

## Comparative Study between Doppler-Guided Haemorrhoidal Artery Ligation (HAL) and Conventional Haemorrhoidectomy for Treatment of III & IV Degree Haemorrhoids

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### ABSTRACT

**Background:** Haemorrhoidal disease is probably the most frequent reason for consultation in proctology with an estimated prevalence about 4.4%. The gold standard treatment is still excisional hemorrhoidectomy, which is considered a safe and definitive method.

**Objective:** The study was designed to compare the clinical and functional outcome of Doppler-guided (DG) haemorrhoidal artery ligation (HAL) and conventional haemorrhoidectomy for treatment of grade III & IV haemorrhoids.

**Patients and methods:** This study was conducted on 60 patients, divided into two groups: group A included 30 patients that were operated upon through the conventional haemorrhoidectomy and group B include 30 patients that were operated upon through Doppler-guided haemorrhoidal artery ligation (DG- HAL), and comparison between two groups as regard outcomes and complications.

**Results:** It was found from this study that DG- HAL is a painless, easily learned, and minimally invasive therapeutic technique that offers a good alternative to all other known treatments of symptomatic hemorrhoids. During the postoperative check-up 6 weeks after the procedure, scar tissue that had been firmly connected to the underlying tissue structure was seen in areas where ligatures had been placed.

**Conclusion:** Using DG-HAL complications are comparable with those associated with other methods, with no severe complications. The DG-HAL procedure is synonymous with a high level of patient comfort and is perfect for outpatient treatment.

**Keywords:** DG-HAL, haemorrhoidectomy, Mucopexy, Hemorrhoids.

### INTRODUCTION

Hemorrhoids affect between 4 and 36 percent of population. The pathogenesis of this disease remains controversial but might be a conjunction of the two theories often discussed: the mechanical explanation in which the muscular fibroblastic supportive tissue of the haemorrhoidal plexus degenerates and the vascular explanation in which the arteriovenous shunts open, leading to dilation of the haemorrhoidal venous plexus<sup>(1)</sup>. Hemorrhoids become symptomatic through prolapse, bleeding, pain, pruritus, and/or mucus discharge. Grade of hemorrhoids does not always correlate with symptoms<sup>(2)</sup>.

Traditionally, the initial treatment of grade III & IV haemorrhoids is conservative management, if symptoms prevail. There is wide range of treatment modalities include injection sclerotherapy, infrared coagulation, rubber banding and operative hemorrhoidectomy (open, closed or stapled)<sup>(3)</sup>.

Common complications of hemorrhoidectomy are pain, bleeding, infection, fissure, delayed healing, stenosis, soiling and anal incontinence<sup>(4)</sup>.

In 1995, a new method was introduced by a Japanese surgeon, Kazumasa Morinaga in which the arterial blood supply of haemorrhoidal plexus are bound with ligatures (Doppler –Guided Haemorrhoidal artery ligation)<sup>(5)</sup>. Doppler –Guided HAL is easy to perform and is a minimally invasive technique that offers a good

alternative to all other surgical treatment of symptomatic hemorrhoids and is also associated with less postoperative pain. The HAL technique is designed to interrupt the arterial blood supply to the anal cushions by using a Doppler probe and pulling up the prolapse by bunching up the mucosa. The connective tissue in the collapsed hemorrhoid regenerates until the resolution of the prolapse<sup>(5)</sup>.

### AIM OF THE WORK

To compare the clinical and functional outcome of Doppler-guided haemorrhoidal artery ligation (HAL) and conventional haemorrhoidectomy for treatment of grade III & IV haemorrhoids.

### PATIENTS AND METHODS

Sixty patients were treated for haemorrhoids by either Haemorrhoidal artery ligation or by conventional haemorrhoidectomy at Al-Azhar University Hospitals, Cairo, Egypt during the period from November 2018 to May 2019, **after obtaining the Local Ethics Committee approval. All patients admitted to the surgery department and signed a written informed consent.** They were randomized using close-envelope into two groups:

**Group I:** 30 patients, operated upon through the conventional haemorrhoidectomy.

**Group II:** 30 patients, operated upon through the DG-HAL technique.

**A) Inclusion criteria:** - age ranged from 17 to 60 years old.

- Failure of conservative and non-surgical treatment.

**B) Exclusion criteria:**

- Patients with bad general condition who declared unfit for safe elective anesthesia.

- Patients with thrombosed piles or patients with 4th degree piles associated with complete rectal prolapse.

- Patient with chronic pain conditions or on opioid analgesics for other cause.

**Surgical Techniques:** Patients were randomized to undergo either conventional haemorrhoidectomy or the Doppler-guided haemorrhoidal artery ligation using closed envelopes opened before surgery. Operations were carried out under spinal or general anaesthesia.

**Group A: conventional hemorrhoidectomy**

It is usually done in an outpatient setting (23 hours or less hospital stay). Anesthesia can be general, caudal, or spinal. The conventional Ferguson's hemorrhoidectomy is performed with a scalpel, scissors, or electrocautery, although excision of the haemorrhoidal tissue can be achieved with any (electronic or other) cutting instrument. There are numerous publications about these techniques, and the results are inconsistent about which method causes fewer complications and less pain. After the haemorrhoidal pedicle has been mobilized, an absorbable suture is usually placed at the pedicle site. After the haemorrhoidal bundle is excised, with any internal or external components of the disease, the mucosal wound and skin are completely closed with a continuous suture. Wounds are cleaned and checked for appropriate hemostasis, and antiseptic ointment and a small dressing are often applied; no packing is necessary.



**Figure (1):** a) Exposure of the haemorrhoidal cushions. b) V-shaped incision in anal and perianal skin is done with a pair of blunt scissors. c) The haemorrhoidal tissue is dissected from internal sphincter by diathermy. d) Separation of haemorrhoidal tissue up to its pedicle e) Transfixation of the pedicle by vicryl 0.

**Group B: Doppler-Guided haemorrhoidal artery ligation**

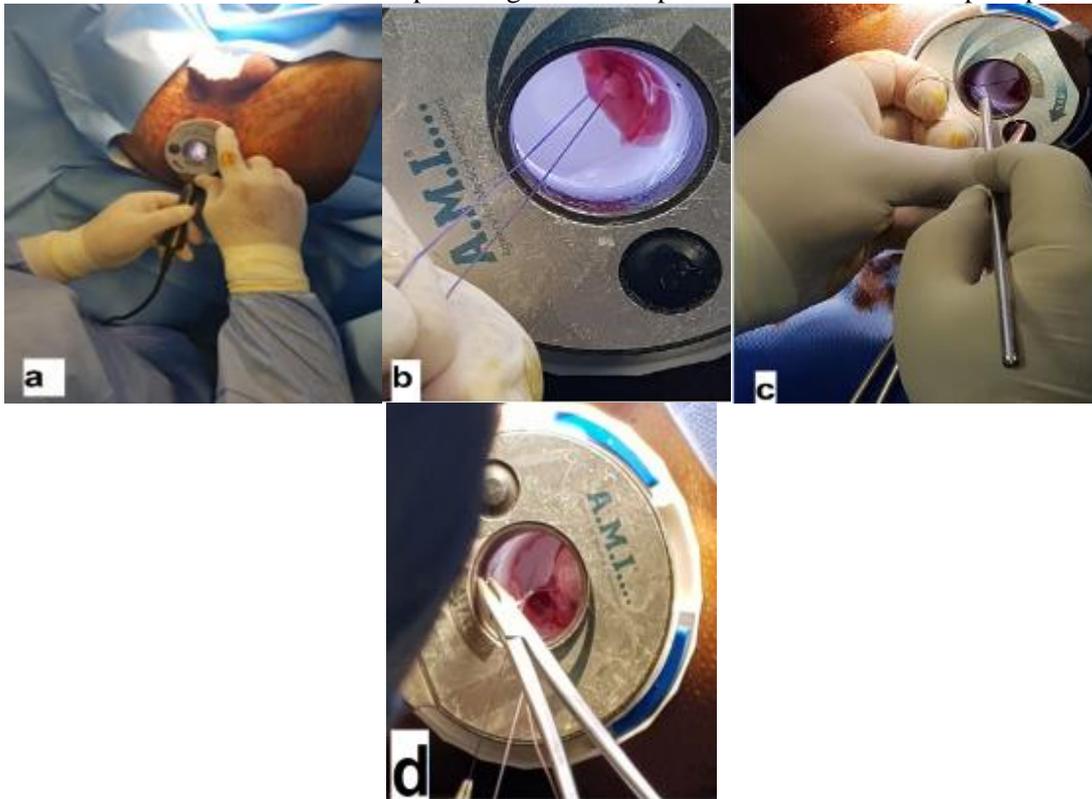
Transanal haemorrhoidal dearterialization is a non-excisional surgical method that consists of localization of the terminal branches of the superior rectal artery using a Doppler, and the consequent surgical ligation of those branches. A proctoscope with a slot into which can fit an opposite Doppler probe. Distally to the Doppler probe there is an operative window that allows the application of the stitches to the rectal mucosa. The tip of the needle holder is inserted inside a pivot in the proctoscope that allows the needle to have always the same precise trajectory.

The proctoscope is illuminated by a light cable inserted through its handle. The Doppler is used to localize the terminal branches of the superior rectal artery 1–2 cm above the internal cushions. After complete insertion into the patient’s anus, the proctoscope is gently rotated around the rectal circumference in order to locate an audible pulsating

arterial signal that confirms that the Doppler transducer is directly above the artery.

There are six terminal branches of the superior rectal artery, consistently located at odd hour positions (1, 3, 5, 7, 9, and 11 o’clock. This topography has never been described as a constant, but in clinical practice it is the norm. After their localization, the arteries are ligated approximately 3 cm above the dentate line with absorbable 2.0 suture mounting a 5/8 short round needle, with a “figure-of-eight” stitch. The knot is tied outside the proctoscope and laid down using a knot pusher. Confirmation of the vessel ligation is performed by repeat Doppler measurements. The reduction or complete absence of the Doppler signal provides evidence of vessel occlusion.

This results in decongestion of the haemorrhoidal tissue and alleviation of symptoms. The decreased tension allows for the regeneration of the connective tissue within the cushions. This facilitates the shrinkage of the piles and the reduction of prolapse.



**Figure (2): a) Auscultation of the haemorrhoidal artery by HAL-RAR device. B & c) Ligation of the haemorrhoidal artery by vicryl 2-0. d) Underrunning sutures to do RAR.**

**Statistical Analysis**

Data were analyzed using IBM SPSS software package version 20.0. Quantitative data were presented as mean ± SD. Qualitative data were presented as number and percentage. Logistic regression analysis was used to calculate odds ratio and P value. P value less than 0.05 was considered significant.

**RESULTS**

Most of hemorrhoids affect the middle age ones in both groups as shown in (table 1).

Most of hemorrhoids were one column in group A. While most of patients operated in group B were affected by three columns. And there was no statistically significant difference between both groups as regards number of columns affected with hemorrhoids, since P value > 0.05 (0.749) (Table 2).

Most of patient's complaint was anal irritation and swelling in both groups. And there was no statistically significant difference between both groups as regard the patient's complaint, since P value > 0.05 (0.191) (Table 3).

The mean operative time was 17: 20 minutes in Group A increasing to 24 minutes if the patient has three columns piles or has significant intraoperative bleeding that need additional time to be controlled. While time was 9.85 minutes in Group B increasing to 13 minutes if the patient suffering from three columns and that was statistically significant between both groups as regard the operative time, since P value < 0.05 (0.0401) (Table 4).

Operative time of patients ranged from 5-25 minutes in both groups with significant difference as most of patients operated by harmonic consumed less than 15 mins even if they were 3 columns and 4th degree while most of patients operated by MMH ranged from 11-25 minutes, which showed how harmonic use decrease the operative time significantly (Table 5).

The return to daily work of patients ranged from 3-15 days in both groups, with most of them returned to their daily work 10 days in Group A while fifty percentage of those in Group B needed less than 7 days to return to work, which was statistically different as P value is less than 0.005 (Table 6).

Table (7) showed that post-operative pain in the first 48 hour was more sever in group A as most of patients described moderate pain and demand high doses of NSAIDs to control pain and sometimes frequent titrated shots of opioids as pain killer, While patients in Group B described less severe pain that was easy controlled by routine doses of NSAIDs alone without opioids.

The mean healing time was 32.40 days in Group A and 25.10 days in Group B. The follow up was done at 3 days then 1 week then 2 weeks, 1 month, 2

months and 3 months. There was statistically significant difference between both groups as regard the healing time, since P value > 0.05 (.01254).

**Table (1):** Patients age groups in our study.

Age Group	Group A	Group B
	No. (%)	No. (%)
19-30 years	9 (30%)	10 (33.3%)
31-44 years	12 (40%)	12 (40%)
45-56 years	9 (30%)	8 (26.6%)
<b>Total</b>	30 (100%)	30 (100%)

**Table (2):** Affected hemorrhoids columns.

Hemorrhoidal column	Group A	Group B	T - value
	No. (%)	No. (%)	
One columns	14 (46%)	6 (20%)	0.749
Two columns	8 (27%)	8 (27%)	
Three columns	8 (27%)	16 (53%)	
<b>Total</b>	30 (100%)	30 (100%)	

**Table (3):** Patients complaint.

Complaint	Group A	Group B	T value
	No. (%)	No. (%)	
Anal irritating swelling	15 (50%)	15 (50%)	0.191
Swelling and bleeding	7 (23.3%)	10 (33.3%)	
Swelling and prolapse	8 (26.6%)	5 (16.6%)	
<b>Total</b>	30 (100%)	30 (100%)	

**Table (4):** Mean operative time

Group	Number (No.)	Mean ± SD	T Value
Group A	30	17.20 ± 5.08	0.0401
Group B	30	9.85 ± 3.71	

**Table (5):** Operative time in minutes.

Operation time	Group A	Group B
	No. (%)	No. (%)
5-10min	2 (6.5%)	12 (40%)
11-20 min	18 (60%)	18 (60%)
20-30 min	10 (32.5%)	0 (0%)
<b>Total</b>	30 (100%)	30 (100%)

**Table (6):** Return to daily work.

Return to daily work	Group A	Group B	T-Value <0.005
	No. (%)	No. (%)	
3-7 days	10 (30%)	15 (50%)	=.005
7-10 days	15 (50%)	12 (37%)	
11-15 days	5 (20%)	3 (18%)	
Total	30 (100%)	30 (100%)	

**Table (7):** 1st 48h severity of pain

Pain score	Group A	Group B
	No. (%)	No. (%)
8-10: Worst pain	2 (6.66%)	0
6-7: Sever pain	4 (13%)	1 (3.33%)
4-5: Moderate pain	19 (63.3%)	7 (23.3%)
1-3: Mild pain	4 (13%)	20 (66.6%)
0: No pain	1 (3.33%)	2 (6.66%)
Total	30 (100%)	30 (100%)

**Table (8):** Healing Time

Group	Number (No.)	Mean ± SD	T Value
Group A	30	32.40 ± 4.21	0.01254
Group B	30	25.10 ± 5.33	

**DISCUSSION**

Analysis of the results obtained from this study showed that there was no significant difference between Doppler-guided haemorrhoidal artery ligation and ligation-excision haemorrhoidectomy as regarding personal demographic data, age was ranging between 22-60 years old in first group and between 23-56 years old in second group. There were 18 female and 12 males in first group and 16 females and 14 males in second group.

The results are similar to **Bursics et al.** (6) study, (Comparison of early and 1-year follow-up results of conventional hemorrhoidectomy and hemorrhoid artery ligation: a randomized study), in which the two groups were comparable in sex distribution and patient age.

Regarding post-operative pain and doses of analgesia required, DG-HAL technique had the advantage of less post-operative pain and less doses of analgesia required than ligation-excision haemorrhoidectomy.

In DG-HAL procedure mean pain score was 2.2 ± 1.01 (range 1-4) in comparison to mean pain score 6.67 ± 1.05 (range 5-8) in ligation-excision haemorrhoidectomy.

In HAL technique mean doses of analgesia was 1.47 ± 0.74 gm (range 0-3) in comparison to mean doses

of analgesia 14.93 ± 2.79 gm (range 10-20) in ligation-excision haemorrhoidectomy.

The results of the study are nearly the same as the results described by **Bursics et al.** (6) where mean doses of analgesia in HAL technique was 2.9 ± 7.7 gm. While, mean doses for ligation-excision haemorrhoidectomy was 11.7 ± 12.6.

Regarding hospital stay and return to normal life style in relation to the type of operation. Hospital stay was less in HAL technique, mean in days was 1.03 ± 0.13 (range 1-1.5) than in ligation-excision haemorrhoidectomy, mean was 1.83 ± 0.52 (range 1-3).

Return to normal life style was faster in HAL technique, mean in days was 4.33 ± 0.82 (range 3-6) in comparison with ligation-excision haemorrhoidectomy, mean 17.07 ± 3.63 (range 12-22).

The results are the same as in **Bursics et al.** (6) study where mean of hospital stay in hours was 19.8 in HAL technique in comparison to ligation-excision haemorrhoidectomy which was 62.9, also the mean for return to normal lifestyle in HAL was 3 days where it was 24.9 days in haemorrhoidectomy.

Post-operative bleeding and infection; were significantly lower in DG-HAL than in ligation-excision haemorrhoidectomy, with 3 cases only (13.3%) with post-operative bleeding and 2 cases (6.7%) with infection in HAL technique, while 16 cases (53.3%) with bleeding and 12 cases (40%) with infection in ligation-excision haemorrhoidectomy. The results were near the results of **Scheyer et al.** (7) where bleeding was observed in 4.8% and infection in 0.3% of cases in HAL technique.

Regarding incontinence and residual prolapse there was no significant difference between the two groups.

Concerning long-term post-operative complications in both groups there was no statistical difference between the two groups as regards postoperative stenosis and recurrence. The results are nearly the same as in **Bursics et al.** (6) study.

Analysis of the results obtained from this study showed that there was no significant difference between Doppler-guided haemorrhoidal artery ligation and ligation-excision haemorrhoidectomy regarding haemorrhoidal grade in both groups, there was no significant difference between the two groups.

Comparison between the two groups regarding preoperative manifestations in both groups showed no significant difference between the two groups.

Analysis of the results obtained from this study showed that there is no significant difference between Doppler-guided haemorrhoidal artery ligation and ligation-excision haemorrhoidectomy as regards the operative time, which was ranging between 20-35 min in DG-HAL and ranging between 20-40 min in ligation-excision haemorrhoidectomy.

**CONCLUSION**

We believe that Doppler-guided HAL is a painless, easily learned, and minimally invasive therapeutic technique that offers a good alternative to all other known treatments of symptomatic hemorrhoids. All stages of haemorrhoidal disease can be treated using HAL.

#### REFERENCES

1. **Hardy A, Chan CL, Cohen CR (2005):** The surgical management of haemorrhoids: a review. *Dig Surg.*, 22: 26-33.
2. **Loder PB, Kamm MA, Nicholls RJ *et al.* (1994):** Haemorrhoids: pathology, pathophysiology and aetiology. *Br J Surg.*, 81 (7): 946-954.
3. **MacRae HM, McLeod RS (1995):** Comparison of haemorrhoidal treatment modalities. A meta-analysis. *Dis Colon Rectum*, 38: 687-694.
4. **Johannsson HO, Graf W, Pahlman L (2002):** Long-term results of haemorrhoidectomy. *Eur J Surg.*, 168: 485-9.
5. **Morinaga K, Hacuda K, Ikeda T (1995):** A novel therapy for internal hemorrhoids: Ligation of the haemorrhoidal artery with a newly devised instrument in conjunction with Doppler flow meter. *Am J Gastroenterol.*, 90 (4): 610-613.
6. **Bursics A, Morvay K, Kupcsulik P *et al.* (2004):** Comparison of early and 1-year follow-up results of conventional hemorrhoidectomy and hemorrhoid artery ligation: a randomized study. *Int J Colorectal Dis.*, 19: 176-180.
7. **Scheyer M, Antonietti E, Rollinger G *et al.* (2006):** Doppler-guided hemorrhoidal artery ligation. *Am J Surg.*, 191: 89-93.