# EVALUATION OF DOPPLER-GUIDED HEMORRHOIDAL ARTERY LIGATION AND RECTO-ANAL REPAIR FOR THE TREATMENT OF HEMORRHOIDS

***Nguyen Van Tiep[1], Le Anh Tuan[2]***

**SUMMARY**

***Objectives:*** *To evaluate the results and present some experiences in Doppler-guided hemorrhoidal artery ligation and recto-anal repair (DG-HAL/RAR) for treatment of hemorrhoids at Military Hospital 103.* ***Subjects and methods:*** *A prospective study on 59 patients who underwent DG-HAL/RAR for treatment of hemorrhoids from June 2018 to August 2019.* ***Results:*** *Average age: 43.7 ± 14.9 years. The youngest was 20 years old, the oldest was 81 years old. The ratio of male/female was 2.3/1. Mean surgical time: 34.6 ± 9.6 minutes. The average number of hemorrhoids knotted was 3.95 ± 0.84; the average number of hemorrhoids stitched was 3.1 ± 0.8. Surgical complications: Submucosal hematoma: 1.7%. Short-term outcomes: Mild pain: 61%; moderate pain: 39%; severe pain: 0%. The average time of post-operative pain relief was 1.96 ± 0.7 days. Average length of hospital stay: 3.5 ± 1.5 days. Long-term outcomes: Recurrence: 3.3%; grade III: 1.7%; grade II: 1.7%. Hemorrhoids embolism: 1.7%. General results: Good 93.2%; average: 5.1%; bad 1.7%.* ***Conclusion:*** *DG-HAL/RAR is a safe and minimally invasive surgery as it conserves anal tissue structures, prevent open wounds and excessive bleeding. The hemorrhoidal artery is ligated to restrict the blood flow reaching the hemorrhoids, then fixated to their normal position by hanging stitching.*

** Keywords: Hemorrhoids; Doppler-guided hemorrhoidal artery ligation and recto-anal repair.*

## INTRODUCTION

Hemorrhoids can be treated conservatively with western or traditional medicine, or surgery. Surgical interventions are considered to be the most effective [10, 11]. However, there is yet to be a gold standard treatment for hemorrhoids. Every surgical method has certain limitations, complications and sequelae after surgery, which can have a negative impact on the patient's quality of life. Classic surgical methods for hemorrhoid removal such as Milligan-Morgan, Ferguson, Parks, Whitehead are effective, but they are technically challenging and cause significant side effects such as post-operative pain, anal infection, anal stenosis, bleeding. Recovery from the disease may be lengthy process, impacting patient's ability to work for long periods of time. DG-HAL/RAR is a new technique and developed based on the classical hemorrhoidal ligation surgery, performed under the guidance of Doppler ultrasound with the principles of minimally invasive intervention to cause minimal pain and allow for rapid recovery [4, 8, 12].

[1]*Digestive Surgery Center, Military Hospital 103,* ***Vietnam Military Medical University***
[2]***Vietnam Military Medical University***
***Corresponding author: Nguyen Van Tiep (chiductam@gmail.com)***
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This surgical method has been deployed in many countries around the world such as the UK, France, the US, etc. A study in Europe (2013) in 7 countries with a large number of patients with grade III or IV hemorrhoids has shown superiority over other surgical methods in efficacy and safety [5]. In view of the above, we conducted this study aiming: *To evaluate the results and present some experiences in DG-HAL/RAR for treatment of hemorrhoids at Military Hospital 103*.

## SUBJECTS AND METHODS

### 1. Subjects

59 patients who were diagnosed with grade II and III hemorrhoids (according to Goligher's classification) were selected to undergo the DG-HAL/RAR technique at Military Hospital 103 from June 2018 to August 2019

** Selection criteria:*

*Patients who were diagnosed with grade II and III hemorrhoids (according to Goligher's classification) and failed medical treatments or other procedures were selected.*

** Exclusion criteria:*

- Hemorrhoids grade IV.

- Patients with concomitant diseases such as: Anal fissure, thrombosed hemorrhoids, anal fistula, anal malformation, external hemorrhoids.

- Hemorrhoid formation from underlying diseases such as portal hypertension, rectal cancer, etc.

### 2. Methods

** Study design:* A cross-sectional study.

** Surgical techniques:*

- Tools: The surgical instruments A.M.I TRILOGY hemorrhoids. Using HAL A.M.I 2/0 sutures, pointed 5/8 perimeter needles.

- Surgical steps:

+ Step 1: Manipulate anus, assess and identify lesions.

Use 2 fingers to slowly dilate the anus. Lubricate the Trilogy equipment and put it inside the anal canal. The surgeon rotates the device in all directions to assess the condition and mobility of the mucosa, the location and extent of prolapse of the mucosa and hemorrhoids, bleeding points, or concomitant injury.

+ Step 2: Identify hemorrhoids and constrict.

Under the guidance of arterial doppler ultrasonography, the pulsation of the artery was detected.

Hemorrhoidal artery tightening: Keep the tool in place over the defined arterial position, and perform stitching of the artery with stitches as shown in figure 8. The needle must be pierced through the submucosa. About 5 to 8 arteries will be found. However, this number varies with each patient and the severity of hemorrhoids in each case.

Ultrasonography over the sutured artery will show decreased vascular supply to the hemorrhoids.

+ Step 3: Stitch the hanging tufts of hemorrhoids.

Firstly, the original stitch is as adjacent to tufts hemorrhoids as possible, swivel device slightly to be better mucosa.

The following stitches are placed along the tufts of hemorrhoids, each spaced from 7 to 10 mm, not exceeding 10 mm

and not less than 5 mm apart. The last stitch is placed at the top of the hemorrhoids and above the pectinate line, and then tied with the remaining thread to pull the mucous membrane and hemorrhoids back to the base of the hemorrhoids in the lumen of the anal canal. Tightening the suture should be done slowly and gently, to avoid choking. Stitch each tuft of hemorrhoids in a clockwise direction until the end.

+ Step 4: Check, disinfect, end the surgery.

Put the Trilogy device back in the anal canal to reassess the entire ano-rectal canal. Pay attention to possible mucosal tears or bleeding at suture sites. If there are bleeding points, provide haemostasis with an X-shaped stitch. At the same time, closely assess the condition of the anal canal to avoid stenosis immediately after surgery.

* *Post-operative monitoring and data analysis:*

Patients were followed-up from 1 to 6 months after discharge and evaluated based on indicators including: Difficulty with defecation, pain anal bleeding when defecating or presence of abnormal masses in the anus, etc.

* *Data analysis:* By using SPSS software.

## RESULTS

A total of 59 patients participated in the study: Mean age: 43.7 ± 14.9 years. The youngest was 20 years old, the oldest was 81 years old. The working age from 30 - 60 years old accounted for 66%. The male/female ratio: 2.3/1. Grade of hemorrhoids: Grade II: 13.6%, grade III: 86.4%.

* *Characteristics of surgery:*

*Table 1:* Characteristics surgery.

| Characteristics of surgery | Number of patients | Min | Max | Average |
|---|---|---|---|---|
| Number of sutured hemorrhoidal arteries | 59 | 3 | 7 | 3.95 ± 0.84 |
| Number of hanged hemorrhoid tufts | 59 | 1 | 4 | 3.1 ± 0.8 |
| Surgical time (minutes) | 59 | 20 | 70 | 34.6 ± 9.6 |

* *Surgical complications:* 1 patient had submucosal hematoma, accounting for 1.7%.

* *Short-term outcomes after surgery:*

*Table 2:* Results after surgery

| Short-term outcomes after surgery | Number of patients | Min | Max | Average |
|---|---|---|---|---|
| Average postoperative pain-free duration (days) | 59 | 1 | 4 | 1.96 ± 0.7 |
| Average length of hospital stays (days) | 59 | 2 | 11 | 3.5 ± 1.5 |
| Transit time (days) | 59 | 1 | 3 | 1.8 ± 0.6 |
| Time to withdraw urinary catheter (days) | 59 | 1 | 3 | 1.5 ± 0.8 |

*Table 3:* Relationship between number of ligated hemorrhoids and degree of pain after surgery.

| Degree of pain after surgery | Number of sutured arteries | | | | p |
|---|---|---|---|---|---|
| | 3 - 4 arteries | | 5 - 7 arteries | | |
| | n | % | n | % | |
| Mild | 35 | 68.6 | 1 | 12.5 | 0.0083 |
| Moderate | 16 | 31.4 | 7 | 87.5 | 0.0083 |
| Total | 51 | 100.0 | 8 | 100.0 | |

*Table 4:* Relationship between number of hanged hemorrhoid tufts and severity of pain after surgery.

| Severity of pain after surgery | Number of hemorrhoids tufts | | | | p |
|---|---|---|---|---|---|
| | 1 - 2 hemorrhoid tufts | | 3 - 4 hemorrhoids tufts | | |
| | n | % | n | % | |
| Mild | 11 | 91.7 | 25 | 53.2 | 0.035 |
| Moderate | 1 | 8.3 | 22 | 46.8 | 0.035 |
| Total | 12 | 100.0 | 47 | 100.0 | |

* *Long-term outcomes after surgery:*

*Table 5:* Long-term outcomes after surgery.

| Long-term outcomes after surgery | Before surgery | | After surgery | | p |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Anal pain | 55 | 93.2 | 4 | 6.8 | < 0.01 |
| Bloody defecation | 42 | 71.9 | 2 | 3.4 | < 0.01 |
| Prolapsed hemorrhoids | 59 | 100.0 | 2 | 3.4 | < 0.01 |

* *Complications:*

Thrombophlebitis: 1 patient.

Recurrent hemorrhoids: 2 patients with grade III.

*Table 6:* Satisfaction with surgical outcomes.

| Satisfaction with surgical outcomes | Number of patients | Percentage (%) |
|---|---|---|
| Good | 55 | 93.2 |
| Average | 3 | 5.1 |
| Bad | 1 | 1.7 |
| Total | 59 | 100.0 |

## DISCUSSION

### 1. General features of the surgery

Surgical treatment of hemorrhoids in the world as well as in Vietnam with classic surgical methods such as Milligan-Morgan, Ferguson, and Whitehead all involve the complete excision of hemorrhoids with or without anal reshaping. These surgeries are performed on a sensitive area of the anus involving many nerve endings, resulting in a large degree of post-operative pain. At the same time, the hemorrhoids are supplied directly by the hemorrhoid artery, which may result in large bleeding for the patient [6]. Surgical suture of hemorrhoids are minimally invasive, with minimal pain. The minimally invasive technique of tightening the hemorrhoids and lifting the mucosa together with the prolapsed hemorrhoids, anal cushion and other anatomical components of the anal canal are preserved, thus minimizing iatrogenic dysfunction. Advantages: Degree and duration of pain post-operation reduce significantly compared to other surgeries. At the same time, recovery time is faster and patients resume normal activities sooner.

** Technique:*

We use the A.M.I TRILOGY equipment during our operations. In our study, the average number of stitched hemorrhoidal arteries was 3.95 (range: 3 - 7 arteries) in which 16 patients with the least ones, only 1 patient with the most ones; 22 patients with 4 stitched hemorrhoidal arteries. Ratto C reported that there were 5 - 8 hemorrhoidal arteries, the common positions in the anal canal were 3, 7, 11 o'clock in lithotomy position [3]. According to Bursics, the average number of hemorrhoidal arteries was 6 ± 1.7 arteries [7]. Our results show fewer knotted arteries than the above findings because patients in our study were at grade II and III of hemorrhoids, which showed a lower rate of hemorrhoidal artery proliferation than grade III and IV.

** Surgical complications:*

There were no cases of accidental rectal mucosal tear. However, there was 1 case of sub-mucosal hematoma as a result of poor technique, whereby the suture pierced into the hemorrhoids or tore into arteries. The two ends of the sewing thread were stretched and tied to strengthen stitches over the old position of an X-shaped stitch.

** Surgical time:* Average surgical time was 34.6 ± 9.6 minutes. The shortest was 20 minutes, the longest was 70 minutes. This included performing DG-HAL/RAR surgical steps and combined anal rectal pathology, of which the main time was in step 3 and 4, especially step 4. According to Roka S (2013), the average surgical time was 35 minutes, the shortest was 13 minutes, the longest was 75 minutes [5].

### 2. Short-term outcomes after surgery

** Post-operative pain:*

Immediate pain as well as bleeding post-operation is a challenge for both surgeons and patients. In most cases, patients have more pain post-operation compared to pre-operation (if not using prophylactic analgesia). Its causes include: open wound from surgery; damage to the sensitive nociceptors of the anal canal; wound infection; hemorrhoid thrombosis, etc. In our study, all patients who undergo

surgery have minimal post-operative pain as the technique was minimally invasive. The hemorrhoidal arteries that are ligated during surgery are the straight hemorrhoids, while the oblique hemorrhoids are preserved. The results show that all patients with pain after surgery have to use painkillers in different degrees. In this study, mild pain was found in 36 patients (61%); moderate pain: 21 patients (35.7%); none of the patients had severe pain. Compared with Nguyen Trung Tin's findings, the author used the technique of ligating and hanging hemorrhoids without Doppler ultrasound, 91% of patients had pain after surgery, of which 9% had severe pain [1]. This result was consistent with Zagridskiy's, post-operative pain level by DG-HAL/RAR was significantly reduced compared to the classical surgical group ($p < 0.001$) [6]. Comparing post-operative severity of pain with the number of stitched hemorrhoidal arteries, the results showed that: Patients with 3 - 4 stitched hemorrhoidal arteries had a higher rate of mild pain than patients with 5 - 7 arteries (68.6% vs. 12.5%) - a statistically significant difference ($p = 0.0083$). The incidence of moderate pain in patients with 3 to 4 arteries was lower than in patients with 5 to 7 arteries (31.4% vs. 87.5%), the difference was statistically significant ($p = 0.0083$). These results demonstrated that the number of ligated arteries was related to the degree of pain within 24 hours after surgery, in particular, degree of pain increases with increasing number of ligated arteries.

Relationship between numbers of fixed hemorrhoids and severity of pain: The rate of less pain in patients with 1 - 2 fixed hemorrhoid tufts was higher than in patients with 3 - 4 hanged hemorrhoids tufts (91.7% vs. 53.2%), the difference was statistically significant ($p = 0.035$). Moderate pain rate in patients with 1 - 2 fixed tufts of hemorrhoids was lower than in patients with 3 - 4 lifted hemorrhoid tufts (8.3% vs. 46.8%), the difference was statistically significant ($p = 0.035$). This result showed that the number of hemorrhoids with fixed lifting was related to pain level after surgery within 24 hours. It means that the more the stitches of hemorrhoids are fixed, the more the severity of pain is.

* *Post-operative pain time:* On the third day, pain level was reduced in most patients and they did not have to take medicine. After surgery, we instructed patients to soak the anus 3 times/day and after each defecation in warm and light salt water (about 40 degrees) until the pain in the anus was gone. The average post-operative pain-free time was 1.96 ± 0.7 days. Roka S's (2013) study on degree of pain according to the VAS scale (1 - 10 points): On the 4th day, VAS score over 7 points: 1 patient, 4 - 6 points: 15 patients, and less than 3 points: 93 patients [5]. Our research showed that postoperative pain time was shorter than other findings. In Bursics' study on DG-HAL/RAR, pain level and pain time after surgery was lower than other findings [8].

* Length of hospital stay: The average length of hospital stay was 3.5 ± 1.5 days, the shortest and the longest day were 2 and 11 days, respectively. The length of hospital stay of 3 days (50.8%) and 2 days (18.6%) accounted for a high proportion.

In Roka S' study (2013), it was 2.3 days (1 - 9 days) [5], Zagriadskiy's (2011) and Morgan Milligan's: 18.3 hours and 62 hours, respectively [6].

**3. Long-term outcomes after surgery**

The rate of pain before surgery (93.2%) decreased to 6.8% (follow-up after surgery), the difference was statistically significant with $p < 0.01$. It means that pain symptoms were significantly reduced after surgery. Patients without pain before surgery had no pain after surgery. Other patients with pain before surgery had almost no pain or a lower level of pain after re-examination (Patients No. 09, 49, 51 and 56 still had anal soreness at follow-up).

Bleeding symptoms pre-operation (71.9%) decreased to 3.4% (re-examination after surgery), the differences were statistically significant ($p < 0.01$). Symptoms of bleeding at re-examination were found in the patients number 51 and 56, these two patients had symptoms of bleeding before surgery.

The rate of prolapse of hemorrhoids before surgery (100%) reduced to 3.4% at the follow-up. The difference was statistically significant with $p < 0.01$. Among 2 patients with recurrence of hemorrhoids prolapse, the extent of the prolapse at the follow-up in patient number 51 was similar to pre-surgery (prolapse without spontaneous prolapse). In patient number 56 who did not self-contract before surgery, after re-examination, the symptom decreased but prolapsed hemorrhoids was still present (spontaneous prolapse).

There were 2 cases of recurrence of hemorrhoids, accounting for 3.3%, of which 1 case (number 51) had recurrence of hemorrhoids grade III. The remaining one case of hemorrhoids grade III was provided counselling of drug use and daily living. In our study, recurrence rate of hemorrhoids was lower than other findings. Wallis de Vries BM et al's study on 110 patients with hemorrhoids at grades 2 and 3 revealed a recurrence rate of 12% after 6 months [9].

**4. Evaluation of general results**

The overall result was good, patients had normal defecation, no burning pain, no bleeding, no mass of anal prolapse (93.2%). There were 4 cases with abnormal symptoms in the anus. Average and bad results accounted for 6.8% (including 1 case (1.7%) with bad results). Compared with Ferguson surgery: Good results: 95.3%; average: 4.7%; bad: 1.4% [2] (the author combined the radical suture during surgery); Milligan-Morgan surgery: Good: 77.9%; average: 14.3%; bad: 7.8%, Longo surgery: Good: 90.82 - 91.4%; average: 5.5 - 12%; bad: 2.9 - 3.68% [6].

## CONCLUSION

Doppler-guided hemorrhoidal artery ligation and recto-anal repair is a safe, less invasive surgery that preserves the anal cushion organization, does not cause open wounds and have little blood loss. Surgical time was short, mean surgical time was 34.6 ± 9.6 minutes. After surgery, mild pain: 61%; moderate pain: 39%; no patient with severe pain. The hospital stay was short (3.5 ± 1.5 days on average). Long-term outcomes: The recurrence rate was low (3.3%), the patient had almost completely reduced symptoms after surgery.

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