PERSPECTIVES IN CLINICAL GASTROENTEROLOGY AND HEPATOLOGY

The Evaluation and Treatment of Hemorrhoids: A Guide for the Gastroenterologist

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The Lord will smite thee with . . . the emerods {hemorrhoids}, and with the scab, and with the itch, whereof thou canst not be healed.

Deuteronomy 28:27, King James Bible

. . . and he smote the men of the city, both small and great, and they had emerods in their secret parts . . . and the men that died not were smitten with the emerods: and the cry of the city went up to heaven.

Samuel 5:1, King James Bible

Ancient references to symptomatic hemorrhoidal disease date back thousands of years and can be found in the Bible as well as early Egyptian, Babylonian, and Greek scripts.[1–3] The first known mention of this condition is from an Egyptian papyrus in 1700 BC, which advises . . . "Thou shouldest give an ointment of acacia leaves, ground and titurated together . . . and place in the anus, that he recovers immediately."[4] Indeed, there are few diseases more recounted in human history than hemorrhoids. The word *hemorrhoid* is derived from the Greek, with *haima* meaning blood and *rhoos* meaning flowing. Another common word for hemorrhoids used in the vernacular is "pile," which comes from the Latin *pila*, meaning a ball. As aptly noted by Senagore, "although few people have died of hemorrhoidal disease, many patients who have undergone certain hemorrhoid therapies wish they had," and this entity is one of the few diseases with its own patron saint (St Fiachre, the patron saint of gardeners and hemorrhoid sufferers).[1]

Symptomatic hemorrhoids are common, and those with hemorrhoids along with other anorectal diseases frequently present to the gastroenterologist with lower gastrointestinal (GI) bleeding and perianal complaints for evaluation and treatment. These patients and their referring physicians have an expectation that the gastroenterologist who examines this area should be able to provide comprehensive care of any nonsurgical anorectal ailments that are present. However, in large part because of the fact that formal training in anorectal pathology is not included in the combined Gastroenterology Core Curriculum, the care of these problems is often deferred to surgical specialties.[5,6]

There now seems to be an increasing recognition of this gap in the training of gastroenterology fellows, because an increasing number of GI programs are beginning to include nonsurgical anorectal care into their curricula. Some have called for the formal inclusion of anorectal entities into GI fellowship training.[5] It is the intent of this article to serve as a general introduction of the nonsurgical care of hemorrhoids to gastroenterologists, helping them provide a more complete continuum of care to their patients.

Epidemiology

The exact prevalence of symptomatic hemorrhoids is very difficult to establish, because many sufferers do not seek care for their problems or rely on over-the-counter remedies, whereas others attribute other anorectal symptoms as being a result of hemorrhoids.[7–9] As noted in a recent American Gastroenterological Association review, the epidemiology of hemorrhoidal disease has been studied via different tools, each of which has methodologic limitations. Surveys that rely on patient self-reporting are nonspecific, and physician-reported diagnoses or hospital discharge data are not always confirmed. Thus, epidemiologic data can vary widely. Estimates of the prevalence of symptomatic hemorrhoid disease in the United States range from 10 million people, a 4.4% prevalence rate,[10] to a National Center for Health Statistics report of up to 23 million people or 12.8% of U.S. adults.[11] Others have reported up to a 30%–40% prevalence rate in the United States.[12,13] A recent prospective study of screening colonoscopy patients revealed the presence of hemorrhoids in 38.9%, with 44.7% of those patients suffering from hemorrhoidal symptoms.[14] In 2004, the National Institutes of Health noted that the diagnosis of hemor-

Abbreviations used in this paper: ASCRS, American Society of Colon and Rectal Surgeons; GI, gastrointestinal; IRC, infrared coagulation; RBL, rubber band ligation.

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rhoids was associated with 3.2 million ambulatory care visits, 306,000 hospitalizations, and 2 million prescriptions in the United States.[15]

Although it has been stated that 50% of the population will experience symptomatic hemorrhoid disease at some point in their lives,[16] the peak incidence of symptomatic disease seems to be between the ages of 45–65 years. Development of hemorrhoids before the age of 20 is unusual, and the risk is higher for whites than for blacks.[10,17,18] Pregnancy is associated with an increased risk for hemorrhoids, and there is a slightly increased prevalence in women compared with men.[9,19] Neither chronic constipation nor portal hypertension has convincingly been linked to hemorrhoids.[20,21] Hemorrhoids are commonly seen in patients with spinal cord injury.[10,22,23]

Anatomy

Why are hemorrhoids called hemorrhoids and asteroids called asteroids? Wouldn't it make more sense if it was the other way around? But if that were true, then a proctologist would be an astronaut.

Robert Schimmel (1950–2010)

The rectum extends from the terminal sigmoid colon to the anus, is lined by columnar epithelial mucosa innervated by the sympathetic and parasympathetic nervous systems, and consequently is relatively insensate. Its vascular and lymphatic supplies originate from the hypogastric system. The anal canal, which is approximately 4 cm in length, extends from the anal verge to its junction with the rectum close to the proximal aspect of the levator-sphincteric complex. Unlike the rectum, the anus is lined by anoderm, which is a modified and sensitive squamous epithelium richly innervated with somatic sensory nerves, and supplied by the inferior hemorrhoidal system.[8,24] The dentate line is the point at which the squamous anoderm meets the columnar mucosa and typically lies about 3 cm above the anal verge.[25] The dentate line is the major anatomic reference point when considering the treatment of hemorrhoids. Internal hemorrhoids are cushions of fibrovascular tissue located just proximal to the dentate line, with the external hemorrhoidal cushions lying distal to it. This terminology can seem a bit confusing, because in this context, the word *external* does not mean outside the anal canal, but rather distal to the dentate line; there are external hemorrhoids residing inside the anal verge (Figure 1).

Work by Thomson,[26] published in 1975, used both anatomic dissections along with radiologic and vascular studies to best elucidate hemorrhoidal anatomy. He noted that the submucosa in the area of the anal canal formed a discontinuous layer of thickened tissue, creating "cushions" typically found in the left lateral, right anterior, and right posterior positions, although there are frequent anatomic variations of this arrangement.[9,26] These cushions receive their blood supply primarily from the superior hemorrhoidal artery as well as branches of the middle hemorrhoidal arteries; however, there is some communication with the inferior hemorrhoidal arteries as well. The venous drainage is provided by the superior, middle, and inferior hemorrhoidal vessels, allowing for communication between the portal and systemic circulations. These vessels form direct arteriovenous communications within the cushions, and for these reasons, hemorrhoidal bleeding is arterial in nature rather than venous.[26]

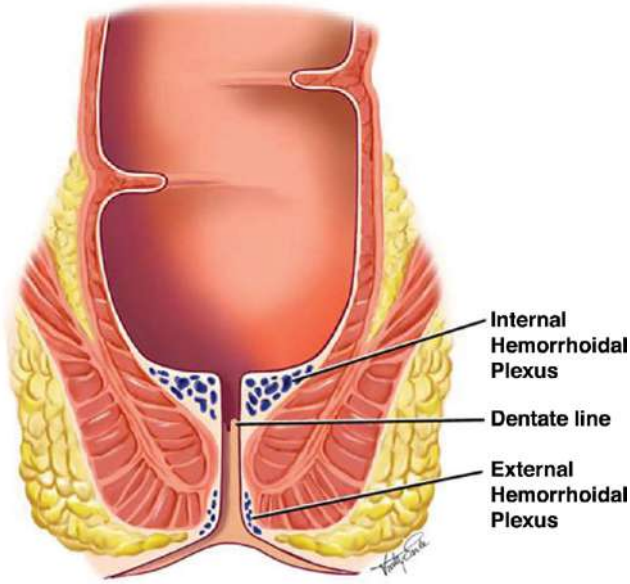

Figure 1. Illustration of normal anorectum. Courtesy of Iain Cleator, MD, Vancouver, BC, Canada.

The submucosal layer of these cushions contains not only the vessels mentioned above but is also rich in muscular fibers, which arise from both the internal sphincter and the conjoined longitudinal muscle. These muscular fibers (the muscularis submucosae) help to maintain adherence of these tissues to the underlying internal sphincter.[26,27] With time and aging, starting as early as the second or third decade of life, this supporting tissue can deteriorate or weaken, leading to distal displacement of the cushions and venous distention, erosion, bleeding, and thrombosis and also allowing for tissue prolapse.[3,9,26,28]

The hemorrhoidal cushions are considered to play an important role in the maintenance of rectal continence, contributing 15%–20% of the resting pressure of the anal verge. They also work to protect the sphincter mechanism during defecation, in addition to providing complete closure of the anal opening, especially while performing a Valsalva maneuver.[26,29,30]

Pathophysiology and Symptoms

Although hemorrhoidal cushions are normal anatomic structures, they are infrequently referred to until issues arise, and then the term *hemorrhoid* is meant as a pathologic process. The pathogenesis of hemorrhoids is not completely clear, but as stated by Kann et al,[3] "all etiologic factors work toward stretching and slippage of the hemorrhoidal tissue." As the supporting tissue of the anal cushions weakens, downward displacement of the cushions can occur, causing venous dilation and prolapse.[29,30] There is some controversy regarding the pathogenesis of symptomatic hemorrhoids, as Thomson[26] and Corman[31] propose the following possibilities:

1. Deterioration of the anchoring connective tissue, as described by Thomson.
2. Downward displacement or prolapse of the hemorrhoidal tissue.
3. Abnormal distention of the arteriovenous anastomoses within the cushions.

4. Abnormal dilatation of the veins of the internal hemorrhoidal venous plexus.

Any number of possible contributing factors leading to migration of the hemorrhoidal cushions has been suggested, including lack of dietary fiber, chronic straining, spending excess time on the commode, constipation, diarrhea, pregnancy, sedentary lifestyle, and a family history. Apart from pregnancy, none of these etiologies are supported by good evidence.[9,30] Others have discussed the role of pelvic floor dysfunction, particularly as that relates to elevated anal sphincter pressure, which has been demonstrated in some patients with symptomatic hemorrhoids. However, it is not clear whether these pressure changes are the cause or the result of hemorrhoids.[27,32,33]

As the overlying skin or mucosa is stretched, additional fibrous and sinusoidal tissue develops. With time, the anatomic structures supporting the muscularis submucosae weaken, leading to continued slippage and prolapse. As the redundant tissue moves toward the anal verge, it becomes susceptible to injury and allows symptoms to develop[11] (Figure 2).

The majority of hemorrhoidal symptoms arise from enlarged internal hemorrhoids, with bleeding as the most common presenting symptom.[9] As internal hemorrhoids prolapse through the anal canal, the tissue can become traumatized and friable, leading to bleeding. Hemorrhoids are arteriovenous plexuses, so the bleeding is typically bright red in color.[9,28] Blood that is darker in color suggests other, more proximal sources. Bleeding can be identified on the toilet paper or in the toilet bowl, is typically not mixed with stool, can drip or squirt out, and can be exacerbated by straining.[12,27] Hemorrhoids typically do not cause a positive Hemoccult test by themselves.[9,34,35] Internal hemorrhoids are covered with columnar mucosa, leading to mucous deposition on the perianal skin, which can also cause itching and perineal irritation. The prolapsing tissue can also impede the ability of the anal verge to "seal," and so fecal soiling can be noted as well.[8]

Internal hemorrhoids originate from points proximal to the dentate line and are covered by relatively insensate mucosa, so they are typically not painful. Internal hemorrhoids also rarely thrombose.[9] Hemorrhoid-associated pain usually comes from thrombosed external hemorrhoids, which can present as an acutely painful perianal swelling. External hemorrhoids are otherwise typically asymptomatic. With this in mind, if pain is one of the patient's symptoms, then it is recommended to look for coexistent complicating issues that may be the cause of perianal pain. These associated factors include entities such as anal fissures, solitary rectal ulcer syndrome, and a host of issues dealing with pelvic floor dysfunction (internal sphincter spasm, pelvic dyssynergia, proctalgia fugax, etc).[8]

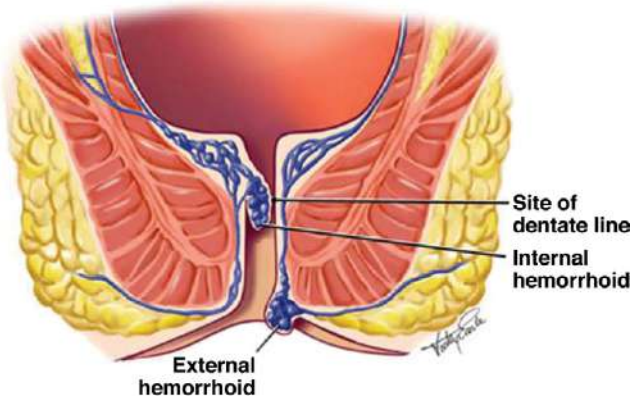

Figure 2. Illustration of internal hemorrhoid beginning to prolapse into the anal canal and external hemorrhoid. Courtesy of Iain Cleator, MD, Vancouver, BC, Canada.

Table 1. Grades and Types of Hemorrhoids

Grades of internal hemorrhoids (Banov[36])	
I	Nonprolapsing internal hemorrhoids
II	Internal hemorrhoids prolapse during defecation, spontaneously reduce
III	Internal hemorrhoids prolapse during defecation, must be manually reduced
IV	Internal hemorrhoids prolapsed and incarcerated
Types of hemorrhoids	
Internal	Covered by columnar epithelium, Figure 2
External	Covered by squamous epithelium (anoderm), Figure 2
Mixed hemorrhoids	Involving and bridging both of the above spaces, Figure 4

Grading of Hemorrhoidal Disease

Internal hemorrhoids have been staged or graded on the basis of their severity. The classification of Banov et al[36] is based on the degree of hemorrhoidal prolapse during defecation (Table 1 and Figure 3). Hemorrhoids can also be classified by their location.[31] Mixed hemorrhoids arise from both the internal and external plexuses along with their anastomotic connections (Figure 4).[7,8]

Diagnosis

Patient History

Patients presenting with most anorectal symptoms will often assume that they are due to hemorrhoids.[27] Keeping this in mind, it is always important to determine whether the patient's symptoms are due to hemorrhoids, some other anorectal disorder, or a combination thereof. The symptoms, in large part, depend on the location of the hemorrhoidal changes in relation to the dentate line. Internal hemorrhoids are located proximal to (above) the dentate line and tend to be associated with painless bleeding, prolapse, mucus discharge, soiling, and symptoms of pruritus ani. Perceived incontinence or soiling can be caused by prolapsed hemorrhoids that create a "wicking effect" by which anal content may seep out. Internal hemorrhoids rarely cause significant pain unless they become prolapsed, incarcerated, and begin developing gangrenous changes. On the other hand, external hemorrhoids are typically asymptomatic unless they become thrombosed.[27,37] Mixed hemorrhoids involve areas both above and below the dentate line and can present with bleeding, pain, or other symptoms[18] (Figure 4).

A detailed history is mandatory in patients presenting with symptoms consistent with hemorrhoidal disease. Significant anal pain could come from other entities, and in this regard the timing of the pain is important. Acute onset of pain associated

Figure 3. Photograph of grade 3 hemorrhoid with prolapse (*left*) and after manual reduction (*right*). Courtesy of Iain Cleator, MD, Vancouver, BC, Canada.

with perianal swelling suggests a thrombosed external hemorrhoid, but pain on defecation typically indicates the presence of a coexistent anal fissure, which can be found in up to 20% of hemorrhoid patients.[38] This may be related to findings that patients with hemorrhoids tend to have higher resting anal sphincter pressures than those without. It is not clear whether these elevated pressures are the cause or the result of the associated hemorrhoids, but the relationship does seem consistent.[37,39] Other pain-associated entities to consider include inflammatory bowel disease with proctitis or perirectal fistula or abscess, anal warts, rectal cancers, anal polyps, or solitary rectal ulcer syndrome.[8,9]

Additional information that may be of importance includes the relationship between symptoms and defecation and a description of factors that might either relieve or exacerbate a patient's symptoms. There may be value in finding out how often a patient defecates, whether constipation or diarrhea is an issue, how much time they spend on the commode, and whether they must manually reduce their hemorrhoids after defecation.[3] It is also important to ask about soiling or incontinence because many patients may be hesitant to discuss this.

Rectal bleeding should never be assumed to be from hemorrhoids without at least some type of visual examination. Depending on the patient's age, history, presence of alarm symptoms, risk of colon cancer, and digital rectal examination, anoscopy, flexible sigmoidoscopy, or colonoscopy should be performed. Published guidelines support this recommendation.[9,40] Studies have demonstrated the unreliability of physician diagnosis without visualization; in some reports, up to 50% of rectal bleeding initially attributed to hemorrhoids turned out to have a different diagnosis after endoscopic evaluation.[13,41]

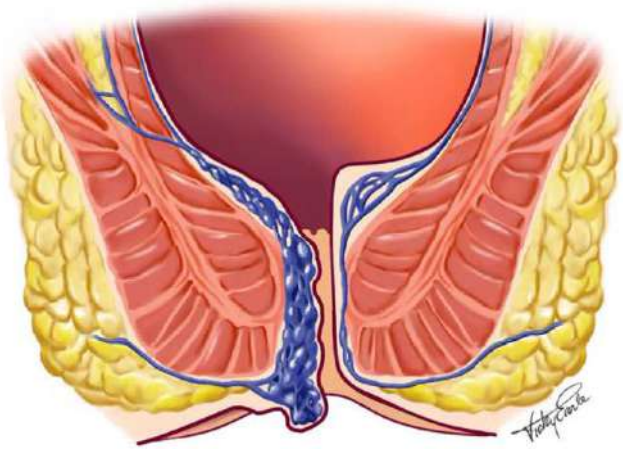

Figure 4. Illustration of a "mixed" hemorrhoid involving the internal, external, and bridging spaces. Courtesy of Iain Cleator, MD, Vancouver, BC, Canada.

Physical Examination

A visual inspection of the perianal area will allow for the description of any external abnormalities. The examination is classically performed in the prone or left lateral decubitus position, but generally the left lateral position is preferred because it is more comfortable for patients and typically less intimidating than the prone or prone jack-knife positions.[3,42] Entities that may be encountered include skin rashes, external hemorrhoids or tags, fissures, fistulae, abscesses, neoplasms, condylomata, prolapse, hypertrophic papillae, or any combination thereof.[8]

A digital rectal examination is also required. The digital rectal examination seems to be a bit of a "lost art" for many clinicians, but it is a tremendously important aspect of the evaluation of patients presenting with anorectal complaints.[5] It should be stressed that the proper evaluation of the anal verge and its structures can provide important information that is useful in formulating a treatment plan for these patients. Care should be taken to evaluate the introitus, looking for signs of inflammation, skin lesions, and the anal sphincters, all of which can be evaluated in the anal canal. Too often, the digital rectal examination begins up in the rectum after the examining finger has passed through the internal sphincter, assuring that the examiner will not be able to appreciate evidence of scars, small fissures, origins of fistulae, and more.[43] In addition to looking and palpating for any masses, lesions, areas of inflammatory change, fluctuance, tenderness, etc, characterizing the anal sphincters is an important feature of any digital examination. A careful examination will help depict the tone of the sphincters and whether the internal sphincter has separated from the external sphincter, amplifying the intersphincteric groove. This double sphincter sign can indicate the presence of coexistent sphincter spasm. In addition, a partially healed anal fissure can be deduced by the presence of thickening or scar in the posterior midline or roughening of the otherwise smooth anoderm. Palpation is important, because these areas may be difficult to see.[8,43]

Some have suggested that descriptions of the physical position of any finding not be described by using the face of a clock but rather by using right/left and anterior/posterior in the description.[31] Thus, for example, the left lateral hemorrhoid is at 3:00

when viewed in the classic supine position, 6:00 in the left lateral decubitus position, and 9:00 when in the prone position.[8,43]

Anoscopy

Anoscopy is a technique that seemingly is rarely taught in GI fellowship programs.[5] It is the most accurate method for examining the anal canal and the distal-most rectum. With the availability of inexpensive disposable anoscopes, the procedure may be performed in the office on unprepped patients quickly, safely, and with minimum patient discomfort.[42] There are a number of types of anoscopes available, but they can best be broken down into the categories of being slotted or non-slotted. Slotted anoscopes feature a cutout from the wall that allows the tissue in question to bulge into the slot, improving visibility, whereas in non-slotted anoscopes, no such cutout exists. Each has its advantages and disadvantages, but both offer an opportunity to visualize the anus and distal rectum in a manner that is not possible to do with a flexible endoscope. Non-slotted anoscopes do not require rotation to see pathology but tend to compress hemorrhoids; slotted anoscopes cannot be rotated because of patient discomfort and need to be completely withdrawn and rotated by using an obturator if the pathology is not identified on the initial pass.

Flexible Sigmoidoscopy and Colonoscopy

Flexible endoscopy is much more frequently performed to evaluate a patient with anorectal issues but appears to be not as accurate as anoscopy.[5,8,44] In a prospective study, Kelley et al[44] found that anoscopy identified 99% of anal lesions in subjects, whereas colonoscopy revealed only 78% when straight withdrawal of the scope was performed and only 54% during retroflexion. The limitation of flexible endoscopy pertaining to the anorectum emphasizes the importance of the anorectal physical examination as well as the advantages of incorporating the techniques of anoscopy in the GI setting.

There are some maneuvers that can be performed during flexible endoscopy to increase the accuracy and diagnostic yield in regard to the diagnosis of hemorrhoids and other anorectal issues.[8] When performing a colonoscopy (or flexible sigmoidoscopy) and when in retroflexion, the act of insufflation causes the rectal vault to distend and stretch, and this can cause flattening of internal hemorrhoids. If the rectum is not partially deflated during this portion of the examination, the only hemorrhoids that can be seen are at or near the dentate line, ie, external hemorrhoids by definition. To more adequately evaluate this area, partial deflation will allow the hemorrhoidal tissue to become more obvious and easier to characterize; failure to do so will very likely underestimate the presence of hemorrhoidal disease (Figure 5). Excess air insufflation during flexible endoscopy can account for negative findings in patients presenting with a compatible hemorrhoid history, whereas anoscopic examination of these patients can reveal significant hemorrhoidal findings.[5,8,44]

Another limitation of flexible endoscopy is the difficulty in describing the spatial orientation of the hemorrhoidal disease. A technique that can help with this dilemma is to irrigate the rectal cavity while examining for hemorrhoids. For example, when patients are in the left lateral decubitus position, fluid will tend to puddle in the dependent portion of the rectum on the patient's left side. Therefore, the hemorrhoidal column that sits in or immediately adjacent to that puddle is the left lateral column.

Figure 5. Hemorrhoids identified via endoscopy. Courtesy of Neal Osborn, MD, Atlanta, Georgia.

Once that point of reference has been established, the other hemorrhoids can be identified and described as well (personal communication, Mitch Guttenplan, MD, Atlanta, GA).

It should be stressed that even when using the tips mentioned above, there still is a role for anoscopy in the evaluation of these patients, particularly because it can be done in the office setting in an unprepped patient. The procedure is quick, relatively painless, and inexpensive, yet it can yield a significant amount of information.

Treatment

The common people call them piles, the aristocracy call them hemorrhoids, the French call them figs – what does it matter so long as you can cure them?

Attributed to Ardene, an English surgeon from the Middle Ages

There are a variety of treatments available for the care of patients with symptomatic hemorrhoidal disease.[9,40] The successful resolution of this issue is based on 2 factors: (1) the thorough evaluation of the patient to identify any additional factors that may well be compounding the patients' complaints of hemorrhoids and (2) a care plan that will treat both the hemorrhoids as well as these compounding issues. Internal hemorrhoids typically cause any combination of itching, bleeding, swelling, and prolapse; if pain is a component of the symptom complex, then more often than not, a fissure or thrombosed external hemorrhoid is present. The treatment of fissures, spasm, various skin rashes, thrombosed external hemorrhoids, and other confounding factors is beyond the scope of this article; however, it is strongly suggested that these additional entities be treated concurrently with the hemorrhoids for the best possible clinical results.

The different hemorrhoid therapies typically break down into the groups of conservative management, nonsurgical treatments, and surgical treatments.

Conservative (Medical) Treatment

Dietary and behavioral modifications are typically among the first-line recommendations made to patients with most anorectal disorders, including those with hemorrhoids. Typical recommendations include increasing dietary fiber, the avoidance of straining or minimizing time on the toilet during defecation, and using soothing sitz baths several times per day. There is moderate-quality evidence to support the use of dietary fiber in the medical treatment of symptomatic hemorrhoid disease[38,40,45] as well as an indication that continued use of fiber may decrease the likelihood of recurrence.[46] As noted in a recent guideline by the American Society of Colon and Rectal Surgeons (ASCRS), a Cochrane analysis of increased fiber intake in 378 patients assessed in 7 randomized trials demonstrated benefit in both symptomatic hemorrhoid prolapse (relative risk, = 0.53; 95% confidence interval, 0.38–0.73) and hemorrhoidal bleeding (relative risk, = 0.50; 95% confidence interval, 0.28–0.89).[40]

There is some evidence to support the use of sitz baths in patients with symptomatic anorectal disease as well. Manometric studies have confirmed that application of moist heat to the perianal area reproducibly lowers the internal sphincter and anal canal pressures of treated patients.[47,48] Patients with significant hemorrhoid disease tend to have elevated sphincter tone. Those hemorrhoid patients with pain often have coexistent fissures and thrombosed external hemorrhoids that coincide with elevated anal canal pressures, perhaps explaining why moist heat can prove beneficial.

As for the various products advertised commercially to patients with symptomatic hemorrhoids, Chong and Bartolo noted,[49] "well-designed studies have found no evidence to support the use of any of the myriad of over-the-counter topical preparations that contain low-dose local anesthetics, corticosteroids, keratolytics, protectants, or antiseptics. The use of these agents is widespread for symptomatic relief but the long-term use of these products, particularly steroid preparations, may be detrimental and should be discouraged."

There have been a number of reports describing the potential use of dietary supplements known as flavonoids. These micronized purified flavonoid fractions have been used extensively in Europe and Asia for some time. These compounds may possibly improve venous tone and lymphatic outflow and may help to control local inflammation. Although there have been publications showing potential for these supplements in the treatment of certain hemorrhoid symptoms, there is acknowledgment that additional trials are required and that widespread use of these products cannot yet be justified.[9,49,50]

Nonsurgical, Office-based Treatments

As stated by the ACRCS,[40] there are 3 goals of all nonsurgical hemorrhoid therapies: (1) to decrease hemorrhoid vascularity, (2) to reduce redundant tissue, and (3) to promote hemorrhoid fixation to the rectal wall to improve prolapse.

Rubber band ligation. Rubber band ligation (RBL) is widely acknowledged to be highly effective and the most commonly performed nonsurgical procedure in the treatment of hemorrhoids; it is used in up to 80% of treated patients.[3,51,52] As noted by ASCRS guidelines, in a meta-analysis of 18 prospective, randomized trials, RBL was overall superior to injection sclerotherapy or infrared coagulation (IRC) in the treatment of grades I, II, and III hemorrhoids.[40,52] Although some type of ligation probably dates back to the time of Hippocrates,[4] Blaisdell[53] first described the ligation technique in detail in 1958 by using a pre-tied silk suture. Barron[54] then described the ligation of hemorrhoids by using rubber bands in 1963. Barron recommended treating one column of hemorrhoids per session, separating the treatments by several weeks, to minimize pain and postbanding complications. The banding process causes the banded tissue to necrose and slough. The resultant inflammatory reaction causes refixation of the mucosa to the underlying tissue, helping to eliminate hemorrhoidal prolapse. The end result is a return of the hemorrhoidal cushions to a more normal size and configuration, with resolution of hemorrhoidal symptoms.[9,55] These patients do not require bowel preparation, sedation, or narcotics, have no significant recovery period, and typically can return to work immediately.[8]

RBL has been shown to be a very effective treatment for the majority of hemorrhoid patients, with short-term success rates of up to 99% and long-term success rates of up to 80%.[25,31] The risk of complications is low, reported in <1%–3% of patients, and includes postbanding pain, bleeding, and vasovagal symptoms.[40,56,57] Because of bleeding potential, the procedure is contraindicated in those with bleeding diatheses or those on anticoagulants or antiplatelet agents.[9] The occurrence of postbanding pain is quite variable, ranging from <1%–50%, and is likely due to differences in technique[25,58] because the location, route, and number of areas banded vary, as does the apparatus used to apply the band.

Location of band placement. The internal hemorrhoidal cushions tend to be in the left lateral, right anterior, and right posterior positions, are located proximal to the dentate line, and are covered by columnar epithelium. The hemorrhoidal tissue to be banded must be proximal to the dentate line to minimize the risk of pain, but the optimal location varies in the literature from "a few millimeters"[59] to "at least 2 cm proximal to the dentate line."[7,9,13] Many now use a technique that involves placing the band at least 2 cm above the dentate line, because this practice appears to be associated with the lowest rates of pain.[9,25] Most studies, however, do not specify the exact location of the band placement; therefore, it is difficult to ascertain how many of the differences noted in the rates of pain are due purely to this factor. The pain associated with RBL tends to be minimal and is generally easily managed with sitz baths and over-the-counter pain relievers.[9]

Method of band placement. RBL is generally a simple, inexpensive procedure, and there are any number of devices and ways of applying rubber bands for hemorrhoid treatment, each with its proponents.[8,9,25] Ligation can be performed with either a disposable suction device or a forceps ligator.[7,13,25,31] There are also ligation techniques applied via the flexible endoscope that have demonstrated better visibility and comparable results[41,60]; however, the endoscopic approach is associated with increased time and costs, and some studies suggest a higher frequency of pain with this route compared with other banding techniques.[61] There are also a number of devices that are used through an anoscope or proctoscope as well as a "touch" method[8] in which bands are placed without visualization by using a hand-held, disposable suction device[25] (Figures 6 and 7).

Apart from banding, multiple insertions of a conventional slotted anoscope to expose the hemorrhoid beds may result in an increased incidence of pain in the postbanding period.[62] This may partly account for the relatively low frequency of pain

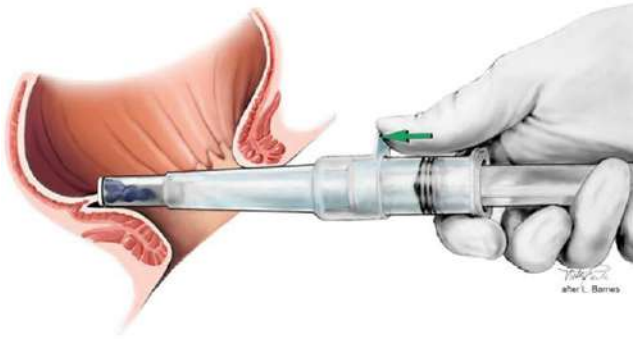

Figure 6. Illustration of RBL by using the touch technique without anoscopy. Courtesy of Iain Cleator, MD, Vancouver, BC, Canada.

(<1%) after the touch technique,[8] which bands hemorrhoids without the use of an anoscope or flexible endoscope, although studies of this technique are limited.[8,25]

How much tissue to band. There are 2 aspects to the discussion of how much tissue should be banded, both of which are controversial. The first is how much tissue to band for a given hemorrhoid, and the other is regarding how many of the hemorrhoidal columns should be treated at a single setting. As noted, the various methods each use different tools for band placement, and bands are positioned at differing locations relative to the dentate line. It is not clear as to exactly how much tissue is banded during these various procedures. The frequent description of placing the band around the "base of the hemorrhoid"[13] can be very difficult to quantify because this can be quite a large area, particularly when visualized anoscopically in patients with more severe disease.

The aim of RBL is to cause an inflammatory reaction that helps fix "loose" mucosa back to the underlying anorectal muscular layer by causing ischemic necrosis of the banded mucosa/submucosa rather than causing the necrosis of the entire hemorrhoidal cushion.[8,9] It is not known how much tissue is necessary to achieve this goal; moreover, banding the deeper muscle layer can cause significant postbanding pain.[25] Pain arises from ischemia of the muscle,

Figure 7. Photograph of an internal hemorrhoid after banding. Courtesy of Neal Osborn, MD, Atlanta, Georgia.

and in the event of immediate postbanding pain, capture of muscle in the band needs to be considered. The band should be freely mobile if no muscle is trapped and will feel "fixed" if there is muscle caught in the band. In this event, digital rectal examination with manipulation of the banded tissue and rolling the band off of any captured muscle should immediately alleviate discomfort, assuming that the band was placed well proximal to the dentate line.[25] Rarely, perineal sepsis can occur when muscle is trapped in the band, resulting in necrosis and subsequent microperforation. This should be suspected and treated emergently if patients develop severe pain, high fever, and urinary retention.[9,25]

Another point of discussion is the number of hemorrhoids to be banded at a single session. In his original description of the technique, Barron[54] found that banding only one hemorrhoid at a session resulted in less pain and fewer problems in the postbanding period. Others have concurred with these recommendations, and banding one hemorrhoid at a time has become an accepted practice.[3,25,27] There are authors who have challenged this practice in an effort to see whether multiple bandings could be safely and more conveniently performed at a single setting.[62–64] Multiple-banded patients, however, may experience a significant increase in the incidence of pain, the need for analgesics, urinary symptoms (including urinary retention), vasovagal symptoms, swelling, and edema (Table 2).[64]

Although there is a need for additional studies comparing single with multiple band ligation, at the present time it would seem reasonable to band a single hemorrhoidal column per treatment, place the band at least 2 cm proximal to the dentate line, and minimize instrumentation of the anorectum during treatment. Conforming to these tenets should allow RBL to be performed effectively, safely, and with minimal postbanding discomfort.[25]

Sclerotherapy. Sclerotherapy dates back more than a century[65] and typically is reserved for grades 1 or 2 internal hemorrhoids. It involves the injection of one of a number of sclerosants into the submucosal space of the hemorrhoid to be treated or into the apex of the hemorrhoid itself. The soft tissue reaction that follows causes thrombosis of the involved vessels, sclerosis of the connective tissue, and a refixation of the prolapsing mucosa to the underlying rectal muscular tissue.[9]

In a prospective study Khoury et al[66] demonstrated that 89.9% of patients with grades 1 and 2 hemorrhoids were helped, whereas a recent randomized, controlled trial demonstrated no advantage of sclerotherapy over bulk laxatives.[67]

The potential complications from sclerotherapy include pain (12%–70%), urinary retention, abscess, and impotence, although serious complications are uncommon.[9,40] Cadaveric dissections have shown the close proximity of parasympathetic ganglia to the typical site of injection. If the sclerosant is injected too deeply,

Table 2. Single vs Multiple RBL at a Single Setting

Complication	Single RBL (%)	Multiple RBL (%)
Pain	4.5	29
Vasovagal reflexes	0	5.2
Urinary symptoms	0	12.3
Bleeding	0	11.6
Swelling/edema	0	2.6
Thrombosed external hemorrhoids	0	1.3

NOTE. Adapted from Lee et al.[64]

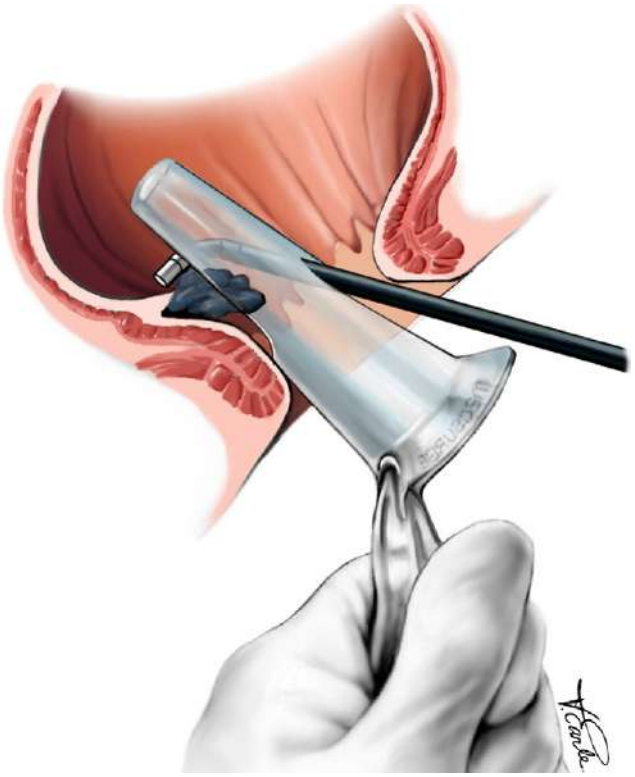

Figure 8. Illustration of transanoscopic approach to hemorrhoid treatment by using IRC probe.

affecting the parasympathetics in the area, impotence can result.[65,68] Fortunately, these reports are rare, as are those of hematuria, hematospermia, epididymitis, urethral stricture, and urinary perineal fistula.[65,69] These complications stress the importance of precise placement of the sclerosing injection. In large part because of the proximity of the genitourinary structures to the right anterior hemorrhoid cushion, a suggestion has been made to avoid the use of sclerotherapy and defer to another technique such as RBL rather than to inject the right anterior hemorrhoid.[70]

Infrared coagulation. This technique was described by Neiger[71] in 1979. The technique calls for delivery of a controlled amount of infrared energy (converted to heat) via a tungsten-halogen lamp to the hemorrhoidal tissue by way of a polymer tip delivered through an anoscope[9] (Figure 8). Three to 4 pulses of infrared energy are applied to the normal mucosa proximal to the hemorrhoidal tissue, not the hemorrhoid itself. One or 2 hemorrhoids are treated per session, with sessions repeated as necessary every 2–4 weeks.[3] The bulk of the reaction takes place in the submucosa, producing tissue destruction, protein coagulation, and inflammation, which then lead to scarring and tissue fixation.[9,72]

The procedure seems best suited for cases of small (grade 1 or 2) bleeding hemorrhoids, with reported success rates of 67%–96% for these grades in 2 randomized, controlled trials.[9] Advantages attributed to IRC include a relative lack of serious complications and the fact that the maximal discomfort occurs during the procedure, as opposed to occurring at a later time. Disadvantages include the cost of the equipment, the limitations of the technique when treating larger, bulkier hemorrhoids and those with prolapse, the need for more retreatments than RBL, and a higher recurrence rate,[3,13,52,73] although recent randomized studies suggest outcomes similar to RBL.[40]

Bipolar diathermy, direct current electrotherapy, heater probe coagulation. These hemorrhoid technologies are also delivered via anoscopy and have been used in grades 1, 2, and 3. The heater probe and bipolar diathermy devices generate heat (1-second pulses, 20 W), which causes coagulation of the treated tissue, leading to a fibrotic reaction at the site of treatment with fixation of the treated tissue.[9] Multiple applications to the same hemorrhoid are typically necessary, particularly for larger lesions. Bipolar cautery success rates in randomized trials range from 88%–100%, but the complication rate is relatively high.[74–78] When comparing bipolar and heater probes, both technologies afforded similar efficacy when treating bleeding, with a 6.2% recurrence of bleeding at 1 year, but the heater probe controlled the bleeding more quickly (76.5 vs 120.5 days), while causing more pain. The overall complication rate was higher with the bipolar technology (11.9% vs 5.1%).[74] Complications include pain, bleeding, fissure formation, or spasm of the internal sphincter, and bipolar coagulation required more treatment sessions and had more treatment failures than did RBL.[41] The depth of the wound created by bipolar cautery is similar to that of IRC.[79] Another study demonstrated symptomatic mucosal ulceration in 24%, significant bleeding in 8%, and prolonged pain in 4%, and neither technology was able to reliably eliminate prolapsing tissue.[9,76]

The direct current probe (Ultroid; Ultroid Technologies, Inc, Tampa, FL) is said to not be a thermal device, but rather it causes the production of sodium hydroxide at the negative electrode of the device, creating the desired tissue effects.[31] Treating hemorrhoids by using direct current technology is limited by the large amount of time necessary to treat the involved tissue, up to 14 minutes per site, and this depends on the grade of the hemorrhoid and the milliamperage tolerated by the patient (110 V up to 16 mA).[9,80] This technique has had limited application because of postprocedure pain that occurs in up to 20% of patients, poor control of prolapse, and the prolonged treatment time.[77] Postprocedural ulcers with bleeding have also been reported. In randomized trials that used this technique, hemorrhoidal bleeding was controlled in 88% of patients.[9]

Meta-analyses. As noted in recent reviews, each of the above methodologies has its advocates, and there is no perfect technique.[9,40] Randomized, controlled trials have compared each method with some of the others, but there is no overarching study that has compared all the techniques together. A highly cited meta-analysis by Helen MacRae queried 18 studies that assessed 2 or more treatment modalities involving grades 1, 2, and 3 hemorrhoids.[79,81] This analysis concluded that RBL was the preferred initial strategy on the basis of a combination of initial outcomes, less need for additional therapy, and low complication rates. Hemorrhoidectomy yielded the best treatment response but had higher complications than RBL. RBL was more effective than sclerotherapy and was similar in efficacy to IRC, with lower recurrence rates than either sclerotherapy or IRC. RBL was associated with more postprocedural pain.[79,81] Another meta-analysis assessing 5 studies involving almost 1000 patients reached similar conclusions but preferred IRC as the initial strategy because of less postprocedural pain.[82]

Cryosurgery and Lord's procedure. These techniques are mentioned only in passing, because both have lost favor in the United States. Cryosurgery is followed by signif-

Table 3. Treatment Options by Grade of Hemorrhoids

	Grade I	Grade II	Grade III	Grade IV	Comments (see text for citations)
Medical management	X	X	X	X	May provide symptomatic relief as well as lessen likelihood of recurrence.
Sclerotherapy	X	X			Limitations with prolapse and complications discussed.
IRC	X	X			Best suited to smaller hemorrhoids, need for more frequent treatments, higher recurrence rates.
Bipolar/heater probe coagulation	X	X			Heater probe with quicker results, but more pain; bipolar with more overall complications.
Direct current therapy (Ultroid)	X	X	X		Limited by time required for therapy.
RBL	X	X	X		Current first-line therapy in I, II, and III. Pain most frequent complication, can be minimized by proximal placement, touch technique, single banding at a session.
Cryosurgery/anal dilatation (Lord's)	NA	NA	NA	NA	Complications prohibitive
Surgery		(X)	(X)	X	For use in patients unresponsive to lesser treatments. More effective than RBL in grade III, but pain/disability caused by surgery leads to recommendation of attempting RBL or IRC first and saving surgery for resistant cases.

icant amounts of pain along with a foul-smelling discharge and a prolonged recovery in several series.[7,9,31] Lord[83] recommended manual stretching of the anus to decrease sphincteric pressure. Although the technique initially showed some promise for both hemorrhoids and anal fissures, there were significant numbers of patients with postprocedural incontinence.[83,84] In addition, response rates are lower than other techniques, are more likely to require additional therapy, and because of the high rates of postdilation incontinence, the ASCRS Surgeons recommends that this procedure be abandoned (Table 3).[85]

Surgical Treatment Options

A detailed description of surgical options available for the treatment of hemorrhoids is beyond the scope of this article; patients requiring these more advanced procedures typically fall into one of the following patient groups[49]:

- Grade III hemorrhoids unresponsive to nonsurgical approaches
- Grade IV hemorrhoids
- Large external hemorrhoids or combined internal and external components
- Concomitant anorectal pathology.

Nonsurgical approaches are successful in 80%–99% of patients with hemorrhoidal issues,[25,27] but in nonresponders, surgery can be contemplated. Surgical hemorrhoidectomy is more effective than RBL in the treatment of grade III hemorrhoids[86] but incurs additional complications, pain, and disability.[79,81]

Surgical treatments fall into several categories. The first is the classic excisional hemorrhoidectomy, which has several technical variations. These techniques are highly effective and have low recurrence rates, but they are offset by significant pain and a prolonged recovery period. Complications have included urinary retention (2%–36%), bleeding (0.03%–6%), infection (0.5%–5.5%), anal stenosis (0%–6%), and incontinence (2%–12%).[79,81]

The procedure for prolapse and hemorrhoids, proposed by Longo in 1998, uses a circular stapling device to divide, resect, and repair the mucosa and submucosa. This causes an interruption of arterial inflow to the hemorrhoids, which "fixes" the previously prolapsing mucosa to the underlying rectal wall. Advantages of the procedure include less postoperative pain and disability than traditional hemorrhoidectomy, but it is not devoid of complications, because there are reports of anovaginal fistula, fistula in ano, hemorrhage, sepsis, and perforation.[52]

Transanal hemorrhoidal dearterialization is a newer surgical technique that uses Doppler identification of the distal rectal arterial branches and suture ligation of the vessels to decrease flow to the hemorrhoidal cushions.[87] This diminution of flow, along with any postinflammatory mucosal fixation that occurs as a result of the surgery, is thought to be responsible for the therapeutic effects noted (Table 3).

Conclusions

My troubles are all behind me.

Hall of Famer George Brett, on returning to a World Series game after receiving treatment for a painful, thrombosed external hemorrhoid

Symptomatic hemorrhoidal disease is an age-old problem commonly encountered in our society, and patients often present to the gastroenterologist for evaluation and care. This disease is well within the purview of gastroenterology, and the treatment of hemorrhoids and other anorectal disorders should be incorporated into the typical GI practice and added to the GI training curriculum. There are a number of medical and nonsurgical approaches to offer, and information was presented to aid in the assessment and definitive care of these patients.

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Conflicts of interest

The author discloses the following: Dr. Ganz has equity in CRH Medical and is on the CRH Medical Scientific Advisory Board.