are typically external



Fig. 11.3 Strangulated, gangrenous hemorrhoids. (Courtesy of Carrie Y. Peterson, MD)

and contain a clot under pressure, causing them to have a rounded, bluish appearance (Fig. 11.4). The distinction between anal “skin tags” and external hemorrhoids is somewhat obscure but is often of great concern to patients. Although anal skin tags are somewhat synonymous with external hemorrhoids, they are typically considered those that are less engorged and bluish in color and are characterized by redundant anoderm. Often a skin tag will develop after a thrombosed hemorrhoid has fully resolved and the clot has absorbed.

Understanding hemorrhoid innervation and sensation is essential to establish the correct diagnosis and select the appropriate treatment strategy [9]. Internal hemorrhoids have visceral innervation, and thus are sensitive to pressure but not pain or temperature. External hemorrhoids have somatic innervation and are exquisitely sensitive to pain and temperature. Importantly, hemorrhoids contribute to up to 20% of baseline continence, acting as a passive buttress to block seepage of stool, and they also engorge on Valsalva and thus potentiate their effect; this may have important implications on patients’ bowel function after hemorrhoid procedures, particularly individuals who have marginal continence [10].

Pathogenesis

Multiple theories exist to explain the development of hemorrhoidal disease in some individuals. Only about 40% of those with enlarged hemorrhoids are symptomatic [11]. Straining



Fig. 11.4 Thrombosed external hemorrhoid

is felt to be a major contributor—most commonly straining with defecation as is typically encountered with constipation, due to either hard stools or pelvic outlet dysfunction. Patients who frequently Valsalva may also be at risk, with common examples being weightlifters or patients with COPD or chronic cough. Compared to a more natural “squatting” position, the typical Western commode requires its users to strain in an unnatural fashion to defecate and may be a contributor to hemorrhoid pathology. Conditions with impaired venous return, including the later stages of pregnancy or pelvic outlet dysfunction, are associated with hemorrhoid engorgement and eventual tissue swelling and laxity. Very little is understood regarding genetic factors contributing to hemorrhoidal disease, although a genome-wide association study (GWAS) found particular mutations associated with the condition [12]. On a tissue level, matrix metalloproteinases, vascular endothelial growth factor (VEGF), and nitric oxide synthase have all been shown to be associated with hemorrhoidal disease [13]. In addition to vessel engorgement, neovascularization may also play an important role [14].

Clinical Presentation

Frequently, anorectal symptoms are incorrectly attributed to hemorrhoids, by both patients and physicians unfamiliar with the associated symptoms and exam findings. A thorough history and physical exam are essential in correctly identifying hemorrhoidal disease and excluding the many other benign and malignant conditions that must be considered.

The most common symptoms associated with internal hemorrhoids are bleeding, pain, and tissue protrusion [15]. Painless bleeding with bowel movements accompanied by intermittent protrusion of tissue from the anal canal are the classic symptoms of enlarged internal hemorrhoids. The bleeding is usually bright red and is commonly described as on the toilet tissue, dripping, or even squirting into the toilet water. The degree of prolapse is also variable and may be intermittent or persistent and spontaneously reduce, require digital manipulation or may not be reducible. Other common symptoms of internal hemorrhoids include rectal pressure, mucus discharge, and soiling of undergarments with stool seepage. Although it can appear significant to patients, bleeding from hemorrhoids is rarely the cause of anemia, although possible with chronic substantial blood loss. Pain is not typically associated with internal hemorrhoids unless they are prolapsed and strangulated, which is not a subtle finding. In fact, the presence of pain should prompt the clinician to question the diagnosis in favor of other perianal processes, such as thrombosed external hemorrhoid, anal fissure, or abscess.

Common symptoms associated with external hemorrhoids include itching, irritation, perianal moisture, and difficulty with hygiene. External hemorrhoids do not cause pain unless thrombosis is present. In this instance, a firm nodule that has a blue or purple tinge is visible and palpable at the anal orifice (Fig. 11.4). These may be nontender or exquisitely painful, and the contained clot can erode through the overlying stretched skin. Spontaneous resolution of thrombosed external hemorrhoids often leaves a skin tag. These may reduce in size over time, but typically do not regress completely, and may be associated with symptoms such as itching and difficulty cleansing the region.

History

The diagnosis of hemorrhoidal disease is almost always a clinical one and should start with a medical history, with great care taken to identify associated symptoms and risk factors. Focus should be on the extent, severity, and duration of symptoms such as bleeding and extent of prolapse, issues of perineal hygiene, and presence or absence of pain. A careful review of fiber intake and bowel habits, including frequency, consistency, and ease of evacuation, should also be performed, as constipation predisposes patients to hemorrhoidal disease. Additionally, acute changes in bowel habits associated with bleeding may signify a more ominous cause, such as inflammatory bowel disease or neoplasm. All patients should be asked about other factors that are related to development of hemorrhoidal disease such as chronic heavy lifting or chronic cough from asthma or chronic obstructive pulmonary disease, or unusual toileting behavior such as withholding or limited access to bathroom facilities. Specific note should be made of anticoagulant use, fecal incontinence symptoms, previous anorectal surgery, obstetric history, and history of radiation to the pelvis, because these may affect management decisions.

Physical examination can be done in the prone or lateral decubitus position. Findings should be noted in anterior–posterior and right–left terms and documented as such. The examination begins with inspection of the gluteal cleft and then, with gentle retraction of the buttocks, inspection of the perianal area and perineum. The skin is inspected for findings such as external hemorrhoids, skin tags, condyloma, skin breakdown, fistulous openings, fissures, erythema, scars, masses, and any gape of the anus at rest. Digital rectal examination should evaluate for other anal pathology and sphincter integrity. Anoscopy should be performed to assess the anatomy [16]. Internal hemorrhoids, located above the dentate line, should be assigned a grade, which will help guide therapy. In addition, an evaluation of the patient while straining on the commode will assist in the diagnosis of hemorrhoid prolapse, as well as exclude full-thickness rectal

prolapse. Laboratory or radiographic studies are not typically required for diagnostic purposes.

Although hemorrhoids are the most common reason for hematochezia, other disease processes, such as colorectal cancer or polyps, inflammatory bowel disease, other colidities, diverticular disease, and angiodysplasia, can also precipitate bleeding [17]. While the majority of patients with hematochezia will not have colorectal cancer, rectal bleeding attributed to hemorrhoids represents the most common missed opportunity to establish a cancer diagnosis [18]. Any patient with age greater than 45, or with a change in bowel habits, anemia, weight loss, or those with a family history of colorectal cancer or suggestive of hereditary nonpolyposis colorectal cancer or Lynch syndrome, should be further examined with colonoscopy [19].

Treatment

Patients generally seek treatment for hemorrhoids once they experience symptoms. Unless patients are presenting in an acute fashion with heavy bleeding, thrombosis, or strangulation, simple non-procedural strategies are the first-line approach. An initial trial of conservative management is typically employed for a period of 6–8 weeks, at which point in-office reassessment is warranted, to determine response to treatment and decide whether further interventions are needed.

Medical Management

Stool Habits

Patients should be encouraged to maintain stooling habits that promote a healthy anal canal by minimizing pressure and strain on the hemorrhoids. Specifically, patients should be educated to avoid sitting on the toilet for prolonged periods of time (discourage reading on the toilet!). The act of defecation should not take more than just a few minutes; if an attempt is unproductive, the patient should get up and try again later when the urge returns. A foot stool will promote a more natural “squatting” position and may help those who endorse straining, or those with a component of pelvic outlet dysfunction constipation [20].

Stool Texture

Critical to alleviating hemorrhoid symptoms is improving the texture of the stool, with the goal of having soft, yet formed stools with adequate bulk [21]. Fiber acts as a “sponge” and prevents stool from becoming overly hard or loose depending on dietary variation or occasional indiscretions. This can be accomplished by supplementing the diet with soluble fiber, with a goal of 25–50 grams daily.

Commercially available fiber supplements include psyllium, methylcellulose, and calcium polycarbophil. Even a strict vegetarian or self-declared “healthy eater” is unlikely to achieve this goal with diet alone and thus should be encouraged to add a supplement. Hard stool causes straining and puts pressure on the hemorrhoids, whereas loose stool can be highly irritating, and frequent defecation can cause symptoms to escalate. Fiber works best when water intake is increased to at least 64 ounces, with more being needed for warmer climates or significant physical activity. For some patients, prebiotics and probiotics are an adjunct to maintain colon health and stool texture [22]. Those with severe chronic constipation may require stool softeners or laxatives to correct their stool texture, and those with chronic loose stools despite fiber supplementation may require antidiarrheals; however, these medications should not be first line in most circumstances.

Hygiene

In addition, soaking in the bath tub, or in a sitz bath, is soothing to the hemorrhoids, allows for relaxation of the pelvic floor, can facilitate reduction of tissue prolapse, and decrease edema. Soaks can be performed at 15-minute intervals in warm water for symptomatic relief, without the need for salts or emollients, which may cause irritation.

Topical Therapies

Generally, patients present for in-office evaluation for hemorrhoids because over-the-counter remedies have already failed. There are no quality data to support the use of commercially available topical therapies (creams, wipes) and suppositories; however, if the patient reports a perceived benefit, it is generally acceptable to continue their use, given the overall low side-effect profile of these preparations. Most common topical products contain topical anesthetics such as lidocaine, steroids such as hydrocortisone, and/or pramoxine, which is an anti-inflammatory. Daily use of topicals beyond 7 days may lead to dermatitis and exacerbate symptoms [23, 24]. Formulations containing steroids also should not be used for more than 7 days as they can lead to thinning of the delicate anoderm. Warm or cold packs can also provide symptomatic relief.

Oral Therapies

Non-steroidal anti-inflammatories may help relieve general discomfort and reduce inflammation. Phlebotonics represent a class of oral plant-derived flavonoids and synthetic drugs that were originally intended for chronic venous disease and are currently used for hemorrhoidal disease predominantly in Europe and Asia, as they are not approved by the Federal Drug Administration for use in the United States. Phlebotonics have been shown to decrease hemorrhoid symptoms through multiple effects, including reducing

inflammation and increasing vascular tone [25]. Multiple studies and meta-analyses have demonstrated modest benefits in reducing symptoms of pruritis and bleeding, and also may be used in the post-operative setting [26, 27].

Office-Based Procedures

With appropriate patient selection, office-based procedures for hemorrhoids can be fast, economical, effective, and low risk. The key to achieving consistently good outcomes is careful patient selection and proper understanding of the technical aspects of each procedure. Outcomes are optimized when patients also utilize the conservative strategies mentioned above. It is important to take a thorough history, paying particular note to use of anticoagulants and bleeding disorders.

Internal Hemorrhoids

Multiple techniques exist for safe in-office treatment of symptomatic internal hemorrhoids, including rubber band ligation, infrared photocoagulation/bipolar diathermy, and sclerotherapy. Patients with grade I–II and some grade III hemorrhoids with symptoms of bleeding are ideal candidates for office procedures. Those with large prolapsing grade III hemorrhoids primarily with associated symptoms of tissue prolapse may need a surgical approach, or an attempt at conservative measures to downgrade them before attempting an office procedure. The techniques described below can all be done in either left lateral decubitus or prone position, based on surgeon preference, and involve instrumentation through an anoscope. Patients who cannot tolerate anoscopy in the office are therefore not suitable candidates for these procedures.

Rubber band ligation involves placement of a rubber band on the redundant mucosa of the hemorrhoid column above the dentate line (Fig. 11.5a). The strangulated hemorrhoid tissue captured within the band necroses after 5–7 days, leaving a small ulcer that eventually will scar in. This technique has been a mainstay of office hemorrhoid procedures since the early 1960s [28]. There are several varieties of hemorrhoid banding devices that exist, including the McGown suction ligator, which applies suction (instead of a separate grasper) to bring the tissue into the device, with a trigger to deploy the band (Fig. 11.5b). While it does require purchase of a suction machine, it enables the surgeon to perform the procedure without a hand from an assistant. The device is used through the anoscope to secure the band onto the mucosa of the selected hemorrhoid. While more than one column may be banded safely in a single office visit, studies demonstrate a higher rate of symptoms including pain and urinary retention.

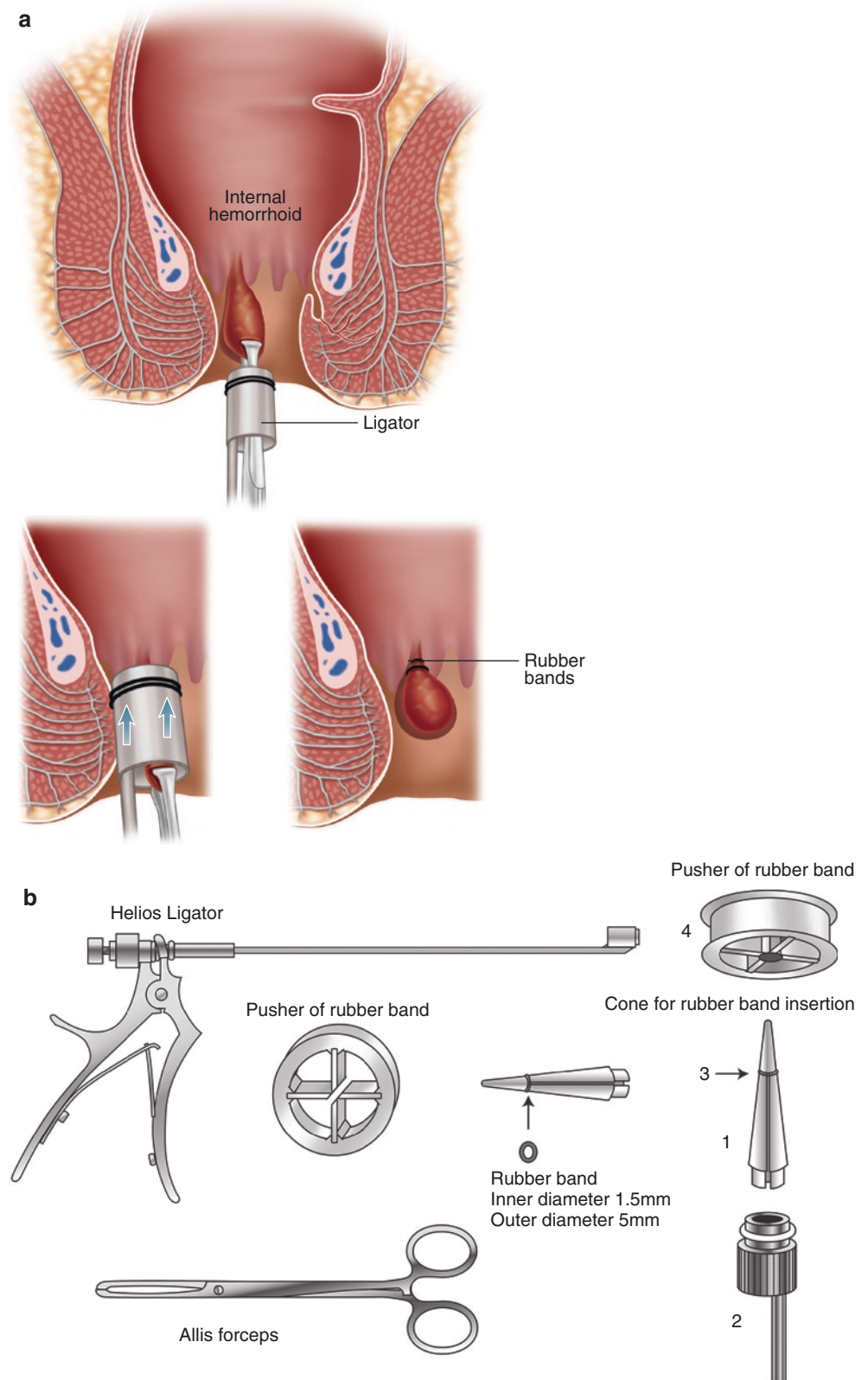
With proper technique, the patients may feel mild rectal pressure during the procedure (which may last up to 1–2 days), but should not experience pain, which is most likely from band placement too distal within the anal canal. While patients on anticoagulation (other than 80 mg aspirin) are conventionally recommended to hold anticoagulation prior to rubber band ligation [29], a recent retrospective case-control study of 82 patients demonstrated no difference in bleeding risk for patients on clopidogrel compared to the control group, 3.75% versus 2.78%, $p = 0.74$ [30]. Risk of bleeding peaks at post-procedure day 5–7, when the tissue necroses and the band falls off, and in rare instances requires operative management. Risk of pelvic sepsis, characterized by fever, urinary retention, swelling, and pain, is rare but can be rapidly progressing and fatal if not immediately recognized.

Energy ablation techniques include infrared photocoagulation and bipolar diathermy. *Infrared photocoagulation (IPC)* causes coagulation and results in vascular sclerosis and fixation of the tissue (Fig. 11.6). Best used for grade I–II hemorrhoids, it uses a tungsten-halogen lamp as an energy source, converting the light to heat with a polymer probe tip. Similar to bipolar diathermy, the probe tip is applied 3–4 times to the apex of the internal hemorrhoid to deliver 0.5–2 second pulses of heat at a 2.5–3 mm depth of penetration. One advantage of this technique is that it can be used on multiple hemorrhoid columns at one time. *Bipolar diathermy* is another similar office technique for grade I–III hemorrhoids that involves the use of 20 watts of pulsed electrocautery at a depth of 2.2 mm focused at the apex of the hemorrhoid, causing tissue coagulation. If applied too distally, these techniques can cause pain and can potentially lead to ulceration or fissure formation.

In terms of outcomes, a prospective randomized trial of 122 patients comparing bipolar diathermy to IPC demonstrated similar outcomes [31]. A small prospective randomized crossover study of 94 patients comparing IPC to rubber band ligation demonstrated less analgesic use and bleeding in the IPC group in the first 24 hours following the procedures, although notably the complication rates in the RBL group were higher than typical [32].

Sclerotherapy is the oldest technique for grade I–III hemorrhoids, having been first described in 1869 [33]. The procedure involves the injection of 1–1.5 mL of a sclerosing agent into the submucosal layer of the base of the engorged hemorrhoid, using a 21-gauge spinal needle (Fig. 11.7). The sclerosant causes fibrosis and fixation of the hemorrhoid. Critical to the technical success of this procedure is avoiding injecting either too superficially, resulting in damage to the mucosa, or too deep, which can cause pain, infection, and abscess. The most common sclerosing agents are hypertonic saline and 5% phenol in oil. One of the advantages of sclero-

Fig. 11.5 Hemorrhoid banding – (a): technique and (b): equipment



therapy is that it is safe for patients on anticoagulation. Multiple small trials compare rubber band ligation to sclerotherapy, with differing results but overall favorable outcomes with both, leading one to conclude that they are comparable and at the discretion and preference of the surgeon [34, 35].

Thrombosed Hemorrhoid Excision

Some of the most grateful patients are those who undergo excision of a thrombosed hemorrhoid in the office setting. Optimal timing of the procedure is critical, and thus knowl-

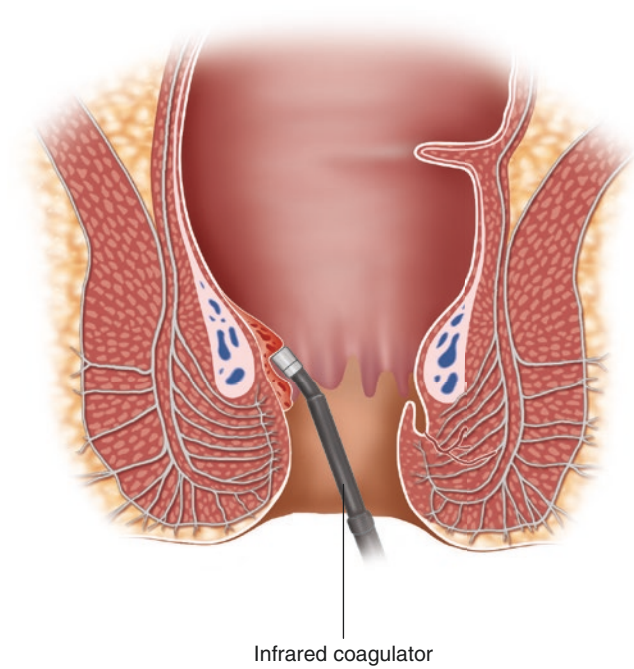


Fig. 11.6 Infrared photocoagulation technique

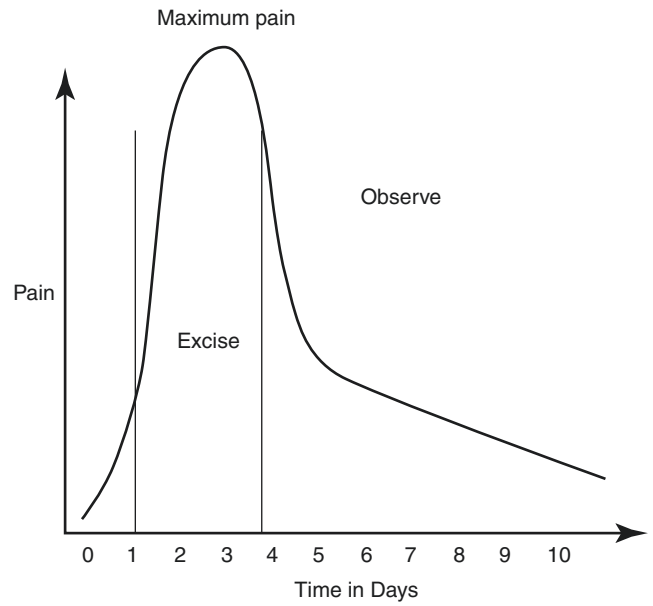


Fig. 11.8 Timing of excision of a thrombosed external hemorrhoid. (With permission from Cintron and Abcarian [101])

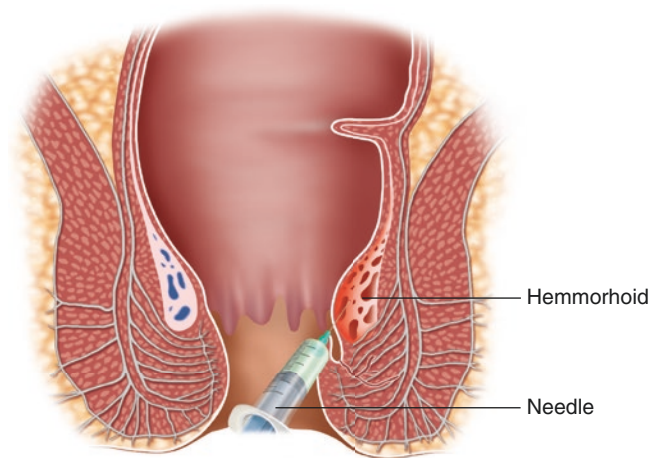


Fig. 11.7 Sclerotherapy technique

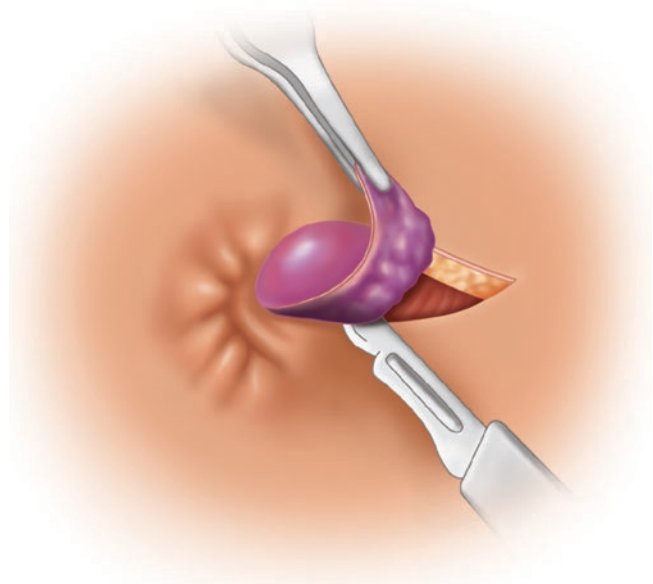


Fig. 11.9 Excision of thrombosed hemorrhoid

edge of the natural history of thrombosed hemorrhoids is important (Fig. 11.8). As most patients should start to experience spontaneous improvement within 72 hours of the onset of symptoms, excision beyond this time point may only serve to increase the intensity and duration of pain. For those not meeting criteria for excision, topical nifedipine has been shown to improve pain scores by decreasing associated sphincter spasm [36]. A small subset of patients will present with persistent pain and a palpable lump for several days to weeks, with no improvement in symptoms, and may also be good candidates for excision. Compared to incision and clot evacuation, excision of the thrombosed hemorrhoid is asso-

ciated with improved outcomes, specifically decreased rate of recurrence and less pain.

To excise a thrombosed hemorrhoid, the perianal skin is cleansed with a betadine solution and allowed to dry (Fig. 11.9). Local anesthetic (1% lidocaine with or without epinephrine 1:200,000) is injected using a 27-gauge needle into the base of the hemorrhoid. Toothed forceps are used to grasp the most lateral or radial aspect of the hemorrhoid, while a fine Metzenbaum scissor (or an office cautery device) is used to meticulously dissect around the hemorrhoid and

associated clot in an ellipse shape, superficial to the sphincter muscle. Dissection in the proper tissue plane results in minimal blood loss. Care is used to prevent going unnecessarily wide on the anoderm, creating a larger wound than necessary. Pressure is held on the excision site, and silver nitrate can be used for hemostasis.

Operative Management of Hemorrhoids

Operative management of hemorrhoids is usually reserved for those patients who have failed medical management or have recurrent, persistent disease despite medical therapy or office-based procedures. Typically, only 5–10% of patients with hemorrhoid-related complaints require operative hemorrhoidectomy [37]. Additionally, operative approaches are most effective for grade III and IV internal hemorrhoids, those with a large external component, and may be the only realistic option for extensive hemorrhoidal disease or incarcerated, strangulated, or gangrenous hemorrhoids.

Excisional hemorrhoidectomy has excellent results, minimal recurrence rates, few complications and remains the gold standard in the surgical management of hemorrhoids. Excisional hemorrhoidectomies can be classified as being done in a closed (Ferguson technique) or open (Milligan-Morgan technique). Because both excisional techniques are associated with significant postoperative pain, other surgical techniques have been devised with the goal of achieving the excellent results of excisional hemorrhoidectomy while reducing postoperative discomfort. More specifically, these other primary operative management techniques include use of ultrasonic energy devices, stapled hemorrhoidopexy, and transanal hemorrhoid dearterialization.

In all operative interventions, bowel preparation and preoperative antibiotics are not required [29]. A preoperative enema can be given at the surgeon's discretion to clear out the distal rectum of stool. The anesthetic technique can be tailored to the patient and can range from local with sedation to full general anesthetic. Positioning in lithotomy, prone jackknife, or left lateral positioning is per surgeon preference. All operations begin with a thorough visual inspection of the perianal skin, followed by digital rectal exam and anoscopy to determine which hemorrhoid columns require intervention and to rule out other pathology not identified during the office examination.

Excisional Hemorrhoidectomy Closed Technique (Ferguson Technique)

First described by Dr. Lynn Ferguson of the Ferguson Clinic in the early 1950s, the closed hemorrhoidectomy technique remains the most common operation for hemorrhoids in the United States [38, 39]. An elliptical incision is made, starting

at the perianal skin and continuing to the anorectal ring, dissecting the hemorrhoid tissue away from the sphincter complex (Fig. 11.10). Dissection can be completed with a scissors, scalpel, or Bovie electrocautery. Dissection is carried out beyond the enlarged internal component at which point the pedicle is suture ligated with absorbable suture and the hemorrhoid tissue amputated. The wound is then closed in a running fashion with the same absorbable suture used to ligate the hemorrhoid pedicle. The suture may be run in locking fashion to improve hemostasis, and small bites of the underlying sphincter complex may be taken to close the dead space. A few millimeters of the anal margin wound may be left open for drainage. One to three columns may be excised using this technique. Care should be taken to preserve bridges of viable skin and mucosa between excision sites to prevent stenosis [40]. Hemorrhoids may be sent as individual specimens, so that any incidental finding on final pathology can be attributed to a specific quadrant, although the likelihood of an incidental finding is only about 1% in the literature [41].

Excisional Hemorrhoidectomy Open Technique (Milligan-Morgan)

The open technique of hemorrhoidectomy is commonly used in the United Kingdom. Perioperative considerations are the same as for the Ferguson technique. The excision is also very similar, however, following suture ligation of the pedicle and amputation of the hemorrhoid bundle the wounds are left open to heal by secondary intent (Fig. 11.11). Again, one to three columns can be excised, with the same caveat regarding preservation of viable bridges of skin and mucosa. Both open and closed techniques are considered appropriate. A recent meta-analysis of 11 RCTs comparing open versus closed hemorrhoidectomy demonstrated that the closed approach was associated with decreased postoperative pain, faster wound healing, and lesser risk of postoperative bleeding. Postoperative complications, hemorrhoid recurrence, and infectious complications were similar [42]. However, multiple individual randomized controlled trials have demonstrated little difference [42–46].

Use of Energy Devices in Excisional Hemorrhoidectomy

Both the open and closed techniques have been modified to include the use of alternative energy sources, such as the bipolar diathermy and ultrasonic shears. A Cochrane review was completed to compare bipolar energy hemorrhoidectomy to standard excisional hemorrhoidectomy [47]. The authors concluded that early postoperative pain was less when the bipolar device was used; however, the difference was no longer noted at day 14. Hemorrhoidectomy completed with a bipolar energy device was also found to be faster. Use of ultrasonic shears seems to produce similar results [48].

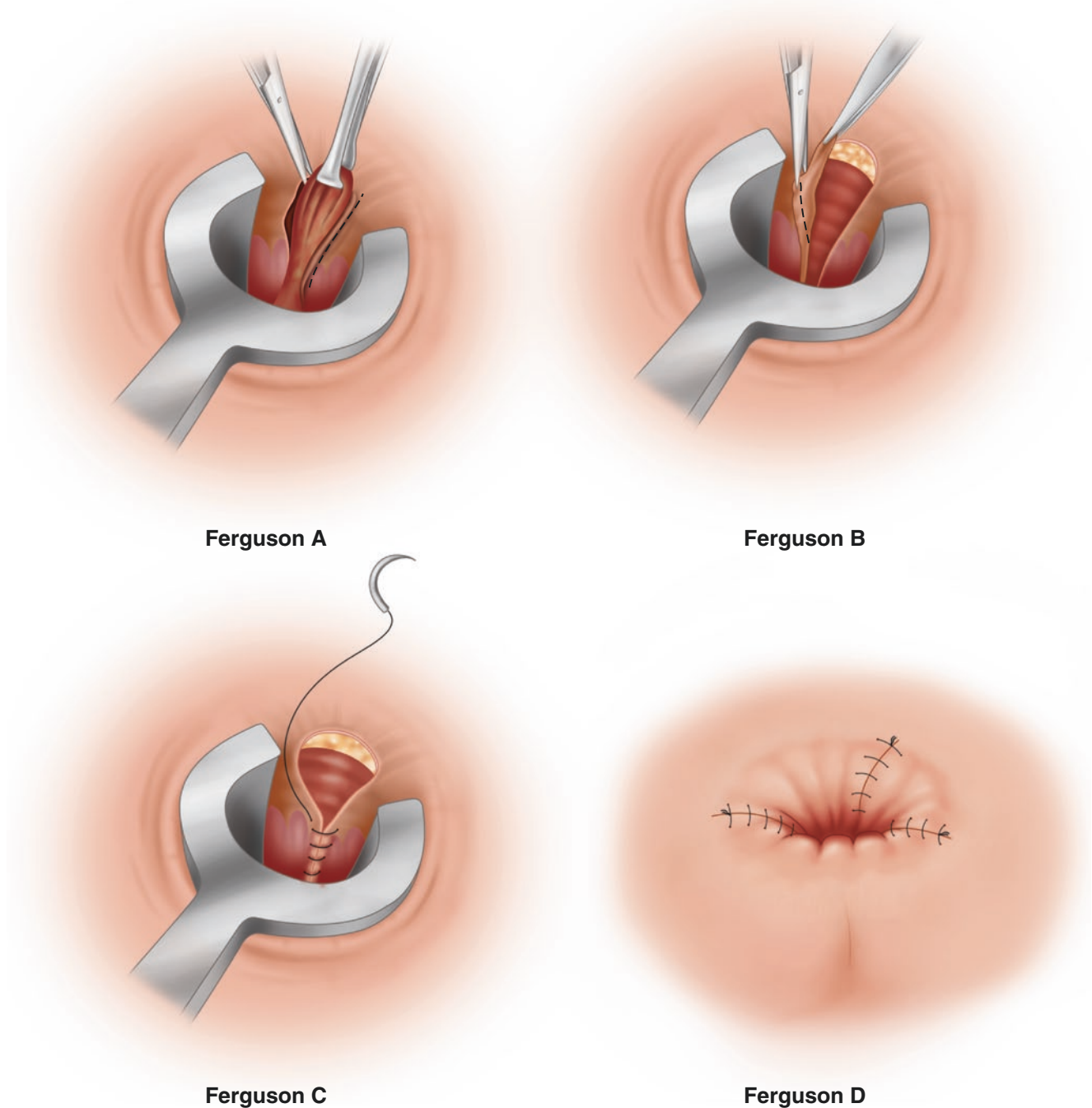
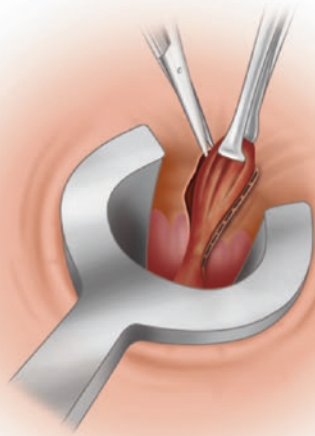


Fig. 11.10 Closed hemorrhoidectomy

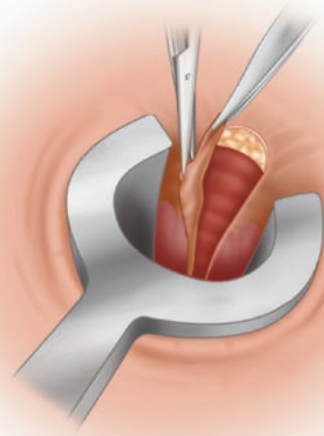
When these two devices were evaluated head to head in a randomized controlled trial of patients undergoing closed hemorrhoidectomy, postoperative pain scores were similar, with no differences in clinical outcomes [49]. Other approaches including diathermy and the use of laser technology have not demonstrated improvements in pain and may be associated with higher cost [50–53].

Whitehead Hemorrhoidectomy

The Whitehead hemorrhoidectomy technique, once common in the United Kingdom, involves a circumferential excision of internal hemorrhoidal tissue and redundant anoderm just proximal to the dentate line. This procedure never gained wide acceptance in the United States, in part owing to a high incidence of postoperative complications including anal ste-



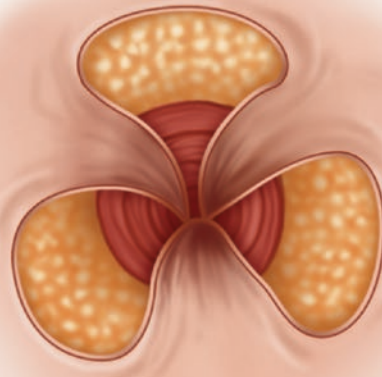
Milligan-Morgan A



Milligan-Morgan B



Milligan-Morgan C



Milligan-Morgan D

Fig. 11.11 Open hemorrhoidectomy (Milligan-Morgan)

nosis, mucosal ectropion (the “Whitehead deformity”), and disturbed continence (Fig. 11.12). Most centers have abandoned this approach.

Stapled Hemorrhoidopexy

Stapled hemorrhoidopexy, first developed in Italy, uses a circular stapling device to address circumferential internal hemorrhoids and create a mucosa-to-mucosa anastomosis. In doing so, the submucosa proximal to the dentate line is excised, resulting in removal of redundant tissue, a cephalad relocation of the anal cushions and interruption of the feed-

ing arteries (Fig. 11.13). Although effective for internal prolapsing disease, it does not address external hemorrhoids. To perform the procedure, a translucent anoscope, provided with the circular stapler, is introduced transanally. After placing the anoscope, a purse-string suture is placed in a circumferential manner into the submucosa, approximately 2 cm above the dentate line (Fig. 11.14). The head of the stapler is then placed through the anoscope and into the rectum. The purse string is tied down around the shaft of the stapler. The stapler is slowly closed while providing traction on the purse-string. Once closed, the stapler is fired and then



Fig. 11.12 Whitehead deformity



Fig. 11.13 Stapled hemorrhoidectomy. (Reused with permission Wexner and Fleshman [102]. Copyright © 2018 Wolters Kluwer)

removed along with the excised tissue. The staple line is inspected for bleeding and controlled, if present, with suture ligation. In females the vagina should be inspected and palpated prior to firing the instrument to ensure that a vaginal cuff has not been inadvertently included.

Early cohort and smaller nonrandomized trials reported stapled hemorrhoidectomy to be associated with less pain and faster recovery when compared with excisional hemorrhoidectomy. A randomized controlled trial of 777 patients undergoing either stapled hemorrhoidectomy or traditional excisional hemorrhoidectomy demonstrated less pain in the stapled group with similar complication rates. Despite these

advantages of the stapled technique, the excisional hemorrhoidectomy group had significantly better quality-of-life scores than the hemorrhoidectomy group. Further, in the stapled hemorrhoidectomy group, 32% of patients reported that their symptoms had recurred compared with only 14% in the excisional hemorrhoidectomy group, and this difference was maintained at 24 months [54]. A Cochrane review of 12 trials including 1097 patients demonstrated similar findings. Additionally, patients undergoing hemorrhoidectomy were more likely to require an additional operative procedure. Lastly, patients undergoing excisional hemorrhoidectomy surgery were more likely than those undergoing stapled hemorrhoidectomy to be asymptomatic following surgery [55].

Stapled hemorrhoidectomy has been associated with several unique complications, including rectovaginal fistula, staple line bleeding, and stricture at the staple line. A systematic review of 784 articles including a total of 14,232 patients found a median complication rate of 16.1%, with five documented mortalities [56]. Between 2000 and 2009, there were 40 published cases in the literature of rectal perforation after stapled hemorrhoidectomy. Thirty-five patients required a laparotomy with fecal diversion, and one patient was successfully treated with low anterior resection. Despite surgical treatment and resuscitation, there were four deaths [57]. The severity of possible complications associated with stapled hemorrhoidectomy have deterred many from its use and reflect the importance of proper training and surgical technique.

Doppler-Guided Hemorrhoidectomy

Originally described by Morinaga in 1995 [58], Doppler-guided/assisted hemorrhoid artery ligation (HAL) uses an anoscope fashioned with a Doppler probe to identify each hemorrhoid artery. The artery is subsequently ligated and, although not initially described, is often followed by a suture mucopexy for patients with symptomatic prolapse. Potential benefits are the lack of tissue excision and less pain.

Patient preparation and setup is identical to any excisional technique. A specialized anoscope with Doppler ultrasound is introduced into the anal canal (Fig. 11.15). The Doppler and anoscope are rotated until a feeding artery is identified (Fig. 11.16). With the aid of a guide to ensure proper depth and location, the artery is suture ligated. The Doppler can be used to confirm loss of signal, indicating ablation of arterial inflow. The process is repeated until the four to six hemorrhoidal arteries have been ligated. Depending on the degree of prolapse, a suture mucopexy may be included using the same stitch as the ligation. This is completed by running a continuous suture from the ligation point toward the distal anal canal, just proximal to the dentate line. The free end of the stitch is then tied to the tail of the suture, pulling the hemorrhoid column into the proximal anal canal toward the ligation.

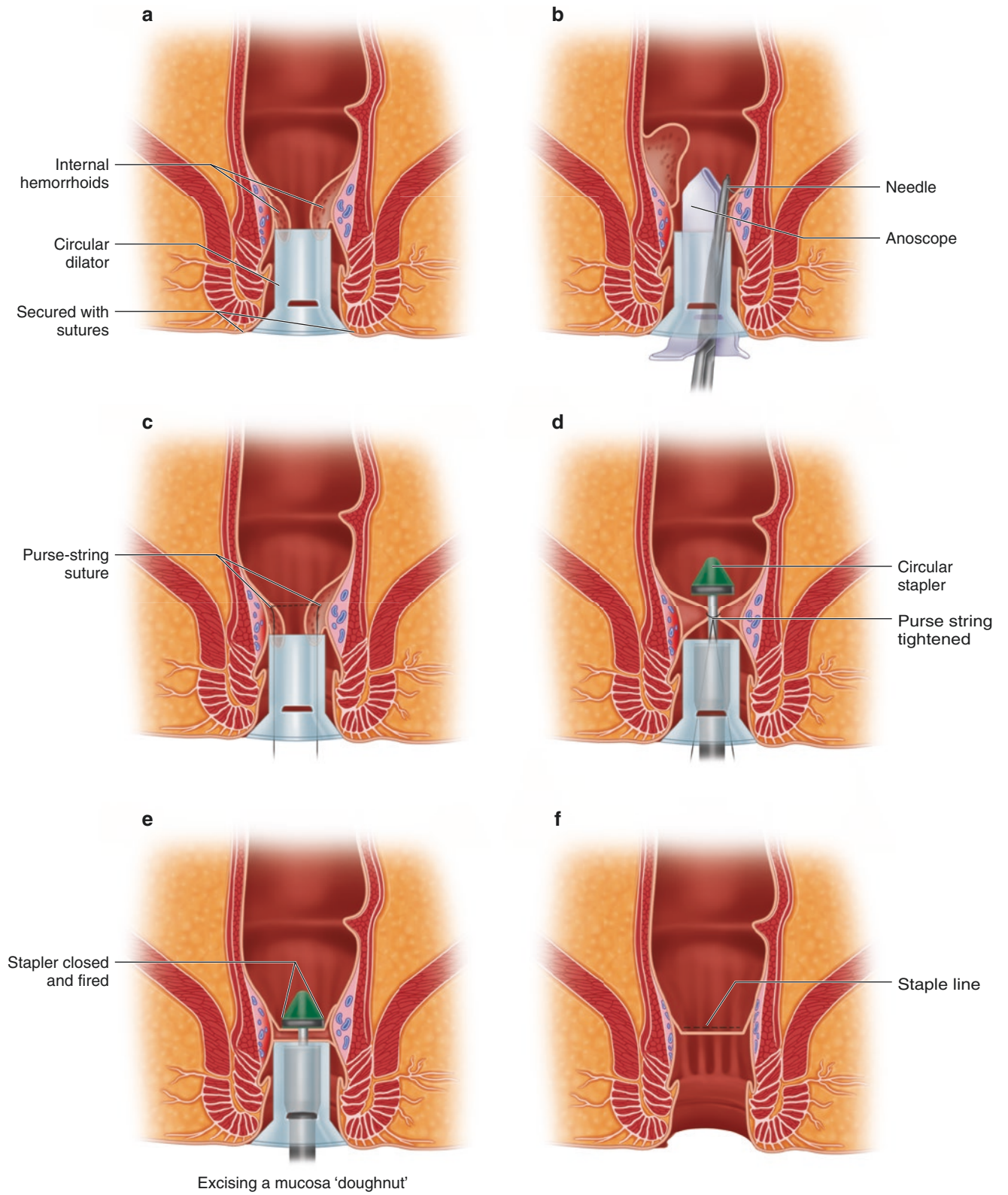


Fig. 11.14 Stapled hemorrhoidectomy technique



Fig. 11.15 Transanal hemorrhoidal dearterialization device

Prospective studies using HAL have demonstrated favorable short-term results [59]. A systematic review evaluating 28 studies, including 2904 patients with grade I–IV hemorrhoids, demonstrated a pooled recurrence rate of 17.5%, with the highest rates for grade IV hemorrhoids. Overall postoperative complication rates were low, with an overall bleeding rate of 5% and an overall reintervention rate of 6% [60]. In a randomized prospective trial comparing RBL with HAL for the treatment of grade II and III hemorrhoids, recurrence rates, symptom scores, complications, quality-of-life assessment, and continence score were similar. Patients had more pain in the early postoperative period after HAL. HAL was also more expensive and was not found to be cost-effective compared with RBL in terms of incremental cost per quality-adjusted life-year [61]. In respect to long-term outcomes, a recently completed meta-analysis of comparing stapled hemorrhoidectomy to HAL demonstrated a statistically significant difference in recurrence (OR 0.55; 95% CI, 0.34–0.90 $P = 0.02$) with increased recurrence in the HAL group [62]. A similar meta-analysis demonstrated that recurrence was highest in those with grade IV hemorrhoids [63]. When comparing HAL to excisional hemorrhoidectomy, one meta-analysis, which included 286 patients in the evaluation of recurrence, found no difference [64]. However, the data regarding long-term comparisons between excisional and HAL hemorrhoidectomy are somewhat lacking. In conclusion, HAL demonstrates favorable short-term results but may be associated with increased recurrence, especially in those with grade IV hemorrhoids.

Pain Management and Postoperative Care

Pain management after hemorrhoidectomy starts with adequate patient counseling in the preoperative setting. Setting

realistic expectations for the patient can go a long way in terms of allaying their concerns and ensuring they are prepared with enough time to recuperate before planning to return to normal activity. Recovery time is variable and depends on the type of procedure, anticipated extent of surgery, as well as the patient's intrinsic tolerance and if they are on preoperative narcotics. Multimodal pain control is critical to minimize discomfort associated with surgery for hemorrhoids, while limiting narcotics.

For patients under conscious sedation, a pudendal nerve block consisting of a 1:1 mix of 1% lidocaine and 0.25% bupivacaine is most commonly used, for a total volume of 40–60 mL depending on patient weight. The addition of 1:200,000 epinephrine to one of the local analgesics will increase the maximum dose and duration of action. Although from a pharmacokinetic standpoint, the onset of lidocaine is faster than bupivacaine, under 2 minutes versus 5 minutes, and the duration of action is shorter, 1–2 hours versus 2–4 hours, the clinically observed differences between the two drugs have not been shown to be significant, with an overall time to onset between 12 and 29 seconds, with a duration of action between 6 and 7 hours [65].

Use of liposomal bupivacaine either as monotherapy or volume expanded in bupivacaine will result in improved analgesia for the first 72 hours postoperatively. A prospective, randomized, controlled double-blind study of 100 patients undergoing excisional hemorrhoidectomy demonstrated significant increase in time to first opioid use, 19 hours versus 8 hours, $p = 0.005$, with corresponding reduction in pain scores [66]. It is our practice to volume-expand a 20 mL bottle of liposomal bupivacaine with 20 mL of 0.25% bupivacaine and inject this at the onset of the procedure as a pudendal nerve block. Importantly, liposomal bupivacaine cannot be volume-expanded in lidocaine, which will competitively drive the bupivacaine out of the liposomes and lead to toxicity. While the cost of liposomal bupivacaine is far greater than conventional non-liposomal alternatives, there are no studies that have performed a cost analysis for outpatient anorectal surgery, although it has been found to be cost-effective (or at least comparable) in many other types of surgery, in part, due to decreased length of stay, which is not applicable in this setting [67–69].

Given that narcotics are associated with unfortunate side effects (such as constipation) and have been shown to increase risk of long-term addiction and contribute to the “opioid crisis” in the United States, it is best to minimize their use [70]. A pudendal nerve block is essential for postoperative pain control, regardless of whether general endotracheal or monitored anesthesia care is used. A prospective, randomized, double-blind, placebo-controlled trial of 61 patients undergoing anorectal surgery compared the use of preoperative oral acetaminophen and gabapentin and intraoperative intravenous ketamine and dexamethasone to pla-

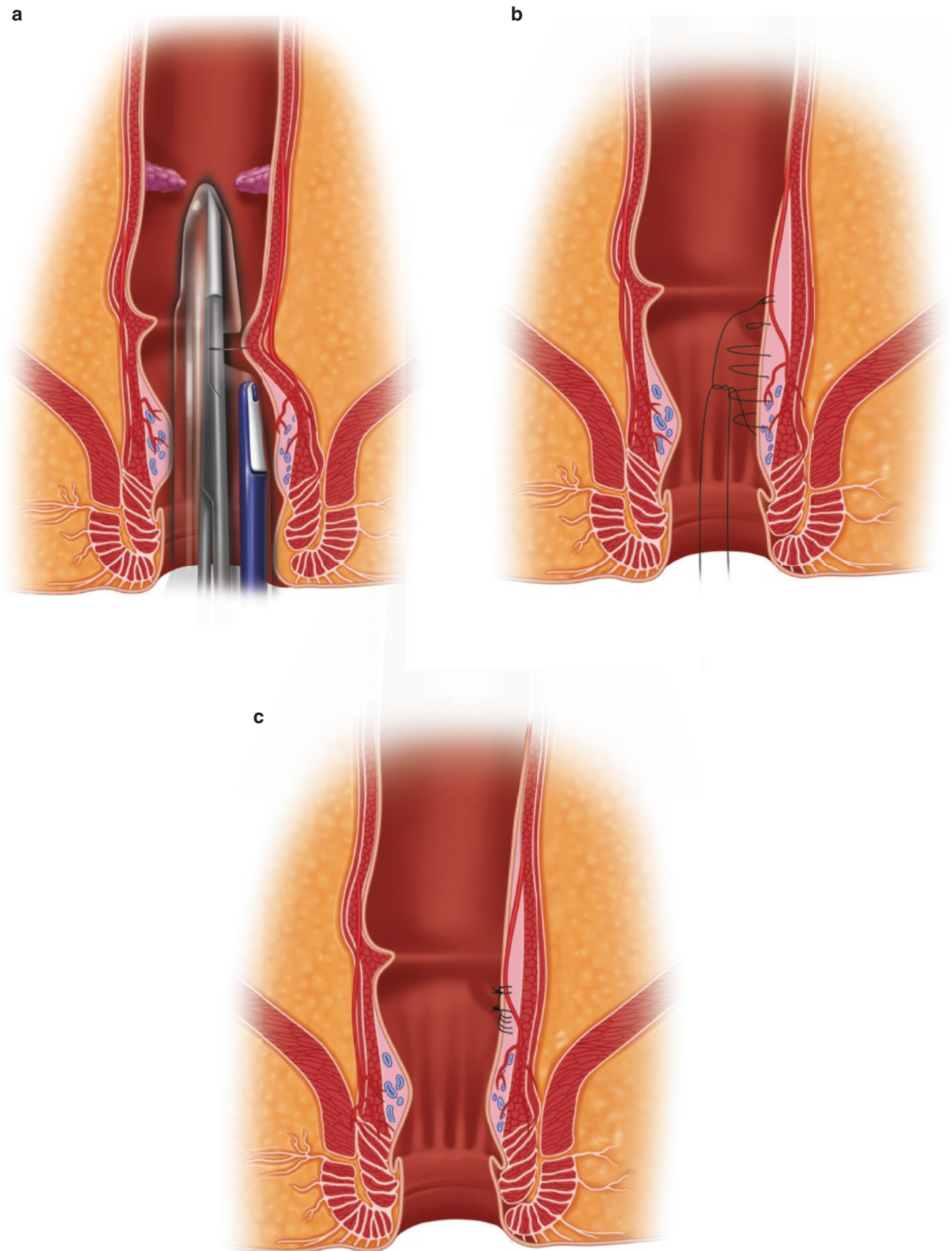


Fig. 11.16 Transanal hemorrhoidal dearterialization

cebo and found significantly decreased self-reported pain scores (50% and 40% decrease) and breakthrough narcotic use (relative risk reduction 76% and 92%) in the post-anesthesia care unit and at 8 hours postoperatively. Unfortunately, as is the case with many such studies, the trial was underpowered to detect a difference in hemorrhoid patients ($n = 17$) [71].

As for oral medications, non-narcotic medications should be used as a mainstay, with narcotic pain medication for breakthrough pain. Recommended effective Motrin dose is 600 mg TID. Acetaminophen can be used either simultaneously or alternating, at doses not to exceed 4 g/day. Diazepam is a very helpful adjunct in reducing sphincter spasm, although this has not been studied formally in the literature. Oral metronidazole has been given in the postoperative setting, although studies are mixed regarding its efficacy in terms of decreasing pain. A 2017 meta-analysis of five randomized controlled trials involving 337 patients found that the metronidazole group had significantly lower pain scores on postoperative days 1 and 4, as well as a significantly faster return to activity; however, when a sensitivity analysis was performed, the largest trial was excluded due to bias, and consequently all the observed findings were no longer statistically significant [72].

No formal guidelines exist to inform clinicians on appropriate prescribing of narcotics after hemorrhoidectomy, although a recent study of over 6200 patients in a claims database determined that a 5- to 10-day prescription is optimal for most patients, noting there was over threefold increased odds of needing a prescription refill in patients with history of opioid use. One of the major limitations of the study was that it could not determine the number of pills or type of narcotic prescribed [73]. A more recent retrospective single-institution study of 77 patients who underwent ambulatory excisional hemorrhoidectomy evaluated postoperative opioid usage to create a prospective prescribing guideline. It was determined that, to meet opioid needs for 80% of patients, the equivalent of 27 pills of 5 mg oxycodone would need to be prescribed postoperatively for home use [74]. Additionally, it is our preferred practice to prescribe narcotics that do not contain acetaminophen, such as oxycodone, to minimize risk of acetaminophen toxicity.

Topicals After Hemorrhoidectomy

Various topical preparations can be considered in the postoperative setting, as data suggest a modest benefit. A prospective, double-blind, randomized controlled trial of 66 patients with grade III–IV hemorrhoids undergoing open hemorrhoidectomy compared use of 5% topical baclofen to placebo and demonstrated a significant reduction in pain and analgesic consumption in the treatment arm at 1 and 2 weeks postop [75]. A 2010 meta-analysis of five randomized controlled trials of 333 patients using topical glyceryl trinitrate

(GTN) ointment after hemorrhoidectomy demonstrated significant reduction in pain on postoperative days 3 and 7, but not on day 1. It also demonstrated an odds ratio of 3.57 for wound healing at 3 weeks postop, compared to placebo ($p < 0.0001$), without a statistically significant difference in incidence of headache [76]. A 2019 study of 40 patients found similar results with regard to postoperative pain, but there was a significantly higher rate of headache in the GTN arm [77]. Additionally, studies demonstrate modest benefits of topical lidocaine in the postoperative setting, when combined with diclofenac or nifedipine [78, 79].

Routine Postoperative Care

Following hemorrhoidectomy, in addition to pain control, patients are instructed to avoid constipation. Patients who have corrected their stool texture prior to undergoing surgery will have the best outcomes. Fecal impaction in the postoperative period can be a devastatingly painful complication and is to be avoided with rigorous attention to maintaining a proper bowel regimen. It is essential to educate patients on the constipating side effects of narcotics, and to counteract this with water intake and fiber, stool softeners, laxatives, and other adjuncts such as prune juice and probiotics. Conversely, patients are also encouraged to avoid diarrhea, whether it be due to underlying conditions (which are best optimized prior to surgery) or by overdoing it with laxatives. Frequent loose stools will be painful and irritating and may delay healing. Lastly, Sitz baths and warm or cool packs will also provide relief from pain. Most patients are familiar with these interventions from their time prior to surgery.

Complications of Hemorrhoidectomy

Urinary Retention

Urinary retention is one of the most common complications following hemorrhoidectomy and occurs at a rate of 1–15%. It is also the most common reason for failure of surgical patients to be discharged from an ambulatory setting [80]. The incidence is higher after spinal anesthesia and after HAL procedures. The risk may be mitigated with decreasing volume of intravenous fluids to less than 500 cc and through judicious use of local anesthesia [81].

Postoperative Hemorrhage

Delayed post-hemorrhoidectomy bleeding is a rare but serious complication after hemorrhoidectomy [82]. The incidence of delayed postoperative hemorrhage has been reported to be 0.9–10% [83, 84]. While some minor bleeding is expected following hemorrhoidectomy, patients who describe passage of an entire bowel movement of blood clots are likely to require and exam under anesthesia. The culprit vessel may not always be found, but if it is, it can usually be managed

with an interrupted figure of eight absorbable suture. It is also reasonable to evacuate any residual clot from the rectum and distal sigmoid via rigid proctoscopy to reduce the chances of clouding the postoperative clinical picture with ongoing hematochezia. Some data suggest that delayed bleeding is linked to risk factors such as the surgical procedure, infection, defecation with excessive straining, and number of piles [85, 86]. Interestingly, a study that evaluated 45 patients with delayed bleeding reported that male gender and individual surgeons were independent risk factors [83]. There was no significant difference in the occurrence of hemorrhage between patients who underwent a closed or open hemorrhoidectomy [43] or between conventional hemorrhoidectomy and using a bipolar energy device [87].

Fecal Incontinence

Incontinence to stool following hemorrhoidectomy can occur but is rare and may be multifactorial in nature. There may be undue stretch placed on the anal sphincter at the time of surgery, direct sphincter injury, or loss of the bulk of the hemorrhoid cushions. Proper technique which avoids the sphincter muscles should have no impact on sphincter integrity or function.

Anal Stenosis

Anal stenosis can occur following hemorrhoidectomy if excessive anoderm is removed. It is most commonly encountered following emergency hemorrhoidectomy and is usually secondary to inadequate remaining skin bridges. Treatment can involve bulk laxatives, dilation, and anoplasty (described elsewhere) [88, 89].

Special Patient Populations

Strangulated Hemorrhoids

Strangulated hemorrhoids are internal hemorrhoids that have prolapsed and become incarcerated and irreducible. Edema and thrombosis of the external hemorrhoids often accompany this condition. The incarcerated internal hemorrhoids may be beefy red, or ulcerated and necrotic, depending on the length of time of incarceration. If not necrotic, circumferential injection of local anesthetic and reduction of the strangulated hemorrhoids can be accomplished, followed by bed rest. One small randomized trial published in 1991 compared reduction followed by banding of the internal component and excision of the external thromboses with excisional hemorrhoidectomy; 13.5% of patients treated with reduction and banding went on to require excisional hemorrhoidectomy [90]. Unless the patient has prohibitive operative risk, the best option for strangulated hemorrhoids is expeditious excisional hemorrhoidectomy; in the presence of necrosis, excision is a necessity. Either an open or a closed technique

can be used. If tissues are very edematous, or if devitalized tissue is present, one may consider leaving the wounds open to prevent abscess. Postoperative care is as usual after excisional hemorrhoidectomy [91].

Hemorrhoids in Pregnancy

Engorgement of the internal hemorrhoids and edema of the external hemorrhoid are common during pregnancy, possibly related to impaired venous return, constipation, and pressure on the pelvic floor. A single institution prospective study of 94 Dutch women demonstrated a 14.4% prevalence of hemorrhoidal prolapse in the third trimester and a 14.6% prevalence of thrombosis in the postpartum period [92]. Hemorrhoid symptoms almost always resolve after delivery and rarely need urgent intervention. Surgical intervention in pregnancy is reserved for strangulated hemorrhoids, or occasionally a very symptomatic external thrombosis. When necessary, operation should be performed using local anesthesia with the patient positioned in the left lateral decubitus position to avoid compression of the inferior vena cava.

Hemorrhoids, Varices, and Portal Hypertension

Rectal varices and hemorrhoids are distinct and different. Rectal varices in patients with portal hypertension provide collateral circulation for the portal system into the systemic venous circulation. Incidence of hemorrhoid symptoms in patients with portal hypertension is like that of the general population [93]. Although rectal varices are common in patients with portal hypertension, they bleed much less commonly than esophageal varices [94]. In the rare instance of bleeding from rectal varices, portal hypertension should be addressed first, whether it be by medical management of transjugular intrahepatic portosystemic shunt, or by portosystemic shunts, or even by liver transplant. Direct control methods such as sclerotherapy and suture ligation will have a higher rate of success if the portal system is decompressed and should be reserved for instances in which all other options have been exhausted [95, 96].

Hemorrhoids in Crohn's Disease

As many patients with Crohn's disease have loose stools, engorged hemorrhoids may occasionally be seen and require surgical intervention. These are specifically distinguished from Crohn-related perianal skin tags. Patient selection is very important. In the background of rectal inflammation, conservative management is indicated. Older literature describes a high rate of poor wound healing and complications with hemorrhoidectomy in Crohn's disease. Some patients with anorectal Crohn's disease describe a hemorrhoidectomy with poor outcome immediately preceding their inflammatory bowel disease diagnosis. However, in appropriately selected patients who are well controlled medically and have no rectal inflammation or other anorectal disease, a

good outcome can be attained. Wolkomir and Luchtfeld reported healing in 90% of patients who underwent hemorrhoidectomy in the setting of well-controlled ileocolonic Crohn's disease [97]. Karin reported on a group of 13 patients with Crohn's disease without rectal involvement who had symptomatic grade 3 hemorrhoids. All underwent transanal hemorrhoidal dearterialization with good outcomes. At 18 months, ten patients were without hemorrhoid-related symptoms [98].

Hemorrhoids in the Immunocompromised Patient

Anorectal pathology is increasingly seen in immunocompromised patients, including those with medically induced immunosuppression, such as solid organ transplant recipients and patients receiving steroids or chemotherapy, as well as those with disease-induced immunosuppression, including human immunodeficiency virus (HIV). One must recall that this population is heterogeneous. For those in whom the immunocompromise can be expected to resolve, conservative management should be pursued aggressively until immunity is normal or nearly so. For those with an ongoing degree of immunocompromise, medical management should be the primary approach, reserving direct intervention only after medical failure and with careful consideration of the implications of complications in this population [91]. RBL

and excisional hemorrhoidectomy have been shown to be safe in HIV-positive patients on highly active antiretroviral therapy with acceptable CD4 counts [99, 100].

Conclusion

In conclusion, hemorrhoidal disease is common and frequently misdiagnosed. Knowledge of associated symptoms along with anorectal and hemorrhoid anatomy is critical in securing the diagnosis and selecting the appropriate treatment (Fig. 11.17). Minimizing straining and improving hydration and fiber intake are the first step for patients with symptomatic hemorrhoids. Most office procedures are best suited for symptomatic grade I–III internal hemorrhoids or thrombosed external hemorrhoids. One's armamentarium should include a variety of techniques for symptomatic hemorrhoids to optimize outcomes and provide individualized therapy. Excisional hemorrhoidectomy continues to provide the most consistent results, while others, possibly less painful surgical interventions, are associated with higher recurrence rates. Complications of hemorrhoid surgery are rare and include urinary retention, bleeding, infection, stenosis, incontinence, and recurrence. Special considerations include pregnant patients, as well as those with Crohn's disease, the immunocompromised, or those with portal hypertension.

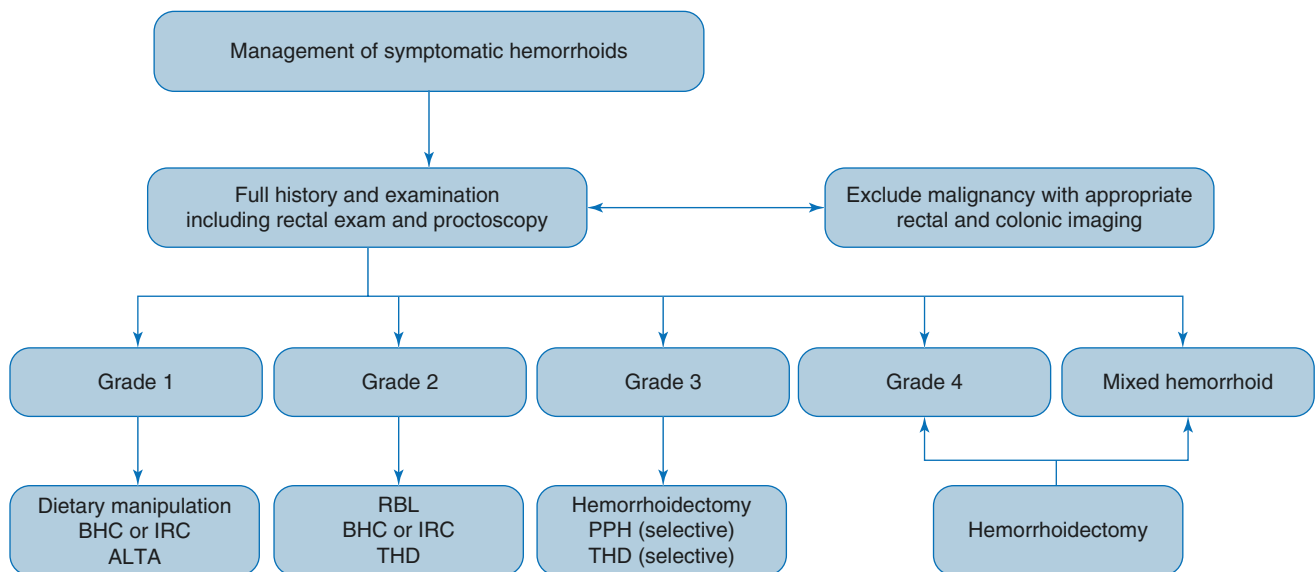


Fig. 11.17 Treatment algorithm

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