CURRENT TECHNOLOGIES TOTREAT HEMORRHOIDS

Abstract

The aim of this study is to explores contemporary technologies for the treatment of piles, focusing on advancements that have revolutionized both diagnostic and therapeutic approaches. Significant progress has been made in the last few years in the technology used to diagnose and treat this illness, aiming to improve patient outcomes and minimize related pain. Cutting-edge imaging techniques, such as high-resolution anoscopy and endoanal ultrasound, enable precise identification of hemorrhoidal pathology, facilitating targeted interventions. Minimally invasive procedures, including rubber band ligation, sclerotherapy, and infrared coagulation, offer outpatient alternatives with reduced discomfort and faster recovery times. Innovative technologies like radiofrequency and laser ablation provide precise tissue treatment, while robotic-assisted surgeries enhance surgical precision. Additionally, recent advance in pharmacological agents and targeted drug delivery systems aim to improve symptom relief and accelerate the healing process. In conclusion, this study underscores the transformative impact of current technologies, emphasizing their role in optimizing patient outcomes and reshaping the landscape of piles treatment.

Keywords: Hemorrhoids, Current Technologies**,** Anorectal disorders.

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I. INTRODUCTION

The Anorectal disorders involve swollen and inflamed veins in the lower rectum and anus called pilesor Hemorrhoids. These veins can become enlarged and irritated, with symptoms that can include severe pain, irritation, itching, bleeding during defecation, and discomfort. In India, the prevalence of hemorrhoids is increasing nowadays. This is mainly due to dietary and lifestyle factors, including being devoid of fibre intake, a diet rich in spicy and fast foods, and a high sedentary occupation. Additionally, cultural practices such as sitting on the floor for extended periods of time can contribute to the development of hemorrhoids. A common risk factor is chronic constipation, which leads to straining during bowel movements, putting heavy pressure on the veins in the rectal area, and also prolonged diarrhoea can also cause irritation and inflammation, increasing the risk of piles. A lack of physical activity can lead to poor blood circulation, making it easier for blood to pool in the veins and form piles. Obesity is another significant risk factor, as excess weight places additional pressure on the pelvic region, contributing to vein enlargement and hemorrhoid formation. During Pregnancy, increased pressure on the pelvic blood vessels and hormonal changes in the mother affect the vein elasticity and form piles. Age is also a factor, as the tissues supporting the veins may weaken over time. Finally, a family history of piles can indicate a genetic predisposition to the condition.

II. GRADES OF HEMORRHOIDS BASED ON SEVERITY

Based on their severity and location, hemorrhoids are categorised into two different types -internal and external hemorrhoids. Internal Hemorrhoids are situated inside the rectum, above the dentate line (a boundary that separates the lower and upper parts of the anus). They are further classified into four grades based on their severity: I-Grade are located within the rectum and may bleed but do not protrude outside the anus. II- Grade also remain within the rectum but may protrude (prolapse) outside the anus during bowel movements and then retract on their own. III-Grade Hemorrhoids prolapse during bowel movement and require manual replaced their original position inside the anal canal. IV-Grade Painful hemorrhoids are at risk of complications such as thrombosis (blood clotting) and strangulation (loss of blood supply). External Hemorrhoids are present under the skin around the anus under the dentate line and they can cause discomfort, pain, and itching. The patients may experience combination of both internal and external hemorrhoids are called mixed hemorrhoids.

III. DIAGNOSIS

The patient history will give complete details about the symptoms, their duration, and any factors that might be contributing, such as your diet, bowel habits, and family history of hemorrhoids. A physical examination of the anus and rectum is often performed by inspecting the area for external hemorrhoids using a gloved finger to check for internal hemorrhoids or any abnormalities.Digital Rectal Examination (DRE) is done by healthcare provider by inserting a lubricated, gloved finger into the rectum to feel for internal hemorrhoids, prolapse growth. Further,Anoscope is a short, lighted tube that is inserted into the rectal area to visualize the lower rectum and anal canal for internal hemorrhoid cushion. Proctoscopy is a longer tube that provides a more extensive view of the rectum and lower colon. It's used to examine internal hemorrhoids and other rectal conditions. Sigmoidoscopy or colonoscopy to examine the entire colon and provide a comprehensive view of the rectal and colon health.

IV. TREATMENT FOR HEMORRHOIDS

1. **Lifestyle Modification and Over-the-Counter Medication:** The first-line management of treating hemorrhoids includes taking 27 to 40 grams per day of fibre from the diet, high fluid intake, emollient laxatives, and increasing fluid consumption. The personalized fibre-rich diet chart is highly recommended for hemorrhoid patients. This will reduce the symptoms and bleeding due to hemorrhoids. Sitz (lukewarm) water baths soothe piles of pain. There are several over-the-counter topical medications available for hemorrhoids, but they don't provide a long-lasting cure. These include astringents, protectants, decongestants, corticosteroids, and topical local anaesthetics. In other parts of the world, hemorrhoids are commonly treated with bioflavonoids like hidrosmin, diosmin, hesperidin, and rutosides.

   Flavonoids may decrease bleeding, severe itching, faecal leakage, and symptomatic relief, but they are not approved by the FDA for hemorrhoid treatment. Prescribed medicine was considered a first-line treatment for piles. 0.4% of topical nitroglycerin ointment reduces visceral pain caused by thrombosed hemorrhoids; it is more commonly used for anal fissures. Effective pain relief is also provided by topical nifedipine and lidocaine; however, this medication is compounded by a pharmacy because it is not a commercially accessible product. Botulinum toxin can successfully lessen the pain of thrombosed external hemorrhoids with just one injection into the anal sphincter.

2. **Office Therapy:** By reducing the size or vascularity of the hemorrhoidal tissue and strengthening its attachment to the rectal wall to reduce prolapse, office-therapy aim to ease patient discomfort. All of these techniques are very well tolerated and may cause slightdiscomfort. However, patients must be aware that all of them have varying recurrence charges and can need additional applications.

   - **Sclerotherapy:** Sclerotherapy was highly recommended therapy option for treating I and II grade level of hemorrhoids.Synthetic compounds are injected for the repositioning of mucosa to the anal muscle by fibrotic scarring. Quinine, urea hydrochloride, vegetable oil, 5% phenol in oil, and hypertonic salt solution are the solutions that were used. The injection should be administered into beneath the skin of the hemorrhoidal tissue and not into the hemorrhoid prolapse because it causes upper abdominal and precordial distress.The risk of bacteraemia during sclerotherapy necessitated antibiotic prophylaxis for individuals with co-existing valvular heart disease and immunodeficiency.

   - **Cryotherapy:** The process of cryotherapy for hemorrhoids involves freezing the affected area using a cold probe or applicator. The extreme cold causes the hemorrhoid tissue to shrink and eventually fall off. The process can cause significant discomfort and pain during and after treatment, as the freezing temperatures applied to the targeted area can lead to sensations of burning, numbness, and even acute pain. Furthermore, cryotherapy carries the risk of skin damage, including blistering, ulcers, and scarring, which can result from the aggressive freezing of tissues. Infection is another concern, as the compromised skin barrier can potentially lead to infections if proper care and hygiene are not maintained during the healing process. Therefore,

careful consideration and consultation with healthcare experts are essential before opting for cryotherapy.

- **Rubber Band Ligation**: A common medical procedure for the treatment of hemorrhoids involves using a rubber band to cut off the blood supply to the swollen veins in the anal and rectal areas. This technique is primarily employed for internal hemorrhoids that protrude outside the anus. During the procedure, a small, elastic band is placed around the base of the hemorrhoid, effectively strangulating it. As a result, the blood flow to the hemorrhoid is reduced, causing it to shrink and eventually fall off within a few days. While rubber band ligation is generally considered a safe and minimally invasive approach, some patients may experience mild discomfort or a sensation of fullness in the rectum temporarily. This method is often repeated for multiple hemorrhoids in separate sessions, if necessary. It is important for individuals undergoing rubber band ligation to follow post-procedure instructions carefully.

- **Infrared Coagulation:** When infrared radiation is applied directly to the hemorrhoidal pedicle, cell death occurs and the pile begins to peel off. This process is known as infrared coagulation. Although it takes a short while, multiple applications are necessary. Similar to RBL, there are benefits and drawbacks. However, some people report less pain, which may be attributed to a reduced volume of tissue necrosis. Although it might be more efficient than RBL, the equipment is more expensive and requires more training**.**

- **Bipolar, Direct Current and Radio Frequency Therapy:** Application of low-watt bipolar diathermy causes tissue coagulation. The entire procedure necessitates numerous applications to the same spot and can take up to 30 seconds. Pain, bleeding, and fissures may occur in 10% of individuals. Direct current therapy, or Ultroid therapy, is getting more popular due to its marketing strategies. During the process, a probe is placed on the hemorrhoidal cushion, and a low direct current is applied for roughly 10 minutes for each hemorrhoidal prolapse. The operation takes longer, but the results are comparable to RBL and sclerotherapy injections. This technique requires minimal power when compared to RBL and radiofrequency ablation. The treatment has not been widely accepted and is quite expensive.

3. Operative Treatment

- **Hemorrhoidectomy:** The most successful method of treating hemorrhoids is excisional hemorrhoidectomy since it has the lowest recurrence rate when compared to other procedures. The treatment is carried out using tools such as scalpels like Ligasure and Harmonic, diathermy or vascular-sealing devices, or scissors. Excisional haemorrhoidectomy can be performed successfully as an outpatient procedure while under perioral anesthesia infiltration. The hemorrhoidectomy procedure is specifically designed for concomitant anorectal disorders such as anal fissures or fistula-in-Ano. The patient's preference and failure of non-operative care due to thrombosis occur in some cases. Hemorrhoidectomy is a successful clinical treatment for third- or fourth-degree internal hemorrhoids. Postoperative pain and discomfort are the main drawbacks of hemorrhoidectomy. Compared to scissors or diathermy

hemorrhoidectomy, Ligasure hemorrhoidectomy has less postoperative pain, a shorter hospital stays, quick wound healing, and faster convalescence.

- **Plication:** Without excision, plication effectively restores an anal prolapse to its original place. The procedure comprises oversewing a hemorrhoidal prolapse and tying a knot at the highest vascular pedicle. The risks of this treatment include pelvic pain and serious bleeding in the anal region**.**

- **Doppler-Guided Hemorrhoidal Artery Ligation:** DG-HAL is generally considered a safe and effective treatment for hemorrhoids, particularly for Grade II and Grade III hemorrhoid. Doppler-guided hemorrhoidal artery ligation (DG-HAL), also known as Trans anal Hemorrhoidal Dearterialization (THD), is a minimally invasive surgical procedure used to treat hemorrhoids. Before performing DG-HAL, the patient undergoes a thorough evaluation to determine the extent and severity of their hemorrhoids. This is typically done using a combination of clinical examination and imaging techniques, such as Doppler ultrasound. It is usually performed as an outpatient procedure, and it can be done under local anesthesia with or without sedation, depending on the patient's preference and the surgeon's recommendation. A specialized anoscope is inserted into the anal canal to provide a clear view of the hemorrhoids.Doppler ultrasound guidanceidentifies the arteries that supply blood to the hemorrhoids. If arteries are located, the surgeon places a suture (thread) around them to tie them off. This process is also known as "dearterialization. “The patients typically experience minimal pain and discomfort compared to traditional surgical methods like hemorrhoidectomy. They can usually go home on the same day and can resume normal activities within a few days. Stool softeners and dietary modifications may be recommended to prevent constipation and straining during bowel movements, which can exacerbate hemorrhoids. Patients are usually scheduled for follow-up to monitor their progress and address any concerns or complications.

- **Stapled Hemorrhoidopexy:** Procedure for prolapse hemorrhoids (PPH) orStapled hemorrhoidopexy, is a surgical technique used to treat internal hemorrhoids that have prolapsed (protruded) outside the anus. The primary goal of stapled hemorrhoidopexy is to reposition and secure the hemorrhoidal prolapsed tissue back to its original position within the rectum. This is performed by using a round shaped stapling device to remove an unwanted circumferential portion of the rectal membrane above the hemorrhoid cushions, thereby lifting and repositioning the prolapsed hemorrhoidal tissue.

  In this technique, the patient is positioned under spinal block anesthesia, and astapling gun is inserted into the anal canal and positioned just above the hemorrhoids prolapse. The circular stapler is then fired, creating a circular excision and this his effect pulls the hemorrhoidal cushions back into their normal position within the anal canal. This technique also creates a circular staple line to control bleeding and seals the excised tissue. The advantage of Stapled over traditional hemorrhoidectomy techniques includes potentially less pain and a faster recovery period. However, it may not be suitable for all patients and the decision to use this procedure depends on factors such as the severity of the hemorrhoids, the patient's health, and the medical

practitioner preference. The major complication involves bleeding, infection, recurrence of hemorrhoids recurrence, anal stenosis, and urinary retention.

4. Laser Technique

- **Help Techniques (Hemorrhoid Laser Procedure):** The technique was performed with the help of spinal anesthesia; the patient was positioned in the supine position with a leg stirrup posture. Cephalosporin (ceftriaxone) was employed as a prophylactic antibiotic. The patient's distal rectum and anal canal are the locations where the laser procedure is carried out using a disposable proctoscope that has been appropriately outfitted. The 600nm optical laser Fiber was used to transmit continuous laser shots with a 980 diode into the hemorrhoid prolapse. The laser beam's intensity and duration have a direct relationship with the depth of shrinkage. Dearterialization was done by activating the optic Fiber network. Previously, the laser diode was overhauled with a power of eight to ten watts. For arterial abolition, two operator-controlled laser shots were taken at a distance of 2mm into the membrane level of the hemorrhoid cushion. The duration of laser shots ranges from 1.2 to 0.6 seconds. A rigid sigmoidoscopy allows the laser beam to reach all the superior rectal arteries in a counterclockwise direction. The help technique was highly recommended for its advantages, such as quick hospital discharge, outpatient procedures, and no bowel preparation. Before the procedure, patients were advised not to take non-vegetarian or green vegetables for at least 2 days. Patients were observed for post-operative discomfort, recuperation, and hemorrhoid recurrence.

- **Laser Hemorrhoidoplasty:** In the frog leg position, local anaesthetic ropivacaine (10 ml/kg) was injected into a bilateral pudendal nerve locoregional block. Deep sedation was achieved with propofol (2.0 mg/kg i.v.) by using a laryngeal mask. Ceftriaxone 2g IV acts as a prophylactic antibiotic for the patients.A 3 mm micro-incision has been made below the skin about 1 to 1.5 cm below the base of the anal hemorrhoidal node.The 1.85 mm-diameter probe was injected into the submucosal tissue through the incision until it reached the region below the distal rectal mucosa. A 1470-nm laser diode is fired in a laser generator to produce 10 to 12 pulses that are set to certain node diameters and have a pulse width of 8 watts per 3 seconds apiece. The hemorrhoidal piles shrank after the laser was discharged into the submucosal tissue of the hemorrhoid prolapse. An anal sponge was placed and the anorectal sores were left untreated. The anal sponge was taken out 12 hours after the treatment, and patients were allowed to return if there were no issues afterward. Dietary adjustments, such as the use of bulking agents, Fiber supplements, and stool softeners, along with proper water consumption, are necessary for post-operative management.

V. CONCLUSION

The speculative glimpse into a futuristic view of hemorrhoid treatment might look into Minimally Invasive Procedure will likely focus on non-invasive or minimally invasive that reduces patient discomfort and recovery time. Procedures might involve advanced lasers, focused energy beams, or nanotechnology to precisely target and treat hemorrhoidal tissue.Nanotechnology could play a significant role in treating hemorrhoids. Nanoparticles could be designed to target and shrink hemorrhoidal tissue, providing a highly targeted and

effective treatment with minimal impact on surrounding healthy tissue. Further use of biologics, such as genetically engineered molecules or stem cells, to promote tissue healing and regeneration. These therapies could accelerate the body's natural healing processes and reduce the hemorrhoids recurrence. In Telemedicine will likely become a standard practice in the future, allowing patients to consult with healthcare professionals remotely. This could be especially useful for post-treatment follow-ups and monitoring, reducing the need for in-person visits.

Advances in genetic testing and personalized medicine could lead to tailored treatment plans based on an individual's genetic predisposition to hemorrhoids. This might result in more effective treatments and a lower risk of recurrence. Virtual Reality Distraction immerse them in relaxing environments, effectively diverting their attention and reducing anxiety during treatments. Implantable devices could be developed to manage hemorrhoids from within the body. These smart implants might release therapeutic agents, monitor tissue health, and adjust treatment as needed; all while being controlled remotely by medical professional, Stem cell therapies and regenerative medicine could be used to stimulate the body's own healing processes, promoting the growth of healthy tissue and reducing the severity of hemorrhoids. Advanced biofeedback techniques and neuromodulation therapies could help patients regain control over the muscles in the pelvic region, reducing the strain that contributes to the development of hemorrhoids.

REFERENCE

[1] Mott T, Latimer K, Edwards C. Hemorrhoids: diagnosis and treatment options. American family physician. 2018 Feb 1;97(3):172-9.
[2] Lohsiriwat V. Treatment of hemorrhoids: A coloproctologist’s view. World Journal of Gastroenterology: WJG. 2015 Aug 8;21(31):9245.
[3] Ganz RA. The evaluation and treatment of hemorrhoids: a guide for the gastroenterologist. Clinical Gastroenterology and Hepatology. 2013 Jun 1;11(6):593-603.
[4] Sanchez C, Chinn BT. Hemorrhoids. Clinics in colon and rectal surgery. 2011 Mar;24(01):005-13.
[5] Higuero T, Abramowitz L, Castinel A, Fathallah N, Hemery P, Duhoux CL, Pigot F, Pillant-Le Moult H, Senéjoux A, Siproudhis L, Staumont G. Guidelines for the treatment of hemorrhoids. Journal of visceral surgery. 2016 Jun 1;153(3):213-8.
[6] Sandler RS, Peery AF. Rethinking what we know about hemorrhoids. Clinical Gastroenterology and Hepatology. 2019 Jan 1;17(1):8-15.
[7] Burch J, Epstein D, Baba-Akbari A, Weatherly H, Fox D, Golder S, Jayne D, Drummond M, Woolacott N. Stapled haemorrhoidectomy (hemorrhoidopexy) for the treatment of haemorrhoids: a systematic review and economic evaluation. NIHR Health Technology Assessment programme: Executive Summaries. 2008.
[8] Lan P, Wu X, Zhou X, Wang J, Zhang L. The safety and efficacy of stapled hemorrhoidectomy in the treatment of hemorrhoids: a systematic review and meta-analysis of ten randomized control trials. International journal of colorectal disease. 2006 Mar; 21:172-8.
[9] Faucheron JL, Poncet G, Voirin D, Badic B, Gangner Y. Doppler-guided hemorrhoidal artery ligation and rectoanal repair (HAL-RAR) for the treatment of grade IV hemorrhoids: long-term results in 100 consecutive patients. Diseases of the Colon & Rectum. 2011 Feb 1;54(2):226-31.
[10] Sun Z, Migaly J. Review of hemorrhoid disease: presentation and management. Clinics in colon and rectal surgery. 2016 Mar;29(01):022-9.
[11] Bleday R, Pena JP, Rothenberger DA, Goldberg SM, Buls JG. Symptomatic hemorrhoids: current incidence and complications of operative therapy. Diseases of the colon & rectum. 1992 May; 35:477-81.

