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## Hemorrhoidectomy - making sense of the surgical options

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## Abstract

While debate continues as to which is the best surgical method for the treatment of hemorrhoids, none of the currently available surgical methods approach the ideal surgical option, which is one that is effective while being safe and painless. In reality, the less painful the procedure, the more likely it is to be associated with recurrence post-op. Where hemorrhoids surgery is concerned, there isn't a "one size fits all" option. Most of the randomized controlled trials performed to date include hemorrhoids of various grades and with a focus on only comparing surgical methods while failing to stratify the outcomes according to the grade of hemorrhoid. We believe that surgery needs to be tailored not only to the grade of the hemorrhoids, but also to the size, circumferential nature of the disease, and prevailing symptomatology.

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**Key words:** Hemorrhoidectomy; Doppler-guided hemorrhoidal artery ligation; Stapler; LigaSure; Conventional

**Core tip:** While the debate continues as to which is the best surgical method for the treatment of hemorrhoids, none of the currently available surgical methods approach the ideal surgical option, which is one that is effective while being safe and painless. In reality, the less

painful the procedure, the more likely it is to be associated with recurrence post-op. Where hemorrhoids surgery is concerned, there isn't a "one size fits all" option. Most of the randomized controlled trials performed to date include hemorrhoids of various grades and with a focus on only comparing surgical methods while failing to stratify the outcomes according to the grade of hemorrhoid. We believe that surgery needs to be tailored not only to the grade of the hemorrhoids, but also to the size, circumferential nature of the disease, and prevailing symptomatology.

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## INTRODUCTION

Hemorrhoids, or "piles", is one of the most common anorectal disorders, with a prevalence of 39% of the population, of whom 44.7% are symptomatic<sup>[1,2]</sup>. Hemorrhoids may be internal or external, depending on its relation to the dentate line. There are four grades of internal hemorrhoids as described by Goligher, and they can be classified using the definitions in Table 1<sup>[3]</sup>. While this common classification of internal hemorrhoids is useful in the selection of treatment and comparison of therapeutic outcomes, Goligher only classifies hemorrhoids based on the degree of prolapse and does not describe the size of the hemorrhoids or whether they are isolated or circumferential; these factors are important in the selection of surgical treatment.

The ideal operation for hemorrhoids should be effective with a low rate of recurrence, minimal post-operative pain to allow early return to normal activities, and safe with minimal morbidity. If recurrence is the main consideration, conventional hemorrhoidectomy (CH) is still

**Table 1** Classification of internal hemorrhoids

Grade	Definition
I	Normal appearance externally, bleeding but not prolapsing
II	Anal cushions prolapse on straining but reduces spontaneously
III	Anal cushions prolapse on straining or exertion and require manual reduction
IV	Permanent prolapse, irreducible

considered the “gold standard”. However, it is associated with significant post-operative pain, perianal discharge, and irritation. Innovation and evolution in hemorrhoidectomy techniques have focused on achieving the “ideal” operation. Many options for surgery on hemorrhoids have been described and multiple trials conducted. Some techniques have been touted to be superior to others, whilst other techniques have been recommended to be uniformly useful for all presentations of hemorrhoids.

This review aims to evaluate the current surgical options for hemorrhoids and to make sense of all the different modalities of hemorrhoid surgery available.

## LITERATURE SEARCH

A comprehensive literature search was performed by the authors using MEDLINE, Embase, and the Cochrane Database of Systematic reviews in January 2014. The search was performed using both medical subject headings (MeSH) and keyword searches. The terms used for the search included: Hemorrhoids (haemorrhoids or hemorrhoids), Piles, CH (open hemorrhoidectomy, closed hemorrhoidectomy, Milligan Morgan hemorrhoidectomy, Ferguson hemorrhoidectomy, or LigaSure hemorrhoidectomy), Stapler hemorrhoidectomy (Procedure for Prolapsed Hemorrhoids or Longo hemorrhoidectomy), and Doppler-guided Hemorrhoidal Artery Ligation. The search was restricted to the last 15 years (2000-2014). Articles that were not available in English were excluded. Clinical practice guidelines and retrospective studies were excluded from this study.

## INCLUSION CRITERIA

Only prospective comparative studies, randomized controlled trials, review articles, and meta-analyses were considered. Articles found using the search terms above were screened by the authors. Only prospective studies and review articles with results stratified according to the grade of hemorrhoids were included in this study.

## DATA INTERPRETATION

Primary outcome was the efficacy of the surgical method (recurrence at less than one year and recurrence at more than one year). Secondary outcomes included mean operating time, number of days taken to return to work, and post-operative complications such as post-operative bleeding, acute urinary retention, anal fistula, and anal stricture.

## PATHOPHYSIOLOGY OF HEMORRHOIDS

The anal canal contains three main cushions in the left lateral, right anterior, and right posterior locations (3, 7, and 11 o'clock positions). Hemorrhoids are defined as the symptomatic enlargement and distal displacement of the anal cushions.

Anal cushions, when engorged with blood, contribute to maintaining anal continence during coughing, straining, and sneezing<sup>[4]</sup>. When engorged with blood, anal cushions protect the underlying anal sphincters during defecation, and play a key role in differentiating liquid, solid, and gas and the subsequent decision to evacuate<sup>[5]</sup>.

The exact pathophysiology of hemorrhoids is poorly understood. Pathological examination of hemorrhoids failed to demonstrate the presence of arteriovenous shunts<sup>[6]</sup>, and while the rectum is the most common site of lower gastrointestinal varices in patients with portal hypertension, it has not resulted in an increased incidence of hemorrhoids in the setting of portal hypertension and varices<sup>[7]</sup>. Hemorrhoids and anorectal varices have been proven to be two distinct pathologies, hence rendering the previously popular theory that hemorrhoids were caused by anal canal varicosities obsolete.

Currently, the most widely-accepted theory is that of the sliding anal canal<sup>[8]</sup>. This theory proposes that hemorrhoids develop due to deterioration of the anal cushions' supporting tissues, and is supported by the fact that muscle tissues are replaced by collagen fibers when examined microscopically. In addition to the above findings, histological studies reveal a severe inflammatory process affecting the connective tissue and the walls of the arterial and venous blood vessels, leading to ischemia with subsequent mucosal ulceration and bleeding<sup>[6]</sup>.

## BACKGROUND OF SURGICAL METHODS DOPPLER-GUIDED HEMORRHOIDAL ARTERY LIGATION

First described in 1995 by Morinaga *et al*<sup>[9]</sup>, Doppler-guided hemorrhoidal artery ligation (DGHAL) involves using a special proctoscope with an integrated Doppler transducer and a lateral ligation window. The level of artery ligation is dictated by the length of the Doppler anoscope, but should be performed above the dentate line. Typically, the intraluminal arteries are located in the right posterior lateral, right middle lateral, right anterior lateral, left anterior lateral, left middle lateral, and left posterior lateral (1, 3, 5, 7, 8, and 11 o'clock positions)<sup>[10]</sup>. The arterial signal is clearly audible when the Doppler probe is directly over the hemorrhoidal artery. A “figure of eight” stitch is then placed through the lateral ligation window, and ligation of the vessel confirmed by the absence of the Doppler arterial signal distal to the suture line. A reduction in the blood inflow to the hemorrhoidal plexus will facilitate the shrinkage of the internal piles.

DGHAL can be done with local anesthetic and seda-

tion, with the patient in the lithotomy position<sup>[10]</sup>. This procedure alone does not deal with hemorrhoid prolapse. In patients with prolapse piles, procedures have been proposed in addition to DGHAL, such as DGHAL with mucopexy<sup>[11,12]</sup>. The attractiveness of this technique lies in the minimally invasive nature of the procedure with no actual excision of tissue per se. The systematic dearterialization of the hemorrhoidal tissues also promises effective intervention for hemorrhoids with recalcitrant bleeding. However, the ability to reduce severe prolapse is not addressed as effectively when there is tissue excision.

## STAPLER HEMORRHOIDECTOMY

First described by Longo<sup>[13]</sup> in 1998, stapler hemorrhoidectomy (SH) is also known as the Procedure for Prolapsed Hemorrhoids (PPH) and was developed as an alternative to CH. In contrast to the traditional approach of removing hemorrhoidal tissue, SH involves excising a circumferential ring of mucosa four centimeters above the dentate line using a circular stapler. This interrupts the superior hemorrhoidal vessels and restores the hemorrhoidal tissues back to their anatomic position. As the excision occurs above the dentate line, it avoids a painful wound in the somatically innervated anoderm. The circumferential nature of the procedure and the ability to restore the anatomy of the anal canal are the cornerstones of the technique's success.

To perform SH, all prolapsing hemorrhoids are first reduced, after which a purse-string suture of 2/0 polypropylene is placed three to four centimeters above the dentate line, catching only the mucosa and submucosa. The circular stapler is opened and inserted through the anus. The purse-string suture is tied on the stapler shaft, and the head of the stapler is closed on the anvil, incorporating the mucosal and submucosal tissue in the purse-string suture. The stapler is then fired and withdrawn. In females, a vaginal examination should be performed to exclude vaginal wall impingement prior to firing of the stapler. The suture line is inspected and any bleeding points ligated.

Complications for SH are similar to those of CH. In addition, rare but potentially life-threatening complications have been described, including anastomotic leakage with pelvic sepsis, anovaginal fistula, and Fournier's gangrene<sup>[14-17]</sup>.

While SH causes less post-operative pain than CH, a small but significant number of patients have complained of chronic pain post-SH. Unrelenting pain of unknown etiology after SH is known as PPH syndrome. 15.1% of surgeons surveyed reported having patients who had excessive pain lasting for months, with 2.4% reporting said pain lasting for years<sup>[18]</sup>. Chronic pain has been postulated to be related to the fibrosis around the staples or direct trauma to the pudendal and sacral nerve spindles by the staples<sup>[19]</sup>. Ielpo *et al*<sup>[20]</sup> reported two patients (1.59%) who complained of persistent pain seven months after SH, which was only resolved after the staples were removed.

## CH

CH is the most widely performed operation for piles<sup>[21]</sup>. The original operation involves the excision of hemorrhoidal cushions off the internal anal sphincter with scissors and ligation of the vascular pedicle.

The two most commonly practiced techniques are the ones described by Milligan *et al*<sup>[22]</sup> and Ferguson *et al*<sup>[23]</sup>. Open hemorrhoidectomy, first described by Milligan and Morgan in 1937, is CH performed with the wound left open. Closed hemorrhoidectomy, described by Ferguson *et al*<sup>[23]</sup> in 1971, involves apposition of the mucosa and skin after excision of the hemorrhoids. CH, as described by Ferguson *et al*<sup>[23]</sup>, is more commonly performed in North America, while the Milligan-Morgan method is more commonly performed in Europe.

Today, CH is performed with diathermy instead of scissors. Open diathermy hemorrhoidectomy, compared to scissors, has been shown to have a significantly shorter operative time with lower analgesic requirements<sup>[24]</sup>. There is also no increased risk of postoperative hemorrhage without pedicle ligation when using diathermy<sup>[25]</sup>.

Despite the interest in SH and DGHAL, CH remains a widely practiced technique due to the lower cost of the operation, and remains the most effective treatment available currently. CH is still considered the current "gold standard" for surgical management of hemorrhoids, as there is effective excision of the prolapsed hemorrhoidal tissue mass. However, pain after CH continues to be a major issue, with prolonged wound healing and a delayed return to normal activities.

## CH ADJUNCTS THAT POTENTIALLY IMPROVE SHORT-TERM OUTCOMES

### LigaSure

Use of LigaSure (Valleylab, Boulder, CO), a bipolar electrothermal tissue-sealing device, allows the sealing of blood vessels up to seven millimeters in diameter with minimal collateral damage to the surrounding tissues and limited tissue charring, as the thermal spread is confined to within two millimeters of the adjacent tissues<sup>[26]</sup>. This device uses a very high frequency current and provides hemostasis by denaturing collagen and elastin from the vessel wall and surrounding connective tissues<sup>[27]</sup>.

The limited spread of thermal energy reduces anal spasm and permits a bloodless hemorrhoidectomy with reduced post-operative pain and faster wound healing. The procedure is carried out in the same way as CH, except that the LigaSure tissue-sealing device is used in place of a diathermy. The hemorrhoids masses are retracted and dissected off the internal sphincter using the LigaSure device, the pedicles secured clear of the internal sphincter, and the resected wound left open to heal with adequate skin bridges. LigaSure hemorrhoidectomy has been shown to improve the short-term outcomes of CH<sup>[27,28]</sup>.

### Zero point two percent GTN ointment

It is believed that post-operative pain causes spasm of the internal anal sphincter, which leads to a further increase in anal pressure and further propagates the pain. Delayed wound healing also contributes to the pain. Topical GTN (glyceryl trinitrate) reduces the spasm of the internal anal sphincter, and the reduced pressure increases anodermal blood flow and hence improves wound healing<sup>[29]</sup>. Improved wound healing also results in reduced perianal irritation, discharge, and pain<sup>[30]</sup>. Use of GTN has certain side effects, of which headache is the most common. Other side effects include dizziness and rebound hypertension. However use of topical GTN is unlikely to result in significant systemic complications<sup>[31]</sup>.

A meta-analysis of five double-blinded, prospective randomized controlled trials on GTN ointment by Ratnasingham *et al*<sup>[32]</sup> demonstrated a significant reduction in pain score on post-operative day three and seven in the GTN ointment group when compared to placebo. Use of GTN ointment was associated with significantly improved wound healing at three weeks, while there was no increase in the incidence of headaches.

### Methylene blue

The use of methylene in hemorrhoids surgery arose when Tan *et al*<sup>[33]</sup> first noticed that patients who were undergoing surgery for perianal fistula had decreased post-operative pain when methylene blue was used to delineate the tracts.

Injection of local anesthetic into the intersphincteric groove and perianal region during perianal surgery blocks the autonomic inferior hypogastric plexus. Methylene blue, a biological dye, results in the destruction of dermal nerve endings, as evidenced by the absence of cutaneous nerve endings on electron microscopy in perianal skin biopsies after methylene blue therapy<sup>[34,35]</sup>.

We have since conducted a randomized controlled trial of intradermal methylene blue during CH and have found it to be effective in reducing post-operative pain during the initial few days after surgery<sup>[36]</sup>.

### Metronidazole

It has been postulated that secondary infection after hemorrhoidectomy, as well as poor or delayed wound healing, contributes to the post-operative pain experienced. In a double-blinded randomized controlled trial by Carapeti *et al*<sup>[37]</sup>, patients given prophylactic metronidazole three times a day for seven days post-CH reported significantly less pain than those in the placebo group on days five to seven post-surgery, as well as a significantly faster median time to return to work or normal activity, and higher patient satisfaction score. Oral and topical metronidazole has been shown to promote wound healing, and hence reduces post-operative pain<sup>[37,38]</sup>.

### Micronized flavonoid fraction

Micronized flavonoid complex consisting of 90% diosmin and 10% hesperidin (Daflon 500 mg) inhibits pros-

taglandin E2 (PGE2) and thromboxane A2 (TxA2) synthesis. Daflon reduces microvascular hyperpermeability and increased lymphatic flow, thus reducing perivascular edema and venous stasis<sup>[39]</sup>.

Ho *et al*<sup>[40]</sup> demonstrated that Daflon 500 mg for one week post-CH significantly reduces the risk of secondary bleeding compared to placebo.

## SURGICAL OPTIONS FOR HEMORRHOIDS

The majority of randomized controlled trials performed thus far focus on comparing the various surgical options available for hemorrhoids, but often present a mixed population or do not mention the disease stage. The focus of these studies has been on the technique rather than how to tailor the option to the individual. Hemorrhoid presentation and symptomatology is extremely heterogeneous, thus a surgeon cannot have the mindset that one technique is suitable for all patients.

As our understanding and experience of each surgical method evolves, we now understand that the grade of hemorrhoids has a profound effect on the evaluation of outcome. One method that is effective for a certain grade of hemorrhoids may have a high rate of recurrence with another grade.

It is in our opinion that each grade of hemorrhoids should be considered as a separate entity when evaluating surgical options. Besides the grade, the size of the hemorrhoids and their circumferential nature need to be taken into account, together with the predominant symptoms of the patient. Only then can surgical management be truly tailored to the patients' needs.

### GRADE I HEMORRHOIDS

Hemorrhoids that are bleeding but do not prolapse are classified as grade I. Surgery is rarely indicated for grade I hemorrhoids, with treatment involving lifestyle modification, medication, and office-based procedures.

Lifestyle modification includes adequate fluid intake and a high fiber diet. Randomized controlled trials have shown micronized, purified flavonoids to be safe and effective, with rapid cessation of bleeding<sup>[41-43]</sup>.

Failing lifestyle modification and medical treatment, grade I hemorrhoids are candidates for office-based procedures, of which rubber band ligation is the most effective<sup>[44]</sup>. Other office-based modalities include sclerotherapy, cryotherapy, infra-red photocoagulation, and BICAP coagulation.

### GRADE II HEMORRHOIDS

18.4% of hemorrhoids are classified as grade II<sup>[1]</sup>. Surgery is not the first line treatment for grade II hemorrhoids, as most are amenable to less invasive modalities such as medication and rubber band ligation (RBL). RBL has a reported cure rate of 86.6% at one-month post-treatment and a recurrence rate of 11% after two years,

**Table 2 Results for grade II hemorrhoids**

Methods	Mean operating time (min)	Return to work (d)	Recurrence at < 1 yr	Recurrence at > 1 yr	Post-op bleeding	ARU	Fistula	Anal stricture
DGHAL	NR	NR	5.3-6.7 <sup>[9,44]</sup>	12 <sup>[44]</sup>	2.2 <sup>[9]</sup>	0 <sup>[9]</sup>	0 <sup>[9]</sup>	NR
SH	NR	NR	NR	NR	NR	NR	NR	NR
CH	NR	NR	NR	NR	NR	NR	NR	NR
CH + LigaSure	NR	NR	NR	NR	NR	NR	NR	NR

DGHAL: Doppler-guided hemorrhoidal artery ligation; SH: Stapler hemorrhoidectomy; CH: Conventional hemorrhoidectomy; ARU: Acute urinary retention; NR: Not recorded.

**Table 3 Results for grade III hemorrhoids**

Methods	Mean operating time (min)	Return to work (d)	Recurrence at < 1 yr (%)	Recurrence at > 1 yr (%)	Post-op bleeding (%)	ARU (%)	Fistula (%)	Anal stricture (%)
DGHAL	19 <sup>[45]</sup>	NR	13-13.5 <sup>[9,44]</sup>	18-31 <sup>[44,45]</sup>	0-6.8 <sup>[9,45]</sup>	1 <sup>[9]</sup>	0-0.5 <sup>[9,45]</sup>	NR
SH	21-31 <sup>[45,47-49]</sup>	6-7.9 <sup>[47,48]</sup>	7.5 <sup>[47]</sup>	3-25.6 <sup>[45,47,49,55]</sup>	0-9.1 <sup>[45,47-49]</sup>	1.6-17.5 <sup>[45,47]</sup>	0 <sup>[49]</sup>	1.3-2.6 <sup>[48,49]</sup>
CH	35-42.36 <sup>[47-49]</sup>	10.2-15 <sup>[47,48]</sup>	5 <sup>[47]</sup>	0-17.5 <sup>[47,49,55]</sup>	1.7-7.5 <sup>[47-49]</sup>	40 <sup>[47]</sup>	2.5 <sup>[49]</sup>	0 <sup>[48,49]</sup>

DGHAL: Doppler-guided hemorrhoidal artery ligation; SH: Stapler hemorrhoidectomy; CH: Conventional hemorrhoidectomy; ARU: Acute urinary retention; NR: Not recorded.

with 7.5% requiring additional surgical treatment<sup>[45]</sup>. Surgery is indicated when there is failure of less invasive modalities. Failures of less invasive methods for grade II hemorrhoids may be associated with the size of the hemorrhoidal tissue mass.

DGHAL has been shown to be effective, with a recurrence rate of 5.3%-6.7% at less than 12 mo follow-up<sup>[10,46]</sup> and a recurrence of 12% when patients were followed-up for more than 12 mo<sup>[46]</sup>. The complications observed in DGHAL are comparable to those associated with other methods, if not less. No severe complications were observed<sup>[10]</sup>.

Our literature search did not show any studies on SH, CH, or CH with LigaSure that stratified data on grade II hemorrhoids or looked at patients with grade II hemorrhoids only (Table 2).

### GRADE III HEMORRHOIDS

DGHAL, while effective for grade II hemorrhoids, has a recurrence rate of 18%-31%<sup>[46,47]</sup> when used for grade III hemorrhoids and followed-up for more than 12 mo. The only factor associated with recurrence was the grade of hemorrhoids, with recurrent prolapse being the main symptom in patients in whom DGHAL was unsuccessful<sup>[46]</sup>. In a randomized controlled trial of DGHAL *vs* SH for grade III hemorrhoids by Avital *et al*<sup>[47]</sup>, DGHAL was shown to have a shorter operating time, significantly lower mean pain scores at 24 h and one week post-operation, significantly less post-operative discomfort, and less post-operative complications. In a randomized trial of DGHAL with mucopexy *vs* conventional open hemorrhoidectomy for grade III hemorrhoids by De Nardi *et al*<sup>[48]</sup> DGHAL with mucopexy did not show statistically lower median pain scores, shorter median days to return to work, or patient satisfaction. Long-term cure rates at 24 mo were similar between DGHAL with mucopexy

and CH.

In various randomized controlled trials on SH *vs* CH for grade III hemorrhoids, SH was consistently associated with a significantly shorter mean operating time<sup>[49-51]</sup>, less pain at first defecation, lower mean pain scores, less analgesia consumption<sup>[49-51]</sup>, and an earlier return to work<sup>[49,50]</sup>. However, if concomitant anorectal procedures involving perianal wounds such as skin tag excision, anal wart excision, or external hemorrhoidectomy are performed, the benefits of reduced pain with PPH may be diminished<sup>[51]</sup>. With longer follow-up periods, there was a trend towards a greater rate of recurrence with SH than CH. Ammatturo *et al*<sup>[49]</sup> reported a lesser mean satisfaction score with SH compared to CH at a follow-up of two years, owing to a higher rate of bleeding and prolapse.

Rare but major complications such as rectovaginal fistulas, pelvic sepsis, and Fournier's gangrene have been reported in the literature, but none of the above trials<sup>[49-51]</sup> reported major complications, perhaps owing to the greater training and experience of the surgeons as SH becomes more widely performed.

In a randomized controlled trial of SH *vs* CH in circumferential grade III hemorrhoids by Kim *et al*<sup>[52]</sup>, the recurrence rate for SH and CH at the end of a five year follow-up was 18% and 23%, respectively, and not statistically significant. The mean operative time was significantly shorter in the SH group, and patients who underwent SH reported significantly less post-operative pain, less burning, and less itching compared to the CH group. Other early post-operative complications such as urinary retention, bleeding, and prolonged wound healing were not significantly different (Table 3).

### GRADE IV HEMORRHOIDS

Grade IV hemorrhoids are symptomatic, prolapsed, and irreducible piles. DGHAL does not deal with prolapse

**Table 4 Results for grade IV hemorrhoids**

Methods	Mean operating time (min)	Return to work (d)	Recurrence at < 1 yr (%)	Recurrence at > 1 yr (%)	Post-op bleeding (%)	ARU (%)	Fistula (%)	Anal stricture (%)
DGHAL	NR	NR	59.3 <sup>[9]</sup>	NR	3.7 <sup>[9]</sup>	3.7 <sup>[9]</sup>	0 <sup>[9]</sup>	NR
DGHAL + RAR	35 <sup>[51]</sup>	NR	NR	9 <sup>[51]</sup>	4 <sup>[51]</sup>	NR	NR	NR
SH	24 <sup>[52]</sup>	NR	NR	50-53.3 <sup>[52,55]</sup>	0 <sup>[52]</sup>	NR	NR	NR
CH	27.4-39 <sup>[52,53]</sup>	16.4 <sup>[53]</sup>	NR	0-6.25 <sup>[52,53,55]</sup>	6.25-11 <sup>[52,53]</sup>	0 <sup>[53]</sup>	NR	NR
CH + LigaSure	22.3 <sup>[53]</sup>	12.2 <sup>[53]</sup>	NR	0 <sup>[53]</sup>	4 <sup>[53]</sup>	4 <sup>[53]</sup>	NR	NR

DGHAL: Doppler-guided hemorrhoidal artery ligation; SH: Stapler hemorrhoidectomy; CH: Conventional hemorrhoidectomy; ARU: Acute urinary retention; NR: Not recorded; RAR: Rectoanal repair.

**Table 5 Summary of recommendations**

	Small hemorrhoids	Large hemorrhoids	Isolated hemorrhoids	Circumferential hemorrhoids
Grade II	Ligation	DGHAL	Ligation	SH
Grade III	DGHAL	CH/SH	CH	SH
Grade IV	CH	CH	CH	CH/SH

DGHAL: Doppler guided hemorrhoidal artery ligation; SH: Stapler hemorrhoidectomy; CH: Conventional hemorrhoidectomy.

and is grossly inadequate for grade IV hemorrhoids, as shown by the high rate of recurrent prolapse when DGHAL is used in isolation<sup>[10]</sup>. In piles with significant prolapse, DGHAL has been combined with mucopexy to lift and secure the protruding hemorrhoids in place. In a study by Faucheron *et al*<sup>[53]</sup>, DGHAL and rectoanal repair (RAR) was shown to be both safe and effective for grade IV hemorrhoids, with recurrence observed in 9% of the study population at a mean follow-up of 34 mo.

Most randomized studies on SH include patients with both grade III and IV hemorrhoids without stratification of data according to grade of hemorrhoids. Additionally, grade IV hemorrhoids often form the minority of study populations. In studies analyzing SH on grade IV hemorrhoids, SH has a significantly lower mean operating time compared to CH, and is associated with significantly less post-operative pain<sup>[54]</sup>. There is, however, a surprisingly high rate of recurrence (50%-53.3%) at follow-up of one year or longer<sup>[54,55]</sup>. In a randomized study by Ortiz *et al*<sup>[54]</sup>, 40% of patients who had undergone SH suffered from tenesmus one year after the operation, a symptom not reported in patients who had undergone CH.

While CH remains the current standard of treatment, especially in the treatment of grade IV hemorrhoids, CH performed with LigaSure instead of diathermy has shown to be promising. LigaSure CH is associated with a significantly shorter operating time, earlier return to work, and a similar rate of post-operative complications and recurrence to the diathermy group<sup>[56]</sup> (Table 4).

## CONCLUSION

While the debate continues as to which is the best surgical method for the treatment of hemorrhoids, none of the currently available surgical methods approach the

ideal surgical option, which is one that is effective while being safe and painless. In reality, the less painful the procedure, the more likely it is to be associated with post-operative recurrence.

Where hemorrhoids surgery is concerned, there is no “one size fits all” option. Most of the randomized controlled trials performed to date include hemorrhoids of various grades and with a focus on only comparing surgical methods, while failing to stratify the outcomes according to the grade of hemorrhoid. We believe that surgery needs to be tailored not only to the grade of the hemorrhoids, but also to the size, circumferential nature of the disease, and prevailing symptomatology. A summary of our recommendations is represented in Table 5.

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