

Evaluation of Doppler-Guided Hemorrhoidal Artery Ligation (DGHAL) as a Novel Technique in Management of Hemorrhoids

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Background: The standard hemorrhoidectomy used to treat hemorrhoidal disease (HD) is linked with severe morbidity, most notably postoperative pain and a delayed return to normal daily activities. To lessen these drawbacks, a minimally invasive surgical procedure called Doppler-guided haemorrhoid artery ligation (DGHAL) has been utilised to treat HD.

Objective: Analyzing the effectiveness of the Doppler Guided Hemorrhoidal Artery Ligation (DGHAL) method for treating grade III haemorrhoids as regards operative time and intraoperative blood loss, as well as postoperative pain, hospital stay, bleeding and infection.

Patients and methods: In order to evaluate the DGHAL technique in the management of grade III haemorrhoids, a prospective observational study was carried out on 30 consecutive patients presenting for haemorrhoidectomy at Ain-Shams University, Dar El-Hekma, El-Intag El-Harby, and other authorised Hospitals from March until July 2021. Patients with grade 3 haemorrhoids, either newly diagnosed or previously diagnosed. To assess ongoing symptoms and surgical sequelae, the patients were observed weekly for one month and subsequently monthly for three months.

Results: The mean age of study groups was (40.93±6.10) years. Regarding gender, the majority of patients were males (80%). The median of intraoperative bleeding was 32.50 ml with range (25-60) ml. The median of operative time was 12 mins with range (10-20) mins. Regarding hospital stay, the median of period was 8 hours with range (6-22) hours. Pain decreased gradually in the 1st 3 weeks postoperative and disappeared at 4th week, (median values = 3, 1.5, 0 & 0) respectively (p=0.006).

Conclusion: Doppler-guided haemorrhoid artery ligation (DGHAL) is linked with reduced intraoperative haemorrhage, surgical time, hospital stay, and postoperative pain score in instances with grade III haemorrhoids. It is linked to a high level of patient comfort and going back to work. DGHAL is also well-tolerated, safe, and effective. It lessens the necessity of doing potentially risky excisional procedures.

Key words: Doppler-Guided Hemorrhoidal Artery Ligation, Hemorrhoids.

Introduction

One of the most common health issues people deal with is haemorrhoids. As people age, haemorrhoids grow more prevalent; it is estimated that at least half of those over 50 have some kind of haemorrhage. Men tend to be twice as likely to be affected as women.¹

Hemorrhoidectomy performs better than any suggested conservative method, including rubber band ligation, sclerotherapy, photocoagulation, and cryotherapy, for treating symptomatic grades III and IV haemorrhoids. Researchers are looking for the best treatment for haemorrhoids as a result of the accessibility of new techniques and technology. The ideal strategy should have a high level of therapeutic safety and effectiveness, low levels of postoperative pain and suffering, and be reasonably priced.²

New surgical procedures that require shorter

hospital stays and enable patients to return to work sooner have made symptomatic haemorrhoids less uncomfortable than they once were.³

All symptomatic piles require surgical excision, especially if nonsurgical or conservative measures are ineffective at treating the symptoms. For bothersome Grade 3 and 4 piles, or when conservative therapies for earlier grades of haemorrhoids fail, or when there is a concurrent chronic anal fissure or fistula, excision of piles, whether surgically, by diathermy, or even by stapler hemorrhoidopexy, is often suitable. Haemorrhoid excision typically causes or results in substantial, frequently excruciating postoperative discomfort that lasts 2–8 weeks.⁴

Discomfort is the main factor that makes some people hesitant to get a hemorrhoidectomy. As a result, many surgeons are still concerned and the search for less painful, practical, and effective alternatives is ongoing. Discomfort is

a common postoperative side effect even when hemorrhoidectomy is performed with diathermy and a monopolar cautery due to thermal spread and injury to the nearby richly innervated tissue. Therefore, restricting and minimising heat damage is probably going to lead to a significant decrease in postoperative discomfort.⁵

The surgical procedure known as Doppler-guided haemorrhoidal artery ligation (DGHAL) is new for treating haemorrhoids. It was first described by Morinaga in 1995, and it makes use of a specially designed proctoscope in conjunction with a Doppler transducer to locate and ligate hemorrhoidal arteries.⁶

Ligation of these arteries impairs blood flow to the hemorrhoidal venous plexuses, which stops hemorrhoidal bleeding and causes the plexuses to atrophy.⁷

According to research thus far, the operation is generally painless, well tolerated, has low complication rates, and is effective in treating bleeding and pruritus complaints.⁸

The goal of this study was to assess the Doppler Guided Hemorrhoidal Artery Ligation (DGHAL) approach for the treatment of grade III haemorrhoids in terms of the amount of time required to do the procedure, intraoperative bleeding, and postoperative pain, bleeding, and infection.

Patients and methods

All patients with 3rd degree hemorrhoids will be operated until fulfill our patients.

The patients had been followed-up weekly for one month then monthly for three months to evaluate ongoing symptoms and postoperative complications.

Inclusion criteria

Patients with grade 3 haemorrhoids who were either newly diagnosed or had previously received a diagnosis.

Exclusion criteria

Exclusion criteria for participants in the study included those with a history of previous hemorrhoidectomy, those who were pregnant, couldn't understand the informed consent process, those who were immunocompromised (such as those with HIV), those who had other proctological diseases like fissures, fistulas, or condylomas, those who had IBD affecting the anus or rectum.

Sampling method

Thirty patients with grade III hemorrhoids (18-60 years old) will be investigated, operated upon using DGHAL, under General or Spinal anesthesia,

followed up for four months post-operatively for pain and bleeding and their final outcome will be evaluated. Operative details were recorded.

Study procedure

All patients were subjected to preoperative, operative, and postoperative assessment:

– Preoperative assessment

The preoperative evaluation included a thorough review of the patient's medical history, a clinical examination that included a general check of the chest, heart, abdomen, and a local examination (per rectal examination) for the detection of haemorrhoids, their grading, complications, and the presence of other associated ano-rectal diseases. Patients who were using oral anticoagulants were advised to stop using anticoagulants prior to the operation.

– Operative assessment

Under spinal or general anaesthesia, with the patients in the lithotomy posture, the procedures were carried out on them. Each case's operating time were noted in minutes and blood loss were calculated by using "Blood Loss Estimation Using Gauze Visual Analogue".

– Postoperative

Patients were checked on every week for the first month, then every month for 3 months. Evaluation of postoperative pain and hospital stay were part of the early postoperative follow-up. The numerical rating scale from 0 to 10 was used to evaluate the pain score, and postoperative bleeding and infection were also studied.

Thirty patients with grade 3 hemorrhoidal disorders underwent Doppler-guided haemorrhoidal artery ligation. All of the study participants' patients received an explanation of the study's specifics. Informed consent forms were signed by the patients. The following items were monitored in the operation

During operation

- Length of the procedure.
- Blood loss.

Postoperative

- Postoperative pain.
- Duration of hospital stay.
- Hemorrhage.
- Infection.

A specially created tool was used for the procedure

"Hadeco echo sounder km-25", which included a proctoscopy fitted with a Doppler probe, a light source, and a window through which the suturing was carried out. Sutures would be easily placed at the right depth. The sutures were placed, and the knots were tied, using a long needle holder and a knot pusher.



Fig 1: HAL Doppler Equipment with display of depth of arteries.



Fig 2: Hadeco echo sounder km-25.

The patients were positioned in the lithotomy posture while under regional (spinal) or general anaesthesia.

The operation began with a digital rectal examination and anal sphincter dilation. A lubricated proctoscope was inserted 6 to 7 cm from the anal margin through the anal canal and into the low rectum. The anoscope was carefully rotated and/or tilted with the Doppler system on to look for the six primary hemorrhoidal artery trunks, which were often found at 1, 3, 5, 7, 9, and 11 o'clock along the circle of the low rectum. The best Doppler signal was then located by carefully pulling back the proctoscope while still tracing the artery distally up to the hemorrhoidal apex. The Doppler signal was quite evident in the low rectum's proximal region, where arteries may be located deep to the muscularis in the perirectal fat; however, it was attenuated or

absent at the intermediate site where the artery penetrated the muscularis of the rectum, and it once more became evident distally in the final 2 cm of the low rectum, where the artery was located in the submucosa, just above the internal hemorrhoid. A 5/8-circle, 27-mm taper-cut needle was stitched with a 2/0 Vicryl suture. Through the proctoscope's glass, a figure-of-eight suture was wrapped around the vessel and ligated. Absence of Doppler noises distal to the sutures proved obliteration of the veins.



Fig 3: Proper examination of the anal canal and exposure of the hemorrhoids.

After the procedure, gauze soaked in povidone iodine ointment was placed inside the anal canal. Patients received postoperative analgesia according on their needs.

The patients were called for examinations after being released from the hospital on postoperative day seven, as well as the second, third, and fourth weeks following surgery in the initial postoperative phase. Patients were monitored routinely to assess long-term results, and findings were recorded using a specifically designed preformat.



Fig 4: Activation of Doppler system, lubricating the proctoscope and turning on the light source.

The surgical time was calculated by predicting how long it would take to perform the procedure,

commencing with the skin manipulation and ending with the complete ligation of the targeted haemorrhoids. Minutes were used as the operational time unit.

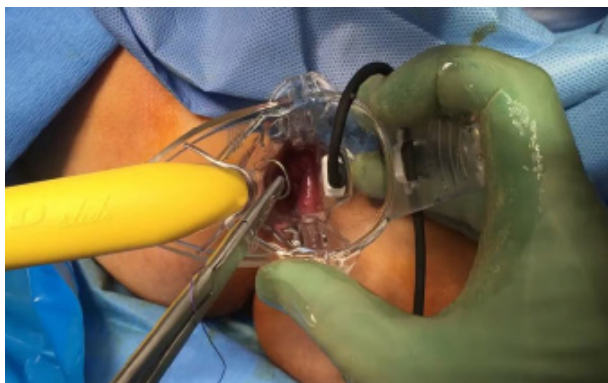


Fig 5: Attacking of detected haemorrhoidal arteries by suturing.

Blood was measured intraoperatively using “Blood Loss Estimation Using Gauze Visual Analogue,” which was carried out by calculating and documenting the size and quantity of gauzes used in each surgery.

The numerical rating scale was used as a scoring system to determine the severity of post-operative pain. Patients were instructed using a pain rating measure using a 10-point scale ranging from 0 to 10. Before going to bed, the patients were asked to write down their day’s highest pain score at home.



Fig 6: Final outcome after the operation.

Unless clinically indicated differently, patients were released the same day as surgery. All patients were required to wash their hands twice a day and clean the operating table. Following discharge, patients were seen in the clinic once a week for a month.

Infection and postoperative haemorrhage were tracked and recorded during the course of the four-month follow-up period.

Statistical Analysis

By examining the distribution of the data and applying normality tests, numerical data were examined for normalcy (Kolmogorov-Smirnov and Shapiro-Wilk tests). The Friedman test was used to compare the postoperative pain score during the course of the trial. Data were provided as mean SD (If numerical and normally distributed) and with median (Range) (If not normally distributed). The cutoff for significance was chosen at P 0.05. With IBM SPSS Statistics for Windows, Version 23.0, statistical analysis was carried out. Armonk: IBM Corporation.

Results

Table 1 showed the mean age at study group was (40.93±6.10). Regarding gender, the majority of patients were males (80%).

As shown in **(Table 2)**, intraoperative data and hospital stay at study group showed that there was median of intraoperative bleeding 32.50 ml with range (25-60) ml. The median of operative time was 12 minutes with range (10-20) minutes. Regarding hospital stay the median of period was 8 hours with range (6-22) hours.

As shown in **(Table 3)**, comparison of Postoperative pain score over study time at study group showed significant decrease from postoperative pain score at one week to pain score at 2 week then significant decrease at pain score of 3 week, but no significant difference between scores from 3rd to 4th week (Median values = 3, 1.5, 0 & 0) respectively (p=0.006).

Table 1: Demographic characteristics of our study group

	Study Group (n=30)	
	Count	%
Age (Years)	Mean ± SD	40.93±6.10
Gender	Female	6 (20%)
	Male	24 (80%)

Table 2: Intraoperative data and hospital stay at study group

	Median	Range
Intra operative bleeding (ml)	32.50	25.00_60.00
Operative time(minutes)	12.00	10.00_20.00
Hospital stay (hours)	8.00	6.00_22.00

Table 3: Post-operative pain score over study time at study group

	Median	Range
Postoperative pain week 1	3.00 A	1.00_5.00
Postoperative pain week 2	1.50 B	0.00_3.00
Postoperative pain week 3	0.00 C	0.00_1.00
Postoperative pain week 4	0.00 C	0.00_0.00
P value for time effect		0.006*

Discussion

Even though DGHAL has complications similar to those of other surgical techniques, Rotta et al. (2012) determined that its outcomes show less postoperative pain, allowing for a quicker recovery and return to work. We looked at 42 individuals who had stage I, III, or IV haemorrhoids and had been submitted to DGHAL. Stage II patients made up 11 (26%); stage III patients made up 21 (50%); and stage IV patients made up 10 (24%). The 42 patients received six artery branch ligations, followed by continuous suturing for rectal mucopexia. The simultaneous removal of nine patients' perianal skin tags was required. The following factors were assessed in the postoperative phase: discomfort, tenesmus, bleeding, itching, prolapse, mucus discharge, and recurrence. The typical length of postoperative care was four months (One to nine months). For 85.7% of patients, tenesmus was the most prevalent postoperative symptom, followed by pain in 28.6% of cases, perianal burning in 12.3%, mucus discharge in 12.3%, and perianal hematoma in 4.7%. Two patients needed surgical hemostasis due to extensive postoperative bleeding, one of whom required blood transfusion. 95 percent of the patients said they were happy with the procedure.⁹

In agreement with us, De Vries et al. (2007) claimed that DG-HAL is a secure and efficient treatment for the treatment of symptomatic grade 2 and 3 haemorrhoids. According to the DG-HAL approach, 110 consecutive patients with symptomatic grade 2 and 3 haemorrhoids were treated. It was 47.6 years old on average. 42 patients had haemorrhoids in grade 2, and 68 had grade 3. There were 7.3 ligations per person on average. Proctoscopy revealed that 97 (88%) individuals had significantly improved hemorrhoidal grading after 6 weeks. 93 of the 110 patients (84.5%), who had had follow-up care for an average of 37 weeks, were happy with the postoperative outcome. Morbidity was 3%,

while mortality was 0%.¹⁰

In agreement with us, Forrest et al. (2010) noted that DGHAL-RAR is well tolerated, safe, and effective. It lessens the requirement for potentially risky excisional techniques. In the near term, the RAR component is a useful addition to DGHAL for the treatment of prolapse, but longer follow-up will be needed to show the technique's durability. A minimum of 6 months after surgery, 77 consecutive patients (49 men) who had DGHAL-RAR for symptomatic haemorrhoids were evaluated. Of the patients, 57 (74%) had both prolapse and bleeding symptoms. The median number of RARs and DGHALs was two for RARs and six for DGHALs. The majority of patients (96%) were released the same day. At the follow-up visit, 11 patients reported recurrent symptoms, five prolapses, four bleeding episodes, and two pruritus episodes. Eight individuals experienced anal fissures following surgery. 84.4% of patients endorse the surgery. six weeks after surgery.¹¹

In their correspondence with us from 2011, Walega et al. came to the conclusion that RAR appeared to be a secure technique of treating advanced HD without any significant side effects. Anal pressures are significantly affected by the treatment, and there is no indication that there is a chance of faecal incontinence following the procedure. In order to treat advanced hemorrhoidal illness, they provided 12-month follow-up findings of functional evaluation and safety assessment of Recto-Anal-Repair (RAR), a modification of hemorrhoidal artery ligation (DGHAL) (HD). RAR was used on patients with grade III and IV HD (DGHAL combined with restoration of prolapsed haemorrhoids to their anatomical position with longitudinal sutures). Prior to 3 months and 12 months following the RAR surgery, each patient had a rectal examination, anorectal manometry, and a quality of life (QoL) questionnaire completed. 20 patients had their 12-month follow-up completed.

There were no significant issues. Three months after RAR, only three patients (15%) reported continued symptoms, while five cases of residual mucosal prolapse (25%) were found. Another three HD recurrences were found 12 months following the RAR, bringing the total to 8 individuals (or 40%) with HD recurrence. Anal pressures were considerably lower after RAR compared to before ($P < 0.05$), and the difference persisted 12 months later. One patient (5%), 3 months after RAR, reported sporadic soiling.¹²

In contrast to us, Sirivongs and Thienghiantham (2016) claimed that while one-fourth of patients experienced recurrence, long-term outcomes were not any better than with the historical routine open hemorrhoidectomy. On the other hand, patients with grades II or III internal haemorrhoids who underwent DG-HAL and RAR had modest short-term clinical outcomes with minor sequelae. They assessed the long-term clinical results of internal haemorrhoids treated with rectoanal repair (RAR) and Doppler-guided hemorrhoidal artery ligation (DG-HAL). Patients with internal haemorrhoids of grades II or III were included in the study. 28 of the 36 patients had full data, and they were all included in the study. It was 51.1 15.0 years on average. Mucosal prolapse (100%) and bleeding (82.1%) were the two most often occurring presenting symptoms. The typical length of the symptoms was 20 months (range, 0.5- 240 months). The average surgical duration was 40.9 9.9 minutes, and the average number of sutures used was 5.6 0.9. Almost all patients (96.4%) had a pain level of less than or equal to 5 24 hours after surgery when measured using the VAS pain scale. There were six (21.4%) patients who experienced urinary retention, infection, anal fissures, and thrombosed external haemorrhoids, respectively. The two most frequent recurrent complaints at five years were prolapse and bleeding, which affected eight patients (28.6%) and six patients (21.4%), respectively.¹³

We agreed with Roka et al. (2013) when they claimed that Doppler-guided recto-anal repair (DGRAR) is a successful therapeutic option for treating advanced hemorrhoidal disease that yields comparable outcomes to other recognised treatment modalities. In seven coloproctological centres, 184 patients with grade III (58%) or grade IV (42%) haemorrhoids participated in a prospective observational study. Recurrence of symptoms and the requirement for additional treatment were the primary objectives (Medical or surgical). In 8% of patients, postoperative problems were observed. 91% of patients were symptom-free and 91% were pleased with the outcome after a 3-month follow-up. 89% of patients had no symptoms after a 12-month follow-up, and 88% were pleased with the outcome. 19% of patients required additional

medical or surgical care.¹⁴

In agreement with us, Jeong et al. (2011) revealed that a DG-HAL & RAR can be expected to provide decreased pain, no significant complications, and positive long-term results in the majority of haemorrhoid patients, except those with severely prolapsed haemorrhoids. 97 individuals who received a DG-HAL & RAR for haemorrhoids and were monitored for a year were looked into. The admission period was 1.6 1.1 days on average. When compared to preoperative discomfort, there was no discernible difference on day seven postoperatively ($P > 0.05$). The average length of the procedure was 34.0 7.3 minutes, while the recovery period was timed at 2.3 2.0 days. Only 14 patients (14.4%) experienced a recurrence of their preoperative symptoms at the one-year follow-up, and no significant consequences were found.¹⁵

Additionally, Sherif (2016) found that DG-HAL with RAR is a successful minimally invasive treatment for grade IV haemorrhoids with outcomes comparable to MM hemorrhoidectomy with fewer complications, less postoperative pain, a shorter hospital stay, and an earlier return to work. 126 patients with grade IV haemorrhoids participated in this prospective, randomised, clinical trial. They were split into two equal groups: group A, in which 63 patients underwent DG-HAL with RAR, and group B, in which 63 patients underwent MM hemorrhoidectomy. Patients in group A had older means overall ($P = 0.003$).

In group A, the procedure took noticeably longer ($P > 0.001$) than in group B. $P = 0.006$ indicates that group A experienced the first defecation earlier than group B. In group A, the mean hospital stay was significantly reduced ($P < 0.001$). In addition, group A experienced the return to work much sooner ($P > 0.001$). In group A patients, the postoperative pain score (Visual analogue scale) was much lower, notably during faeces ($P > 0.001$). Class II and III analgesic use postoperatively was considerably lower in group A than in group B ($P > 0.005$). There were no discernible changes between the two groups after a year of follow-up in terms of postoperative complications, recurrent prolapse, anorectal function, or faecal continence.¹⁶

In 2015, Aigner et al. disputed our findings. In patients with grade III symptomatic haemorrhoids, they assessed the effectiveness of further Doppler guided closure of submucosal hemorrhoidal arteries. They came to the conclusion that mucopexy techniques are successful for treating prolapsing haemorrhoids, however Doppler-guided HAL did not significantly improve mucopexy's outcomes. The key to success is repositioning the hemorrhoidal zone, and mucopexy should be applied where there is the most obvious prolapse. The two trial

groups were randomly assigned to 40 patients. In the first two postoperative weeks, patients in Group A experienced less pain. Two patients in Group A (10%) and one in Group B (5%) exhibited recurrent grade III haemorrhoids at the 12-month follow-up ($p=0.274$). Between the preoperative examination and the assessments at 1 and 6 months, neither group's transperineal ultrasonography findings showed any appreciable morphological alterations ($p>0.05$).¹⁷

In their correspondence with us from 2010, Cho et al. claimed that the DG-HAL & RAR is a painless and secure treatment. An efficient solution for treating symptomatic or prolapsed haemorrhoids is the DG-HAL & RAR. The median age of the patient was 50.2 years and the median follow-up period was 415 days. The type of internal haemorrhoids has the following constitutions: Grade II: 13, Grade III: 16, and Grade IV: 5. The average length of the procedure was 35 minutes, and the post-op hospital stay was 1.4 days. The average amount of time to get back to work was 1.8 days. There were no serious problems or painful conditions that required the infusion of analgesics. Two patients have experienced recurrence of symptoms thus far.¹⁸

The clinical and functional outcomes of Doppler-guided (DG) haemorrhoidal artery ligation (HAL) versus traditional haemorrhoidectomy for the treatment of grade III & IV haemorrhoids were studied by Khalil et al. in 2019. They claimed that there are no serious risks while utilising DG-HAL, and that any issues are equivalent to those linked to other treatments. The DG-HAL method is ideal for outpatient care and is known for its high level of patient comfort. In this study, 60 patients were divided into two groups and underwent two different types of surgery: group A included 30 patients who underwent a traditional haemorrhoidectomy, and group B included 30 patients who underwent a Doppler-guided haemorrhoidal artery ligation (DG-HAL), with comparisons between the two groups' results and side effects. This study revealed that DG-HAL is a minimally invasive, painless therapeutic approach that represents a promising alternative to all currently used medications for the treatment of symptomatic haemorrhoids. In regions where ligatures had been inserted, scar tissue that had been firmly linked to the underlying tissue structure was seen during the postoperative check-up six weeks after the treatment.¹⁹

Conclusion

Doppler-guided haemorrhoid artery ligation (DGHAL) was attended with minimal blood loss, short surgical time, little postoperative pain and quick return to work with normal activity. No complications were met in our study group. It is a suitable technique for grade III haemorrhoids avoiding the techniques

necessitating tissue dissection.

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Conflict of interest

None declared.

Ethical approval

The study was approved by the Institutional Ethics Committee.

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