Management of Hemorrhoids: What is New?

Eslam Mohamed Ibrahim[1],Hany Mohamed Hassan[1], Sahar Abdnasser Atayp Beshna[2], Mohamed Abdallah Zaitoun[1]

[1]Department of General Surgery, Faculty of Medicine, Zagazig University, Egypt.
[2]Department of General Surgery, Faculty of Medicine, Azzawia University, Libya.
***Corresponding author:**Sahar Abdnasser Atayp Beshna,
E-mail:saharnasser392015@gmail.com

Abstract

Haemorrhoid is a condition characterized by the prolapsed of an anal cushion that may result in bleeding and pain from rectum or anal canal. It is said to be the fourth leading outpatient gastrointestinal diagnosis. Modern medical science has treatment alternatives such as diet- lifestyle modification, sclerotherapy, banding, LASER ablation etc. in early stage and various surgical procedures such as Haemorrhoidectomy, MIPH etc. in advanced stage with varied prognosis.

KeyWords: Hemorrhoids, LASER, Haemorrhoidectomy.

DOINUMBER:10.48047/NQ.2022.20.19.NQ99418 **NEUROQUANTOLOGY2022;20(19):4542-4555**

Introduction:

The three goals of surgical hemorrhoidectomy are to remove the symptomatic hemorrhoidal columns, reduce the redundant tissue that accounts for the prolapsinghemorrhoidal tissues (mucopexy), and minimize pain and complications. Generally, the more definitive the excision, the greater the pain and the longer the recovery period without a significant reduction in possible complications. Conventional surgery can be used for treatment of main piles only **(1)**.

Light amplification by stimulated emission of radiation (Laser) treatment in hemorroidal diseases can be utilized for main and daughters' piles in several ways. One technique is to use laser as an energy source for excision of hemorrhoids. Another technique is intraoperative localization of feeding arterial branches with the aid of a Doppler probe and using laser to reduce the arterial inflow by dearterialization. The laser hemorrhoidoplasty is performed by using laser as an energy source to denature the submucosal proteins to induce fibrosis and thereby adherence of mucosa to underlying tissue to prevent prolapse. Laser treatment had acceptable clinical outcomes for grade 2 and 3 hemorrhoids with lower rates of postoperative pain and bleeding with satisfactory long-term outcomes **(2)**.

A Conservative Management

Dietary and life style modification:

Constipation and diarrhea have been acknowledged as the main contributing factors in the development of hemorrhoidal diseases **(3)**.

Therefore, recommendations suggest that adequate fiber and fluid intake may improve symptoms. Integrated patient education should be addressed regarding the consumption of daily dietary fiber 25-30 grams per day, drinking 6 to 8 cups of non-caffeinated drinks, and osmotic laxatives as necessary. Dietary fiber should be started from a small amount and increase gradually so that the patients do not

develop an adverse reaction, such as abdominal cramping and bloating **(4)**.

Moreover, the patients should be advised to avoid unhealthy bathroom habits, including excessive straining on the toilet and reading while in the bathroom. A prolonged sitting position in an attempt to defecate for more than 10-15 minutes causes an increase in abdominal pressure and further contributes to hemorrhoids engorgement. Topical preparations including suppositories, steroid creams, and medicated wipes are available for this condition, but no adequate evidence supports long-term success in treating hemorrhoids with these topical products **(5)**.

Oral flavonoids-derivatized phlebotropic drug, such as **micronized purified flavonoid fraction (MPFF)**, consists of 90% micronized diosmin and 10% hesperidin, and is commonly used in clinical treatment. This preparation helps in increasing venous wall tone and lymphatic drainage, further reducing the capillary hyperpermeability by defending the microcirculationfrom inflammatory processes. A meta-analysis of flavonoids for hemorrhoidal management, involving14 randomized trials and 1514 patients, suggested that flavonoids decreased the risk of bleeding by 67%, persistent pain by 65%, and itching by 35%, with a recurrence rate of 47% **(6)**.

B. Outpatient Interventions (Non-Operative)

If the conservative management does not provide maximum results, non-surgical outpatient management can be considered to treatinternalhemorrhoids.These interventions are simple procedures that can be performed in the surgeon's office without anesthesia or require only local anesthesia. Some examples of this type of treatment are rubber band ligation, sclerotherapy, and infrared coagulation **(7)**.

•Rubber Band Ligation (RBL)

This method is the most frequent anorectal outpatient procedure performed in the surgery department. It is indicated for grade II and III internal hemorrhoids **(8)**.

Rubber band ligation does not necessarily require any local anesthetic **(Fig 1)**. The patient lies in prone-jackknife or left lateral position, and the procedure is performed through an anoscope. The ligation procedure is assisted using the McGivney forceps ligator and the suction ligator. Small band rings are applied tightly at the base of the internal hemorrhoid, specifically at half a centimeter above the dentate line, to prevent the ring placement into somatically innervated nerve tissue **(9)**.

This procedure aims to make hemorrhoid tissue necrotic, leaving only a scar fixated on the rectal mucosa. Ligated hemorrhoidal tissue will undergo ischemia and become necrotic in 3-5 days, and then an ulcerated tissue bed will form. Complete healing generally occurs within a few weeks of the procedure **(10)**.

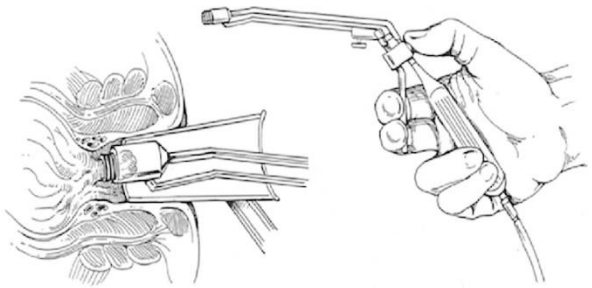


Figure 1. Banding of an internal hemorrhoid through an anoscope using a McGown suction-ligator **(9)**.

The most common complication of RBL is pain or rectal discomfort, which is usually relieved by warm sitz baths, mild analgesics and avoidance of hard stool by taking mild laxatives

or bulk-forming agents. Other complications include minor bleeding from mucosal ulceration, urinary retention, thrombosed external hemorrhoids, and extremely rarely, pelvic sepsis. The patients should stop taking anticoagulants for one week before and two weeks after RBL **(10)**.

Sclerotherapy

This method is one of the oldest forms of non-operative hemorrhoid management, first published in 1869 by Morgan in Dublin. It is mainly indicated for improtruded (grade I and II) internal hemorrhoids or in patient consuming regular anticoagulants. This procedure is administered by injecting 5 mL of 5% phenol in oil, 5% quinine and urea, or hypertonic (23.4%) salt solution at the base of internal hemorrhoid to induce thrombosis of the blood vessels, sclerosis of connective tissue, and shrinkage and fixation of overlying mucosa **(11)**.

An anoscope may be used to assist the procedure. Sclerotherapy is a simple procedure requiring no anesthesia and takes only minutes to perform **(12)**.

It is important that the injection be made into submucosa at the base of the hemorrhoidal tissue and not into the hemorrhoids themselves; otherwise, it can cause immediate transient precordial and upper abdominal pain. Misplacement of the injection may also result in mucosal ulceration or necrosis, and rare septic complications such as prostatic abscess and retroperitoneal sepsis **(5)**.

There are still limited data on the efficacy of sclerotherapy. Nevertheless, a recent trial demonstrated a 20% success rate at one year in treating grade III hemorrhoids. The results were found significantly better for the treatment of grade I hemorrhoids**(13)**.

Infrared Coagulation (IRC)

The principle of IRC therapy aims to apply infrared light waves directly to the hemorrhoidal tissue to induce coagulation and evaporates the water content inside the cell, causing shrinkage of the hemorrhoid tissue **(14)**.

As with sclerotherapy, IRC is indicated for improtruded (grade I and II) internal hemorrhoids. Firstly, a probe is applied to the base of hemorrhoid using the anoscope with a contact time between 1.0 to 1.5 seconds, depending on the intensity and wavelength of the coagulator. The necrotic tissue is seen as a white spot and eventually heals with fibrosis. The IRC is not suitable for large or prolapsing hemorrhoids conditions **(15)**.

The efficacy of IRC is similar to RBL, and pain complications are minimal due to the lower volume of tissue necrosis **(Fig 2)(16)**.

Radiofrequency ablation

Radiofrequency ablation (RFA) is a relatively new modality of hemorrhoidal treatment. A ball electrode connected to a radiofrequency generator is placed on the hemorrhoidal tissue and causes the contacting tissue to be coagulated and evaporized. By this method, vascular components of hemorrhoids are reduced and hemorrhoidal mass will be fixed to the underlying tissue by subsequent fibrosis. RFA can be performed on an outpatient basis and *via* an anoscope similar to sclerotherapy. Its complications include acute urinary retention, wound infection, and perianal thrombosis. Although RFA is a virtually painless procedure, it is associated with a higher rate of recurrent bleeding and prolapse **(5)**.

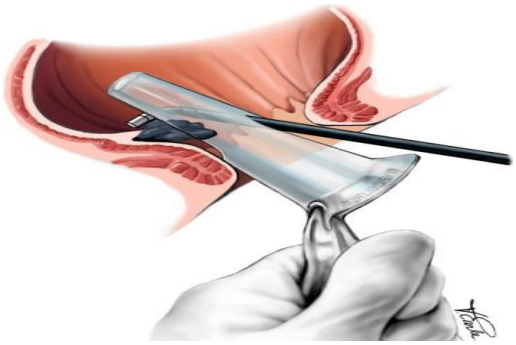


Figure 2. Illustration of transanoscopic approach to hemorrhoid treatment by using IRC probe **(17)**.

C. Surgical Management

Surgical treatment is indicated for grade III and IV internal hemorrhoids and thrombosed external hemorrhoids with persistent symptoms. A perfect operation for hemorrhoids must have minimal postoperative pain and complications, with no risk of recurrence development **(18)**.

Excisions of hemorrhoids (Hemorrhoidectomy)

Commonly excision of hemorrhoidal tissue is performed within the first 48 h of symptoms of thrombosing. Complete excision of a hemorrhoid with associated skin is advised when incision and drainage are ineffective. **(19)**.

Surgical excision of hemorrhoids is perhaps one of the oldest operations ever performed. Although there are numerous variations of the technique two essential operations exist: open excision (Milligan–Morgan) and closed hemorrhoidectomy (Ferguson) **(10)**.

nevertheless, the Ferguson approach might be superior to the Milligan-Morgan approach in terms of long-term patient satisfaction and continence and both techniques may lead to significant postoperative pain **(20)**.

Ferguson excision hemorrhoidectomy

is the most common type of hemorrhoidectomy. In this conventional operation, the prolapsed hemorrhoid connective tissue and congested blood vessels are removed, whereas the anoderma is preserved, and the internal sphincter is protected with a totally inverted sliding process **(21)**.

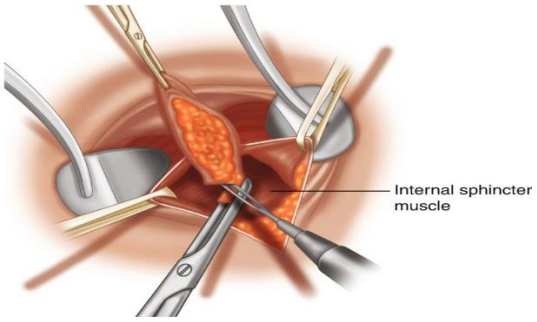


Figure 3. Excision of the hemorrhoid **(22)**.

Milligan-Morgan hemorrhoidectomy

Is an elliptical incision from the perianal skin to the anal canal, leaving wounds open**(19)**.

This technique is preferred for gangrenous hemorrhoids, with pedicle ligation after separation of hemorrhoidal tissues from the sphincter **(23, 24)**.

This procedure is often followed by the removal and pathological examination of hemorrhoidal tissue, particularly if malignancy is suspected. However, hemorrhoidal specimens may not be pathologically examined if there is no suspicion of malignancy **(7)**.

Surgical procedure is mainly indicated if non-surgical management fails.In clinicalpractice,excisional hemorrhoidectomy is also indicated for grade III and IV internal hemorrhoids **(20)**.

Although simple and effective, the drawback of this procedure is significant post-operative pain. Another major post-operative complication is acute urinary retention, affecting 2%-36% of the patients. There has been evidence that Ligasure hemorrhoidectomy results in less

*e*ISSN1303-5150

postoperative pain, shorter hospitalization, faster wound healing and convalescence compared to scissors or diathermy hemorrhoidectomy **(5)**.

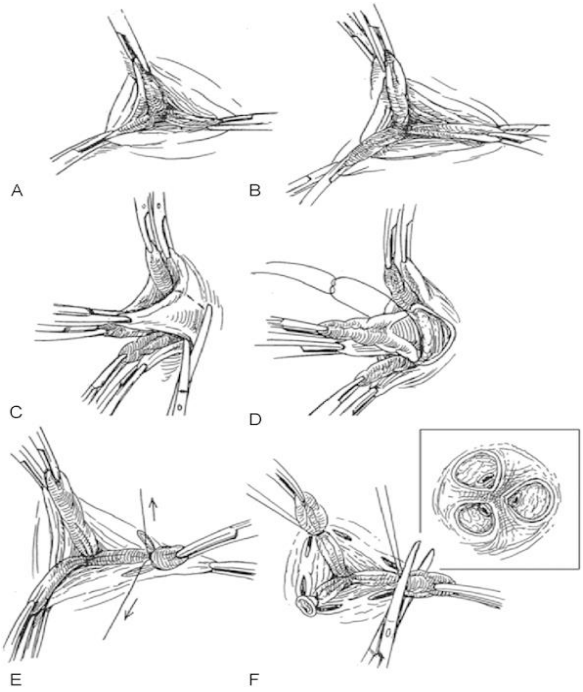


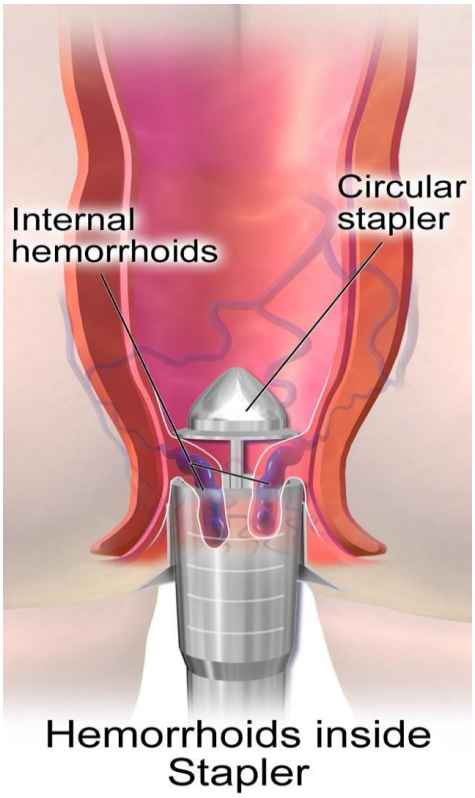
Figure4. Open (Milligan–Morgan) hemorrhoidectomy. Panel A: external hemorrhoid is grasped. Panel B: internal hemorrhoid is grasped. Panel C: external skin and hemorrhoids excised. Panel D: tie placed around the hemorrhoid vascular bundle. Panel E: ligation of the vascular bundle. Panel F: excision of the hemorrhoid tissue distal to the tie **(9)**.

Treatment of hemorrhoids with the use of a stapling device (Stapled Hemorrhoidopexy)

In stapled hemorrhoidopexy, the loose connective tissue of mucosa and the enlarged hemorrhoidal nodules above the dentate line contributing to the prolapse are excised **(25)**.

According to the technique, a special circular device — a stapler excises a ring of redundant mucosa and fixes the hemorrhoidal plexus 4 cm above the dentate line without any sphincter tissues. This operation corrects some abnormal pathogenic pathways: prolapse is resected, the capacity of nodules is reduced, and the vessels supplying the internal hemorrhoidal plexus are ligated, thus limiting the blood supply to the nodules **(26)**.

The complications reported in stapled hemorrhoidopexy are bleeding, injury of the sphincter muscle, dehiscence of anastomotic line, stenosis, and recto-vaginal fistula **(19)**.



Application of the LigaSure technology for the treatment of hemorrhoidal disease

Ligasure hemorrhoidectomy is a sutureless, closed hemorrhoidectomy technique dependent on a modified electro-surgical unit to achieve tissue and vessel sealing. It is safe and effective, has less blood loss, postoperative pain and complications compared to conventional hemorrhoidectomy **(27)**.

The principles of Ligasure haemorrhoidectomy are similar to those of closed haemorrhoidectomy and involve excision of the excess haemorrhoidal tissue after first achieving sealing and haemostasis with a bipolar

*e*ISSN1303-5150

electrothermal sealing device. It is postulated that sealing of haemorrhoidal tissue in between the Ligasure forceps is achieved with minimal collateral thermal spread and limited tissue charring through use of active feedback control over the power output, and proponents of this approach argue this should result in diminished postoperative pain **(28)**.

The operation is performed under general anaesthesia. An anal retractor is inserted and the external part of the haemorrhoid to be removed is grasped with forceps and lifted into the anal canal. The jaws of the Ligasure instrument are closed across the base of the haemorrhoid, and the machine is activated until sealing occurs. The haemorrhoidal tissue above the sealing point is excised, and the process is repeated up the anal canal until the haemorrhoid has been completely removed, leaving a thin strip of coagulated and sealed anoderm along the length of the anal canal. The process is repeated for each haemorrhoid to be removed **(29)**.

Ligasure hemorrhoidectomy has been assessed in a number of randomised trials. One Cochrane review **(30)** found that pain and analgesic requirements during the first 7 days were less after this procedure than following conventional excision, but the difference was lost by day 14. Hospital stay was similar, as were complication rates. In another recent meta-analysis specifically comparing Ligasure hemorrhoidectomy to Ferguson hemorrhoidectomy, the use of Ligasure was associated with lower pain scores, shorter operating times, and lower volumes of blood loss. It would appear that there are some short-term advantages to Ligasure hemorrhoidectomy, but these need to be offset against the extra expense of the procedure **(31)**.

LigaSure technology is based on a unique combination of pressure and energy to create a consistent seal with size up to 7 mm in vascular structures. Largely, the complications appearing by using these new technologies are not completely understood. However, the development of minimal adhesion and tissue damage due to thermal exposure have been reported **(32)**.

Previous studies demonstrated the safety of the aforementioned technology with no risk of development of anal stenosis, when comparing the use of vessel-sealing devices and conventional hemorrhoidectomy **(1, 33)**.

Application of the Harmonic Scalpel™ technology for the treatment of hemorrhoidal disease

The Harmonic Scalpel™ is another novel technology used for the treatment of hemorrhoidal disease by causing coagulation. Vibrating at 55 000 Hz, structures up to 7 mm form adhesions. **(25, 34)**.

It is a safe, rapid, and effective method for the treatment of hemorrhoid grades III and IV. Previous studies reported the presence of some tissue damage, alterations in peripheral nerves, and vascular thrombosis **(25, 34)**.

However, no difference was found in postoperative pain, analgesic requirement, and time until complete wound healing **(35)**.

Non-excisional surgical techniques for the treatment of hemorrhoidal disease

Doppler-guided hemorrhoidal artery ligation is a method that offers a tailored individualized therapy, since it locates the feeding terminal branch of the superior rectal artery (SRA) that

supplies each hemorrhoidal nodule, ultimately performing targeted suture ligation **(36, 37)**.

The advantage of the method is the preservation of the anatomy and physiology of the anal canal **(38, 39)**.

It is especially effective for grades II and III of hemorrhoidal disease **(34, 40)**.

Consequently, the increased blood supply to the anal cushion is diminished, its engorgement is prevented, its size is decreased, and it is ultimately firmly fixed to the floor of the upper surgical anal canal **(41, 42)**.

Non-excisional laser therapies for hemorrhoidal disease

Non-excisional laser therapy was initially described in 1998. with an experimental animal study. Administration of a pulsed laser energy to the submucosal pig rectal tissue allowed coagulation of vessels, with limited damage to the surrounding tissue. **(43)**.

Later, non-excisional laser therapy was applied in humans, with laser hemorrhoidoplasty (LH) first described in 2007. During LH, a laser fiber is introduced through a skin incision at the hemorrhoidal base, and hemorrhoidal cushions are coagulated. Hemorrhoidal laser procedure (HeLP) constitutes another non-excisional laser therapy for the treatment of HD, first described in 2009. During this procedure, a Doppler identifies the terminal branches of the superior rectal artery, which are coagulated with a pulsed laser energy. Both techniques allow obliteration and retraction of the hemorrhoidal plexus. Moreover, they were shown to be safe and effective for the treatment of HD **(43)**.

Therefore, non-excisional laser therapies constitute interventional therapies for the treatment of HD. However, their recommendation is based on low level of evidence **(44, 45)**.

Laser hemorrhoidoplasty (LHP) is a new minimal invasive and painless procedure for day-surgery treatment of symptomatic hemorrhoids determining the shrinkage of the hemorrhoidal piles by mean of a diode laser **(46)**.

The commonly used laser energy in medicine are carbon dioxide, argon, and Nd:YAG. The laser beam causes tissue shrinkage and degeneration at different depths depending on the laser power and the duration of laser light application **(47)**.

The methods used for the generation and transport of laser energy are diverse and consequently, there are many modalities of its application for hemorrhoids. Nd-YAG laser has a non-contact good coagulative effect **(48)** used Nd-YAG laser for the treatment of grades III and IV hemorrhoidal disease and reported no difference in postoperative analgesia as compared to a closed hemorrhoidectomy **(49)**

Laser hemorrhoidoplasty

After the introduction of diode laser in surgery, a new non-excisional hemorrhoid laser procedure (HeLP) was devised for the management of hemorrhoidal disease **(50)**.

Doppler-guided hemorrhoidal laser dearterialization

(51)were the first to use a Doppler probe to identify the terminal branches of the superior rectal artery approximately 3 cm above the dentate line and then used a diode laser beam to shrink these branches. The rationale of this technique is based on reducing the arterial blood inflow to the corpus cavernosum recti, resulting in a progressive reduction of the volume of the

hemorrhoidal plexus and, consequently, a progressive improvement in hemorrhoid-related symptoms.

Post-procedural care

Discerning postoperative complications (e.g., abscess, proctitis) from anticipated symptoms can be challenging. Pain and anal fullness are expected within the first week following hemorrhoidectomy or hemorrhoidopexy. Local medications are used to manage postoperative pain, with topical nitroglycerine ointment having the strongest evidence of effectiveness **(52)**.

Postoperative injection of botulinum toxin as well as oral or topical metronidazole (Flagyl; Metrogel) are also options, although their effectiveness is disputed **(53)**.

In addition to pain, common complications in the early postoperative period include bleeding, urinary retention, and thrombosed external hemorrhoids **(54)**.

Rare but potentially life-threatening complications that must be identified early include abscess, sepsis, massive bleeding, and peritonitis. Complications in the later postoperative period include recurrent hemorrhoids, anal stenosis, skin tags, late hemorrhage, constipation (often due to narcotic use), and fecal incontinence, all of which are often lesser than in the early postoperative period **(1, 55)**.

Complications of Hemorrhoidectomy

Urinary Retention

Urinary retention is one of the most commoncomplications following hemorrhoidectomy and can increase hospital stay **(56)**.

Zaheer found that disease severity, namely, number of quadrants excised, and analgesia requirements were both important risk factors for those patients who underwent hemorrhoidectomy. Although the exact reasons for this complication are not known, it is clear that both fluid restriction and pain control in the perioperative period is important to prevent this complication. There have been a few reports indicating that the stapled hemorrhoidectomy (PPH) is associated with a lower incidence of postoperative urinary retention **(57)**.

Postoperative Hemorrhage

Postoperative hemorrhage is one of the more common complications after hemorrhoidectomy, although the risk is still relatively low. Bleeding typically occurs during one of two-time frames post-surgery. In approximately 1% of cases, the bleeding will occur in the immediate postoperative period. When this bleeding occurs, it is usually the result of a technical error and most commonly requires a return to the operating room for an exam under anesthesia and control of the bleeding. Delayed hemorrhage can occur in up to 5.4% of patients and will typically occur 7–10 days after surgery **(58)**.

Post hemorrhoidectomy bleeding has been attributed to sepsis of the ligated pedicle in the past, although **Chen et al.** found that male patients and the operating surgeon may be risk factors in delayed post hemorrhoidectomy bleeding **(59)**.

If postoperative hemorrhage occurs, immediate packing of the anal canal or tamponade with a Foley balloon catheter will

control the bleeding. If the bleeding does not stop, then an exam under anesthesia may be warranted. Patients that require a trip to the operating room can be determined with the aid of rectal irrigation. However, return to the operating room to investigate and control the bleeding is always a safe option **(4)**.

Anal Stenosis

Anal stenosis can occur if excessive anoderm is removed at the time of the hemorrhoidectomy. The most common setting for this is when an emergency hemorrhoidectomy is done for prolapsed thrombosed hemorrhoids, and inadequate skin bridges remain post-surgery. Treatment can be as simple as the use of bulk laxatives but may require dilation and or anoplasty **(60)**.

Postoperative Infection

Postoperative infections are surprisingly uncommon. The risk of postoperative infection occurs less than 1%, but the rate may be underreported due to abscesses spontaneously decompressing. In the rare circumstance when an abscess or cellulitis occurs, it requires operative drainage and/or antibiotics as needed. Prophylactic antibiotic therapy is not indicated for elective hemorrhoid surgery **(61)**

Fecal Incontinence

Fecal soiling or incontinence can occur following hemorrhoidectomy but is rather unusual. The etiology could be due to a combination of things like sphincter stretch during the procedure due to retraction, direct injury to the sphincter complex, or loss of the hemorrhoidal piles that have been thought to contribute approximately 10–15% of continence **(60)**.

This can be due to direct mechanical or thermal trauma, or due to subsequent infection. Meticulous surgical technique is paramount in avoiding unintentional damage to the anal sphincter. It is also essential that the risk of fecal incontinence be included in the informed consent prior to surgery **(56)**.

References:

1. **Mott, T., Latimer, K., & Edwards, C. (2018).** Hemorrhoids: Diagnosis and Treatment Options. American Family Physician, 97(3), 172–179.
2. **Lakmal, K., Basnayake, O., Jayarajah, U., et al. (2021).** Clinical Outcomes and Effectiveness of Laser Treatment for Hemorrhoids: A Systematic Review. World Journal of Surgery, 1-15.
3. **Kibret, A. A., Oumer, M., and Moges, A. M. (2021).** Prevalence and associated factors of hemorrhoids among adult patients visiting the surgical outpatient department in the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. PLOS ONE 16; e0249736.
4. **Beck, D. E., Wexner, S. D., Hull, T. L., Roberts, P. L., Saclarides, T. J., Senagore, A. J., Stamos, M. J., and Steele, S. R. (2014).** The ASCRS manual of colon and rectal surgery: Springer).
5. **Lohsiriwat, V. (2012).** Hemorrhoids: from basic pathophysiology to clinical management. World J Gastroenterol 18; 2009-2017.
6. **Godeberge, P., Sheikh, P., Lohsiriwat, V., Jalife, A., and Shelygin, Y. (2021).** Micronized purified flavonoid fraction in the treatment of hemorrhoidal disease. Journal of comparative effectiveness research 10.
7. **Soeseno, S. W., Wahyudi, P. A. E., & Febyan, F. (2021).** Diagnosis and Management of

Internal Hemorrhoids: A Brief Review. European Journal of Medical and Health Sciences, 3(5), Article 5.

8. **Brown, S. R., Tiernan, J. P., Watson, A. J. M., Biggs, K., Shephard, N., Wailoo, A. J., Bradburn, M., Alshreef, A., and Hind, D. (2016).** Haemorrhoidal artery ligation versus rubber band ligation for the management of symptomatic second-degree and third-degree haemorrhoids (HubBLe): a multicentre, open-label, randomised controlled trial. The Lancet 388; 356-364.
9. **Sun, Z., & Migaly, J. (2016):** Review of hemorrhoid disease: presentation and management. Clinics in colon and rectal surgery, 29(01), 022-029.
10. **Brown, S. R. (2017).** Haemorrhoids: an update on management. Ther Adv Chronic Dis 8; 141-147.
11. **Izadpanah, A., Hosseini, S., and Mahjoob, M. (2010).** Comparison of electrotherapy, rubber band ligation and hemorrhoidectomy in the treatment of hemorrhoids: a clinical and manometric study. Middle East journal of digestive diseases 2; 9-13.
12. **Madoff, R. D., and Fleshman, J. W. (2004).** American gastroenterological association technical review on the diagnosis and treatment of hemorrhoids1. Gastroenterology 126; 1463-1473.
13. **Yano, T., and Yano, K. (2015).** Comparison of Injection Sclerotherapy Between 5% Phenol in Almond Oil and Aluminum Potassium Sulfate and Tannic Acid for Grade 3 Hemorrhoids. Annals of coloproctology 31; 103-105.
14. **Gallo, G., Martellucci, J., Sturiale, A., Clerico, G., Milito, G., Marino, F., Cocorullo, G., Giordano, P., Mistrangelo, M., and Trompetto, M. (2020).** Consensus statement of the Italian society of colorectal surgery (SICCR): management and treatment of hemorrhoidal disease. Techniques in Coloproctology 24; 145-164.
15. **Tomiki, Y., Ono, S., Aoki, J., Takahashi, R., Ishiyama, S., Sugimoto, K., Yaginuma, Y., Kojima, Y., Goto, M., Okuzawa, A., and Sakamoto, K. (2015).** Treatment of Internal Hemorrhoids by Endoscopic Sclerotherapy with Aluminum Potassium Sulfate and Tannic Acid. Diagn Ther Endosc 2015; 517690-517690.
16. **Ricci, M., Matos, D., and Saad, S. (2008).** Rubber band ligation and infrared photocoagulation for the outpatient treatment of hemorrhoidal disease. Acta cirúrgica brasileira / Sociedade Brasileira para Desenvolvimento Pesquisa em Cirurgia 23; 102-106.
17. **Ganz, R. A. (2013).** The Evaluation and Treatment of Hemorrhoids: A Guide for the Gastroenterologist. Clinical Gastroenterology and Hepatology 11; 593-603.
18. **Rubbini, M., and Ascanelli, S. (2019).**Classification and guidelines of hemorrhoidal disease: Present and future. World J Gastrointest Surg 11; 117-121.
19. **Gardner, I. H., Siddharthan, R. V., and Tsikitis, V. L. (2020).** Benign anorectal disease: hemorrhoids, fissures, and fistulas. Ann Gastroenterol 33; 9-18.
20. **Daif, E., Elfeki, H., and Shoma, A. (2021).** Non-resectional procedures as treatment options for Hemorrhoidal disease. Mansoura Medical Journal 50; 203-216.

*e*ISSN1303-5150

21. **Trenti, L., Biondo, S., Galvez, A., Bravo, A., Cabrera, J., and Kreisler, E. (2017a).** Distal Doppler-guided transanal hemorrhoidal dearterialization with mucopexy versus conventional hemorrhoidectomy for grade III and IV hemorrhoids: postoperative morbidity and long-term outcomes. Tech Coloproctol 21; 337-344.
22. **Kirat, T., Giambartolomei, G., Gutierrez, D., Petrucci, A. M., and Dasilva, G. (2020).** Hemorrhoidectomy. In Mental Conditioning to Perform Common Operations in General Surgery Training: A Systematic Approach to Expediting Skill Acquisition and Maintaining Dexterity in Performance, R.J. Rosenthal, A. Rosales, E. Lo Menzo, and F.D. Dip, eds. (Cham: Springer International Publishing), pp. 107-109.
23. **Bhatti, M. I., Sajid, M. S., and Baig, M. K. (2016).** Milligan-Morgan (Open) Versus Ferguson Haemorrhoidectomy (Closed): A Systematic Review and Meta-Analysis of Published Randomized, Controlled Trials. World journal of surgery 40; 1509-1519.
24. **Rakinic, J. (2018).** Benign Anorectal Surgery: Management. Advances in surgery 52; 179-204.
25. **Fišere, I., Groma, V., Goldiņš, N. R., Gardovskis, A., and Gardovskis, J. (2021).** Worldwide Disease—Haemorrhoids. How Much Do We Know? Paper presented at: Proceedings of the Latvian Academy of Sciences. Section B. Natural, Exact, and Applied Sciences.
26. **Lohsiriwat, V. (2015).** Treatment of hemorrhoids: A coloproctologist's view. World J Gastroenterol 21; 9245-9252.
27. **Khanna, R., Khanna, S., Bhadani, S., Singh, S., and Khanna, A. K. (2010).**Comparison of Ligasure Hemorrhoidectomy with Conventional Ferguson's Hemorrhoidectomy. The Indian journal of surgery 72; 294-297.
28. **Ng, K. S., Holzgang, M., and Young, C. (2020).** Still a Case of "No Pain, No Gain"? An Updated and Critical Review of the Pathogenesis, Diagnosis, and Management Options for Hemorrhoids in 2020. Annals of coloproctology 36; 133-147.
29. **Hartley, J. E., Hill, J., Scott, N., and Williams, J. G. (2012).** Contemporary coloproctology: Springer Science & Business Media).
30. **Nienhuijs, S., and de Hingh, I. (2009).** Conventional versus LigaSure hemorrhoidectomy for patients with symptomatic Hemorrhoids. The Cochrane database of systematic reviews 2009; Cd006761.
31. **Xu, L., Chen, H., Lin, G., and Ge, Q. (2015).** Ligasure versus Ferguson hemorrhoidectomy in the treatment of hemorrhoids: a meta-analysis of randomized control trials. Surgical laparoscopy, endoscopy & percutaneous techniques 25; 106-110.
32. **Champagne, B. J., Stein, S. L., Haridas, M., Ermlich, B., Hoffman, L., Lee, J., Johnson, E. K., and Steele, S. R. (2015).** Novel operative anoscope for Ferguson hemorrhoidectomy: a feasibility study and comparative cohort analysis. Surgical Innovation 22; 149-154.
33. **Kendirci, M., Şahiner, İ. T., Şahiner, Y., and Güney, G. (2018).** Comparison of effects of vessel-sealing devices and conventional hemorrhoidectomy on postoperative pain and quality of life. Medical science monitor: international medical journal of experimental and clinical research 24; 2173.

*e*ISSN1303-5150

34. **Giamundo, P. (2016).** Advantages and limits of hemorrhoidal dearterialization in the treatment of symptomatic hemorrhoids. World journal of gastrointestinal surgery 8; 1.
35. **Talha, A., Bessa, S., and Abdel Wahab, M. (2017).** Ligasure, Harmonic Scalpel versus conventional diathermy in excisional haemorrhoidectomy: a randomized controlled trial. ANZ Journal of Surgery 87; 252-256.
36. **Yilmaz, İ., Sücüllü, İ., Özgür Karakaş, D., Özdemir, Y., Yücel, E., and Akin, M. L. (2012).** Doppler-guided hemorrhoidal artery ligation: experience with 2 years follow-up. The American Surgeon 78; 344-348.
37. **Trenti, L., Biondo, S., Moreno, E. K., Sanchez-Garcia, J. L., Espin-Basany, E., Landaluce-Olavarria, A., Bermejo-Marcos, E., Garcia-Martinez, M. T., Jiménez, D. A., and Jimenez, F. (2019).** Short-term outcomes of transanal hemorrhoidal dearterialization with mucopexy versus vessel-sealing device hemorrhoidectomy for grade III to IV hemorrhoids: a prospective randomized multicenter trial. Diseases of the Colon & Rectum 62; 988-996**.**
38. **Hoyuela, C., Carvajal, F., Juvany, M., Troyano, D., Trias, M., Martrat, A., Ardid, J., and Obiols, J. (2016).** HAL-RAR (Doppler guided haemorrhoid artery ligation with recto-anal repair) is a safe and effective procedure for haemorrhoids. Results of a prospective study after two-years follow-up. International journal of surgery 28; 39-44.
39. **Gachabayov, M., Angelos, G., and Bergamaschi, R. (2019).** THD Doppler: A Reliable Surgical Procedure to Treat Hemorrhoids. Surgical Technology International 34; 189-193.
40. **Garg, P. (2017).** Hemorrhoid treatment needs a relook: More room for conservative management even in advanced grades of hemorrhoids. Indian Journal of Surgery 79; 578-579.
41. **Yilmaz, İ., Karakaş, D. Ö., and SÜCÜLIÜ, İ. (2016).** Long-term results of hemorrhoidal artery ligation. The American Surgeon 82; 216-220.
42. **Trenti, L., Biondo, S., Galvez, A., Bravo, A., Cabrera, J., and Kreisler, E. (2017b).** Distal Doppler-guided transanal hemorrhoidal dearterialization with mucopexy versus conventional hemorrhoidectomy for grade III and IV hemorrhoids: postoperative morbidity and long-term outcomes. Techniques in Coloproctology 21; 337-344.
43. **Longchamp, G., Liot, E., Meyer, J., Toso, C., Buchs, N. C., & Ris, F. (2021).** Non-excisional laser therapies for hemorrhoidal disease: A systematic review of the literature. Lasers in Medical Science, 36(3), 485–496.
44. **Davis, B. R., Lee-Kong, S. A., Migaly, J., Feingold, D. L., and Steele, S. R. (2018).** The American Society of Colon and Rectal Surgeons clinical practice guidelines for the management of hemorrhoids. Diseases of the Colon & Rectum 61; 284-292.
45. **Van Tol, R., Kleijnen, J., Watson, A., Jongen, J., Altomare, D., Qvist, N., Higuero, T., Muris, J., Breukink, S., and Henquet, C. (2020).** European Society of ColoProctology: guideline for haemorrhoidal disease. Colorectal Disease 22; 650-662.
46. **Naderan, M., Shoar, S., Nazari, M., Elsayed, A., Mahmoodzadeh, H., and Khorgami, Z. (2017).** A Randomized Controlled Trial Comparing Laser Intra-Hemorrhoidal

*e*ISSN1303-5150

Coagulation and Milligan-Morgan Hemorrhoidectomy. Journal of investigative surgery: the official journal of the Academy of Surgical Research 30; 325-331.

47. **Brusciano, L., Gambardella, C., Terracciano, G., Gualtieri, G., Schiano di Visconte, M., Tolone, S., del Genio, G., and Docimo, L. (2020).**Postoperative discomfort and pain in the management of hemorrhoidal disease: laser hemorrhoidoplasty, a minimal invasive treatment of symptomatic hemorrhoids. Updates in Surgery 72; 851-857.
48. **Senagore, A., Mazier, W. P., Luchtefeld, M. A., MacKeigan, J. M., and Wengert, T. (1993).** Treatment of advanced hemorrhoidal disease: a prospective, randomized comparison of cold scalpel vs. contact Nd:YAG laser. Diseases of the colon and rectum 36; 1042-1049.
49. **Elfallal, A. H., Fathy, M., Elbaz, S. A., and Emile, S. H. (2022).** Comprehensive literature review of the applications of surgical laser in benign anal conditions. Lasers in Medical Science.
50. **De Nardi, P., Tamburini, A. M., Gazzetta, P. G., Lemma, M., Pascariello, A., and Asteria, C. R. (2016).** Hemorrhoid laser procedure for second- and third-degree hemorrhoids: results from a multicenter prospective study. Tech Coloproctol 20; 455-459.
51. **Giamundo, P., Cecchetti, W., Esercizio, L., Fantino, G., Geraci, M., Lombezzi, R., Pittaluga, M., Tibaldi, L., Torre, G., and Valente, M. (2011).** Doppler-guided hemorrhoidal laser procedure for the treatment of symptomatic hemorrhoids: experimental background and short-term clinical results of a new mini-invasive treatment. Surgical endoscopy 25; 1369-1375.
52. **Liu, J.-W., Lin, C.-C., Kiu, K.-T., Wang, C.-Y., and Tam, K.-W. (2016).** Effect of glyceryl trinitrate ointment on pain control after hemorrhoidectomy: a meta-analysis of randomized controlled trials. World journal of surgery 40; 215-224.
53. **Wanis, K. N., Emmerton-Coughlin, H. M., Coughlin, S., Foley, N., and Vinden, C. (2017).** Systemic metronidazole may not reduce posthemorrhoidectomy pain: a meta-analysis of randomized controlled trials. Diseases of the Colon & Rectum 60; 446-455.
54. **Trompetto, M., Clerico, G., Cocorullo, G., Giordano, P., Marino, F., Martellucci, J., Milito, G., Mistrangelo, M., and Ratto, C. (2015).** Evaluation and management of hemorrhoids: Italian society of colorectal surgery (SICCR) consensus statement. Techniques in coloproctology 19; 567-575.
55. **Simillis, C., Thoukididou, S., Slesser, A., Rasheed, S., Tan, E., and Tekkis, P. (2015).** Systematic review and network meta-analysis comparing clinical outcomes and effectiveness of surgical treatments for haemorrhoids. Journal of British Surgery 102; 1603-1618.
56. **Kunitake, H., and Poylin, V. (2016).** Complications Following Anorectal Surgery. Clin Colon Rectal Surg 29; 14-21.
57. **Yang, J., Cui, P.-J., Han, H.-Z., and Tong, D.-N. (2013).** Meta-analysis of stapled hemorrhoidopexy vs LigaSure hemorrhoidectomy. World J Gastroenterol 19; 4799-4807.
58. **Lee, K.-C., Liu, C.-C., Hu, W.-H., Lu, C.-C., Lin, S.-E., and Chen, H.-H. (2019).** Risk of delayed

*e*ISSN1303-5150

bleeding after hemorrhoidectomy. International journal of colorectal disease 34; 247-253.

59. **Chen, H. H., Wang, J. Y., Changchien, C. R., Chen, J. S., Hsu, K. C., Chiang, J. M., Yeh, C. Y., and Tang, R. (2002).** Risk factors associated with posthemorrhoidectomy secondary hemorrhage: a single-institution prospective study of 4,880 consecutive closed hemorrhoidectomies. Diseases of the colon and rectum 45; 1096-1099.
60. **Luchtefeld, M., and Hoedema, R. E. (2016).** Hemorrhoids. In The ASCRS Textbook of Colon and Rectal Surgery, S.R. Steele, T.L. Hull, T.E. Read, T.J. Saclarides, A.J. Senagore, and C.B. Whitlow, eds. (Cham: Springer International Publishing), pp. 183-203.
61. **Nelson, D. W., Champagne, B. J., Rivadeneira, D. E., Davis, B. R., Maykel, J. A., Ross, H. M., Johnson, E. K., and Steele, S. R. (2014).** Prophylactic antibiotics for hemorrhoidectomy: are they really needed? Diseases of the colon and rectum 57; 365-369.

*e*ISSN1303-5150