

Evaluation of transanal hemorrhoidal dearterialisation (THD)-mucopexy as a successful treatment for stage IV haemorrhoids: a prospective, observational study and a literature review

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Abstract

Introduction: Currently, transanal hemorrhoidal dearterialisation (THD) is considered the gold-standard therapy for symptomatic grade II-III haemorrhoids.

Aim: Our objective was to evaluate the efficacy and safety of THD-mucopexy for the management of grade IV haemorrhoids, with a focus on postoperative complications and recurrence rates.

Material and methods: A total of 37 patients presenting symptomatic grade IV haemorrhoids were enrolled between 2011 and 2014. Thirty-one patients underwent THD-mucopexy, while an additional Milligan-Morgan haemorrhoidectomy with ligation was performed on 6 patients due to excessive tissue prolapse and fibrosis.

Results: The average procedure duration was 37 ±5 min. Within the entire study cohort, 28 patients noted complete or significant improvement in their symptoms (75.68%), while the remaining 9 participants encountered postoperative complications or disturbances (24.32%). The most severe reported complications were severe pain and postoperative bleeding (5.41%). Among the 7 patients with mild complications (18.92%), issues included tenesmus (10.82%), urinary retention (8.11%), mild regional discomfort (10.82%), and moderate pain (5.41%). The mean hospitalisation duration was 2.14 days. The recurrence rate was 2.7%, with no recorded mortality. Importantly, haemorrhoidal reduction was successfully achieved in all patients.

Conclusions: Despite the limited supportive literature evidence, THD-mucopexy is recommended as an effective and safe minimally invasive surgical option for the management of stage IV haemorrhoids. It offers the advantage of less postoperative pain along with low complication and recurrence rates. Further research is needed to strengthen these findings and establish THD-mucopexy as a viable option for grade IV haemorrhoids.

Introduction

Currently, haemorrhoids are the most widespread anorectal disease, with a global incidence of 4–36%, peaking at 45–65 years of age. The sex ratio is approximately 1 : 4, with a female prevalence. The exact pathogenesis of haemorrhoids remains unclear. One hypothesis posits a mechanical explanation in which the degeneration of fibroplastic supportive tissue in the haemorrhoidal plexus contributes to the phenomenon. Concurrently, the vascular theory explains that the

presence of haemorrhoids is attributed to an imbalance in blood flow within the superior hemorrhoidal plexus, characterised by either heightened arterial inflow or diminished venous drainage. The pathogenesis of haemorrhoids is multifactorial, involving a combination of various contributing factors [1–4]. Haemorrhoidal symptoms vary from a sensation of incomplete evacuation and mucus discharge to rectal bleeding, perianal pain, pruritus, and prolapse. Haemorrhoids are categorised

into 4 stages based on their visual characteristics, as per the Goligher classification [3–5].

The management of haemorrhoidal disease involves a complex algorithm, in which the indication for treatment is determined by the subjective severity of symptoms. The selection of treatment is contingent upon both surgical expertise and the stage of prolapse. Many therapeutic modalities are available, varying from conservative (fibre-rich dietary, defecation discipline, sclerotherapy, and rubber-banding) to surgical. Grade IV, persistent, and symptomatic haemorrhoids are primarily treated by surgical haemorrhoidectomy. Although many surgical techniques have been developed, none of them is considered ideal. In recent years, a new minimally invasive surgical technique, based on the pathophysiology of haemorrhoids, has been introduced. Transanal hemorrhoidal dearterialization (THD) is considered the gold-standard treatment for grade II–III haemorrhoids, but its effectiveness for the management of grade IV haemorrhoids remains controversial among surgeons [6, 7].

Aim

This study aimed to evaluate the efficacy and safety of THD-mucopexy in the management of grade IV haemorrhoids, assessing its results and complications during the postoperative period, and during short- and long-term follow-up

Material and methods

Study design

This prospective study was conducted over 3 years from October 2011 to October 2014 in a single centre. The study protocol was approved by the local Institutional Review Board. Written informed consent was obtained from all the patients. In addition, a comprehensive literature search was conducted on PubMed to identify studies related to Transanal Hemorrhoidal Dearterialisation (THD), written in English, from its introduction in 2001 until 31 December 2023.

Patient selection

Inclusion criteria were the patient's age from 18 to 76 years, diagnosed haemorrhoidal disease of grade IV, and surgical treatment with THD-mucopexy. Exclusion criteria were as follows: pregnancy, previous major surgery to the rectum, Crohn's disease or irritable bowel syndrome, use of anti-platelet or anticoagulant medication, body mass index > 30, chronic or acute heart failure, coronary heart disease, hypertension, and kidney failure defined as estimated glomerular filtration rate (eGFR) < 50 ml/min.

Patients with symptomatic haemorrhoids were assessed by proctoscopy, and haemorrhoidal disease was staged based on the Goligher classification. A colonoscopy was selectively performed to exclude other pathologies. After giving informed consent, all patients underwent Doppler-guided THD-mucopexy.

Surgical technique

Patients were placed in a lithotomy position and spinal anaesthesia was given. A glycerine/phosphate enema was used to prepare the rectum 3 h before surgery. A proctoscope with a Doppler ultrasound transducer at its tip was employed to detect arterial pulses. The lateral ligation window and light source of the proctoscope allowed accurate insertion of sutures under direct vision (Figure 1). After Doppler-guided identification of all the distal branches of the superior rectal artery, each vessel was ligated with a 2.0 Vicryl suture (tapered needle with 5/8 circumference). Six arterial branches were usually identified at positions of 1, 3, 5, 7, 9, and 11 o'clock. A mean of six sutures were placed above the dentate line, and then the procedure was finalised by performing mucopexy. However, 6 of 37 patients underwent THD combined with the Milligan-Morgan technique, using LigaSure diathermy due to excessive regional inflammatory fibrosis.

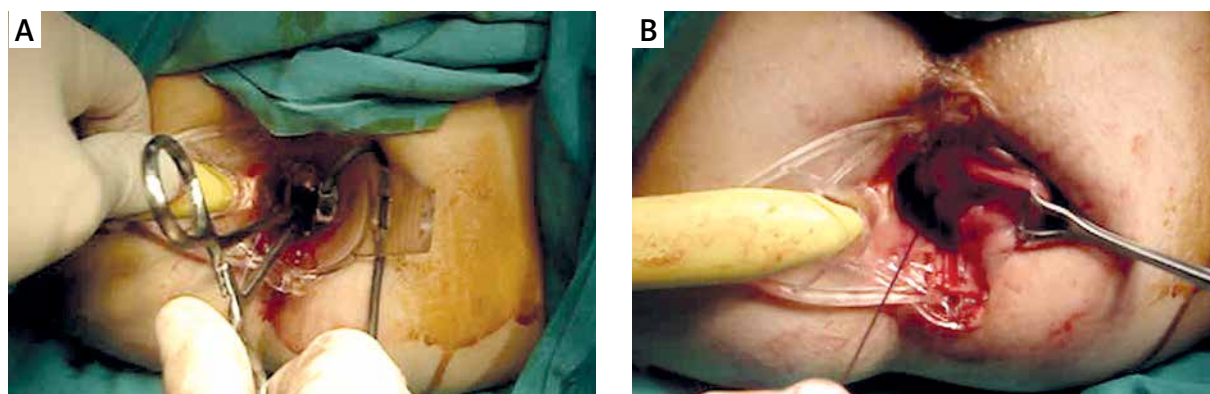


Figure 1. Intraoperative surgical view during suture placement through the lateral window of the THD device

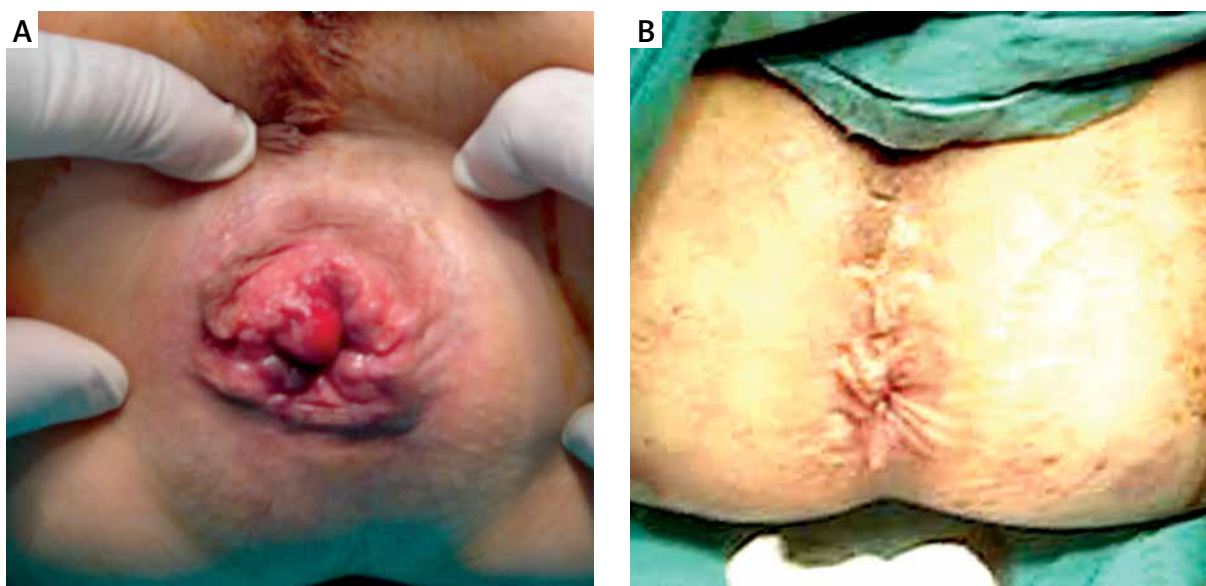


Figure 2. Macroscopic view (A) before and (B) after THD-mucopexy in patients with grade IV haemorrhoids

All patients received prophylactic antibiotics and postoperative anti-inflammatory and analgesic medications. The haemorrhoidal reduction was estimated for all patients (Figure 2). Postoperative instructions included oral stool softeners, lukewarm baths, a 1-month high-fibre diet, and laxatives to protect mucopexy. Four-week follow-up was performed with a physical examination and a long-term follow-up at 12 months from the operation time with a questionnaire. No patient was lost to follow-up.

Results

During the study period (October 2011 to October 2014), 63 patients were admitted to our hospital with haemorrhoidal diagnosis. Of these, 26 were excluded. Thirty-seven patients with grade IV haemorrhoids were included in this study. The sex distribution was 11 males and 26 females. The mean age of male and female patients was 47.55 years (ranging from 25 to 67) and 41.15 years (ranging from 27 to 72), respectively. The presenting symptoms were bleeding ($n = 14$), prolapsed piles ($n = 37$), pain ($n = 37$), pruritus ($n = 7$), mucous discharge ($n = 6$), and thrombotic piles ($n = 4$). Table I displays the primary characteristics of this population along with the comprehensive results. All patients underwent surgical therapeutic management, with 31 individuals undergoing the THD-mucopexy procedure and 6 undergoing THD combined with the Milligan-Morgan technique using LigaSure due to excessive tissue fibrosis. An average of 6 ligations were placed (ranging from 5 to 7), while the median procedure time was 37 ± 5 min. No perioperative com-

plications were noticed, and the mortality rate was 0%. Thirty-three (89.19%) patients were discharged on the second postoperative day, 3 on the third (8.11%), and one on the fourth postoperative day (2.7%). The mean postoperative hospitalisation was 2.14 days. Extended hospitalisation duration is attributed to the advanced stage of haemorrhoidal disease. Statistical analysis was performed with Excel 2013 (Microsoft, Redmond, Wash., USA).

Moreover, the patient's postoperative pain was estimated with the verbal numerical rating scale (NRS) of 0 (no pain) to 10 (worst pain) [8–10]. Mild discomfort was defined as pain from 1 to 3, moderate pain as pain from 4 to 6, and severe pain from 7 to 10 on the pain scale. Of the entire study sample ($n = 37$), 28 (75.68%) patients reported gradual or complete relief of their symptoms without any discomfort. The total complication rate was estimated at 24.32%; 7/37 patients (18.92%) reported mild postoperative complications that were resolved using conservative measures while 2/37 patients (5.41%) presented serious complications. The total recurrence rate was 2.7%, observed in a single patient with a solitary haemorrhoidal node that manifested in the third postoperative month. This patient underwent surgical resection using ligature under local anaesthesia.

In terms of serious complications in this study, one patient (2.7%) was readmitted due to bleeding on the seventh postoperative day, necessitating surgical intervention with a second THD procedure. This revealed a small mucosal rupture, which was probably due to tension from the mucopexy suture. Another patient

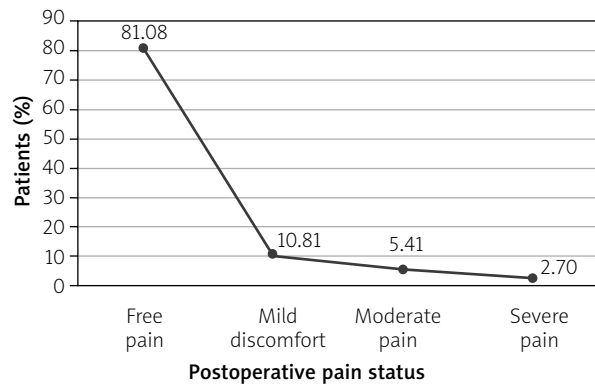
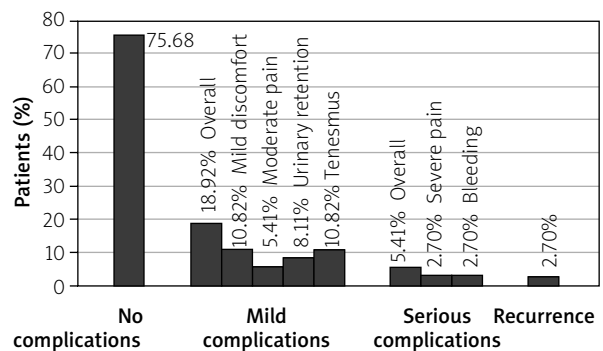
Table I. Patients' demographics and results

Variable	Value
Patients, <i>n</i> (male : female)	37 (11 : 26)
Mean age [years] overall, male/female	43.05, 47.55/41.15
IV grade of haemorrhoid, <i>n</i>	37
Preoperative symptoms, <i>n</i> :	
Bleeding	14
Prolapse	37
Pain	37
Pruritus	7
Mucous discharge	6
Thrombotic piles	4
Surgical management:	
THD-mucopexy, <i>n</i>	31
THD-mucopexy + Milligan-Morgan by LigaSure, <i>n</i>	6
Operation time [min]	37 ± 5
Ligation number, <i>n</i>	6 (range: 5–7)
Mean hospitalisation [days]	2.14 (range: 2–4)
Perioperative complication, %	0
Postoperative status, <i>n</i> (%):	
With no complications	28 (75.68)
With mild complications:	7 (18.92)
Moderate pain	2 (5.41)
Mild discomfort	4 (10.82)
Urinary retention	3 (8.11)
Tenesmus	4 (10.82)
With serious complications	2 (5.41)
Bleeding	1 (2.7)
Severe pain	1 (2.7)
Mortality, %	0
Recurrence, <i>n</i> (%)	1 (2.7)
Patients in short-term follow-up, <i>n</i>	37
Patients in long-term follow-up, <i>n</i>	37

THD – transanal haemorrhoidal dearterialization.

(2.7%) reported severe pain (8 out of 10 on NRS), which was effectively managed with intravenous analgesics and anti-inflammatory medications, resulting in complete resolution by the fourth postoperative day. The pain was presumed to be associated with a suture placed near the dentate line, owing to the highly prolapsed haemorrhoidal tissue.

Among the remaining 7 patients with mild postoperative disturbances, 2 out of 7 reported moderate pain (4 out of 10 on NRS) (5.41%), while 4 out of 7 experienced mild regional discomfort (2 out of 10 on NRS)

**Figure 3.** Overall results for postoperative pain after THD-mucopexy to patients with grade IV haemorrhoids**Figure 4.** Patient's postoperative status after THD-mucopexy for the management of stage IV haemorrhoids

(10.82%), managed with oral analgesics. The average duration of postoperative discomfort was 2.9 days, ranging from 1 to 4 days. Figure 3 illustrates the overall results for postoperative pain. Despite mucopexy being performed for all patients, a low incidence of postoperative pain was observed, probably due to maintaining an adequate margin from the dentate line. Additionally, other mild postoperative disturbances were noted in these 7 patients. Three (8.11%) patients experienced urinary retention, which resolved within 24 hours after catheterisation, and 4 of these patients (10.82%) reported tenesmus, gradually decreasing over time (Figure 4).

At the 4-week follow-up, significant improvement in symptoms was observed in all patients. Physical examinations were conducted for each patient, revealing no residual haemorrhoidal disease. Furthermore, they resumed normal activities and work promptly. At the 12-month follow-up, all patients expressed complete satisfaction with the surgical technique, reporting complete relief of symptoms and reduction of haem-

orrhoidal piles without any complaints of functional disturbances.

Discussion

Surgical management of grade IV haemorrhoids is deemed more effective than alternative conservative therapeutic approaches, given that the requirement for retreatment is estimated to range from 0% to 20% [1]. The selection of appropriate surgical treatment for haemorrhoids necessitates an assessment of the effectiveness and risks associated with the technique, weighed against the potential benefits for the patient [5, 11].

The classic Milligan-Morgan haemorrhoidectomy, first described in 1937, is the most commonly used excision procedure for the management of haemorrhoidal disease. In 1959, a closed alternative to the Milligan-Morgan procedure was introduced by Ferguson [4]. In the contemporary medical landscape, various modifications of haemorrhoidectomy are recognised as effective surgical options, albeit with notable rates of morbidity. A primary concern associated with these techniques is the occurrence of severe postoperative pain. Additionally, potentially serious complications encompass postoperative bacteraemia (5%), anal stenosis, sphincter damage leading to incontinence (up to 33%), and postoperative bleeding [1, 5].

The demand for less invasive surgical techniques, offering effective symptomatic control with fewer postoperative complications, has driven the development of new modalities. One such innovation is stapled haemorrhoidopexy, introduced by Longo in 1998. This excisional procedure involves mucosal resection and is designed to address grade IV haemorrhoids by lifting prolapsed tissue in the anal canal. While it typically results in less postoperative pain, stapled haemorrhoidopexy carries the risk of severe complications, including sepsis, bleeding, large bowel obstruction, perforation, and rectovaginal fistula. The technique's unpredictability in terms of tissue resection extent and suture line depth contributes to increased rates of recurrence and reoperation, ranging from 18.2% to 58.9% [12].

The evolution of minimally invasive surgery has given rise to natural orifice surgery. Since 1995, Doppler-guided haemorrhoidal arterial ligation (DG-HAL) has emerged as a non-excisional surgical approach for haemorrhoidal treatment, initially introduced by Morigana [1, 5]. The underlying theory is that reducing blood flow can lead to a decrease in the haemorrhoidal mass [13]. According to a study by Scheyer *et al.*, after an 18-month follow-up, 80% of patients who underwent DG-HAL were found to be free from pain and bleeding [2]. Another study by Wilkerson *et al.* concluded that DG-HAL is safe and effective for grades I–III, while pa-

tients with grade IV haemorrhoids may not be suitable candidates for this technique [5].

In 2001, Sohn *et al.* introduced a similar technique known as transanal hemorrhoidal dearterialisation (THD) [6]. This surgical approach involves ligating all terminal branches of the superior rectal artery, utilising a proctoscope and Doppler transducer to detect arterial inflow in the haemorrhoidal plexus and selectively ligate vessels. The objective is to decrease blood inflow, leading to the reduction of the plexus, shrinkage of haemorrhoids, and alleviation of prolapse. THD appears to offer advantages such as less postoperative pain, reduced trauma, shorter hospitalisation, and quicker return to normal activities for patients [1, 5, 7]. Dursun *et al.* reported that the efficacy of laser haemorrhoidoplasty in treating haemorrhoidal disease showed a recurrence rate of 50% (6 out of 12) in patients with grade 4 disease ($p = 0.019$) [14].

An advantage of THD over stapled haemorrhoidopexy in terms of postoperative pain is attributed to the use of absorbable sutures instead of permanent staples, avoiding the deepest layers of the region and achieving healing through fibrosis [7]. Currently, THD is indicated for symptomatic grade I to III haemorrhoids; however, its role in the management of grade IV haemorrhoids remains uncertain.

A comprehensive literature search was conducted on PubMed to identify studies related to transanal hemorrhoidal dearterialisation (THD), written in English, from its introduction in 2001 until 31 December 2023. The search yielded 20 articles investigating the effectiveness of THD in managing haemorrhoidal disease, encompassing grades II, III, and IV. Notably, only 2 articles specifically focused on the application of THD in the treatment of grade IV haemorrhoids. The findings are summarised in Table II. Among the 20 studies, only 2 reported larger patient samples ($n_1 = 118$, $n_2 = 176$) compared to the current study ($n = 37$), with the additional feature of a relatively long-term follow-up. Furthermore, this study represents the third examination specifically targeting the assessment of THD-mucopexy effectiveness for the management of grade IV haemorrhoids. The scarcity of statistical evidence regarding the role of THD in grade IV haemorrhoid management underscores the imperative need for further and more specialised studies in this domain.

A study by Simillis *et al.* reported that transanal hemorrhoidal dearterialisation (THD) for grade III–IV haemorrhoids is associated with reduced postoperative pain and quicker recovery, despite higher recurrence rates [15]. However, some studies challenge the postoperative benefits of THD for advanced haemorrhoids. A study by Loganathan *et al.* supports THD for grade

Table II. Literature review for THD. Part A – Studies evaluating exclusively THD-mucopexy for grade IV haemorrhoids. Part B – Studies evaluating THD-mucopexy for grade II–IV haemorrhoids

Authors	Year	Patients (n)	Goligher grade II–IV (x/n)	Surgery
Part A:				
Ratto <i>et al.</i>	2011	35	IV (35/35)	THD + Mucopexy
Giordano <i>et al.</i>	2014	34	IV (34/34)	THD + Mucopexy
Part B:				
Sohn <i>et al.</i>	2001	60	III (38/60), IV (22/60)	THD
Dal Monte <i>et al.</i>	2007	330	II 138/330, III (162/330), IV (30/330)	THD
Festen <i>et al.</i>	2009	41	III (37/41), IV (4/41)	THD
Ratto <i>et al.</i>	2010	170	II (13/170), III (141/170), IV (16/170)	THD + Mucopexy
Zampieri <i>et al.</i>	2012	46	III (21/46), IV (25/46)	THD
Ratto <i>et al.</i>	2012	100	III–IV not known	THD + Mucopexy (90/100) THD (10/100)
Lucarelli <i>et al.</i>	2013	63	III (35/63), IV (28/63)	THD + Mucopexy
Loganathan <i>et al.</i>	2014	85	III (73/85), IV (12/85)	THD
Kjær <i>et al.</i>	2014	73	II (24/73), III (39/73), IV (10/73)	THD
Rubbini and Tartari	2015	106	III (71/106), IV (35/106)	THD + Mucopexy
Ratto <i>et al.</i>	2015	803	II (137/803), III (548/803), IV (118/803)	THD + Mucopexy
LaBella <i>et al.</i>	2015	106	II (4/106), III (69/106), IV (33/106)	THD + Mucopexy (98/106) THD (8/106)
Loganathan <i>et al.</i>	2016	85	III (73/85), IV (12/85)	THD
Atallah <i>et al.</i>	2016	106	I (15/106), II (52/106), III (37/106), IV (2/106)	THD + Mucopexy
Bjelanovic <i>et al.</i>	2016	402	II (16/402), III (210/402), IV (176/402)	THD + Mucopexy
Ain <i>et al.</i>	2018	256		THD + Mucopexy
Genova <i>et al.</i>	2019	89	III (52/89), IV (37/89)	THD
Verre <i>et al.</i>	2022	75	II (25/75), III (40/75), IV (10/75)	THD + Mucopexy

III–IV haemorrhoids but reported an elevated rate of postoperative complications, including severe postoperative pain (16%), postoperative bleeding (7%), constipation (7%), local sepsis (6%), anal fissure (5%), temporary incontinence (2%), and recurrence (19%) [16]. Giordano *et al.* recommend THD for managing grade IV haemorrhoids but note increased postoperative pain on the first day (71%) and even on the seventh day (61%), with 16% of all patients experiencing severe pain [17]. A study by Kjaer *et al.* presented disappointing results for THD in managing grade IV haemorrhoids, suggesting Milligan-Morgan haemorrhoidectomy as a more appropriate option with limited recurrence rates [18].

Conversely, our study supports the idea that THD can achieve a low rate of serious postoperative complications and recurrence, even in grade IV haemorrhoids. This suggests the importance of substantial knowledge and training in the technique. Moreover, despite excluding anticoagulant therapy in our study, the current liter-

ature suggests that THD could be a promising surgical option for grade IV haemorrhoids, even in patients under anticoagulant therapy. A study by Atallah *et al.* supports the notion that there is no significant difference in bleeding rates between patients on anticoagulants and those with interrupted therapy [19].

The literature reports a haemorrhoidal recurrence rate after transanal hemorrhoidal dearterialisation (THD) of approximately 17.5%, ranging widely from 3% to 60%, a variation attributed to study heterogeneity [20]. LaBella *et al.* observed a one-year prolapse recurrence rate of 10.3% in patients with grade III and IV haemorrhoids, despite 98 out of 106 patients undergoing mucopexy [21]. In a study by Lucarelli *et al.*, a comparison of long-term recurrence rates after THD-mucopexy versus stapler haemorrhoidopexy in 55 patients with grade IV haemorrhoids revealed a recurrence rate of 28.6% after THD and 11.1% after stapler haemorrhoidopexy [22].

The conclusion drawn is that the risk of recurrence is higher for grade IV haemorrhoids, regardless of the technique employed, compared to grade III haemorrhoids [23]. In a randomised controlled trial by Genova *et al.* comparing the effectiveness of transanal hemorrhoidal dearterialisation (THD) and the Milligan-Morgan (MM) technique in grade IV haemorrhoids, a 3-year follow-up revealed an increased recurrence rate (approximately 15%) in the THD group ($n = 18$) compared to the MM technique group ($n = 19$) [24]. Additionally, in a larger observational prospective study by Bjelanovic *et al.*, where THD with mucopexy was performed in patients with grade II, III, and IV haemorrhoids, grade IV haemorrhoid patients ($n = 176$) experienced a recurrence rate of about 9.7% (17 out of the total sample of 176) during a 1-year follow-up, despite low rates of postoperative complications [25].

In a 2018 prospective study, a higher recurrence rate of approximately 16% was reported in patients with advanced grade IV haemorrhoids within a short follow-up of 6 weeks [26]. An Italian study, with a limited study group consisting of non-ischemic and non-fibrotic grade IV haemorrhoids ($n = 10$), reported a 0% recurrence rate after performing transanal hemorrhoidal dearterialisation (THD) with mucopexy during a 6-month follow-up [27]. In our relatively small sample, after a one-year follow-up, the recurrence rate was 2.7%, involving a solitary haemorrhoidal pile, possibly attributed to ineffective mucopexy in a patient with extensive disease. Additionally, Giuliani *et al.* discovered that the utilisation of new devices and haemorrhoidal artery ligation during excisional haemorrhoidectomy significantly reduced complications compared to traditional monopolar diathermy [28, 29].

The management of advanced haemorrhoids with THD may face challenges due to excessive tissue prolapse or post-inflammatory fibrosis. Combining mucopexy with THD has proven to be effective in lifting and fixing haemorrhoids, presenting a promising new combination of surgical techniques. In the THD-mucopexy method, dearterialisation and tissue lifting are simultaneously performed. Dearterialisation, guided by Doppler, significantly reduces arterial blood flow to haemorrhoidal tissue, while mucopexy aids in repositioning prolapsed tissue. The original technique involves using a 2.0 suture, mounted on a 5/8 or 3/8, depending on the size of the haemorrhoids and any associated mucosal rectal prolapse. Mucopexy selectively sutures only the prolapsing segment of mucosa and submucosa, minimising the risk of including a large segment of the sphincter. This approach reduces the likelihood of postoperative sphincter damage and anal stenosis [17, 20].

Frequent complications following mucopexy include pain and tenesmus, which can be mitigated with an-

ti-inflammatory drugs and analgesics. Studies by Faucheron *et al.* and Lucarelli *et al.* assert that no severe septic complications were observed after transanal hemorrhoidal dearterialisation (THD) with mucopexy, even in patients with grade IV haemorrhoids. This combined procedure enhances the effectiveness of THD in managing advanced haemorrhoids [22, 23]. While there is limited research on outcomes after combining THD with mucopexy, studies on THD without mucopexy for advanced disease estimate a haemorrhoidal recurrence rate of about 50%, whereas the addition of mucopexy reduces it to 11% [17]. Our study provides supporting evidence for the efficacy of this surgical combination, even in the treatment of grade IV haemorrhoids.

Haemorrhoid artery embolisation stands as an innovative and promising treatment option for haemorrhoids, offering a minimally invasive approach with potential benefits for patients seeking alternatives to traditional surgical interventions. The available literature on endovascular embolisation for haemorrhoidal disease (HD) is limited, comprising 7 studies with less than 230 cases. These studies, mainly from French Departments, show technical success rates between 90% and 100%, indicating the procedure's low complexity compared to other embolic techniques like prostatic artery embolisation. Safety is upheld, with no major complications reported, even when using tris-acryl gelatin particles (TAGp). Clinical outcomes, assessed through varied scales, report success rates from 63% to 97%. Endovascular embolisation shows promise, especially for patients unsuitable for traditional or minimally invasive surgical interventions due to comorbidities or local pathologies [30–34].

The study is subject to significant limitations, such as a relatively small sample size, data gathered from a single centre, and uneven gender distribution in the study groups. In addition, the study includes patients who underwent operation during the study period (October 2011 to October 2014). However, the research maintained a comprehensive patient follow-up over the long term. It is crucial to recognise the necessity for further research to strengthen the findings and establish transanal hemorrhoidal dearterialization with mucopexy (THD-mucopexy) as the preferred surgical approach for grade IV haemorrhoids.

Conclusions

THD is acknowledged as a minimally invasive approach for surgical management in patients with grade II–III haemorrhoids. Although limited literature evidence exists, our study provides support for considering THD-mucopexy as a safe and effective surgical option, even for patients with grade IV haemorrhoids. The no-

table efficacy of this combined method probably stems from precise arterial ligation guided by Doppler and the tissue lifting effect facilitated by mucopexy. However, in cases of excessive tissue fibrosis and prolapse, combining it with the Milligan-Morgan procedure, utilising advanced energy sources, is recommended. It is essential to note that while THD-mucopexy has a relatively low learning curve, its effectiveness and safety rely on the surgeon's substantial experience and training before application in grade IV haemorrhoid cases.

Conflict of interest

The authors declare no conflict of interest.

References

- Wallis de Vries BM, Van der Beek ESJ, de Wijkerslooth LRH, et al. Treatment of grade 2 and 3 hemorrhoids with Doppler-guided hemorrhoidal artery ligation. *Dig Surg* 2007; 24: 436-40.
- Scheyer M, Antonietti E, Rollinger G, et al. Doppler-guided hemorrhoidal artery ligation. *Am J Surg* 2006; 191: 89-93.
- Faucheron JL, Gangner Y. Doppler-guided hemorrhoidal artery ligation for the treatment of symptomatic hemorrhoids: early and three-year follow-up results in 100 consecutive patients. *ASCRS* 2008; 51: 945-9.
- Dal Monte PP, Tagariello C, Giordano P, et al. Transanal hemorrhoidal dearterialisation: nonexcisional surgery for the treatment of hemorrhoidal disease. *Tech Coloproctol* 2007; 11: 333-9.
- Wilkerson PM, Strbac M, Reece-Smith H, Middleton SB. Doppler-guided haemorrhoidal artery ligation: long-term outcome and patient satisfaction. *Colorectal Dis* 2009; 11: 394-400.
- Sohn N, Aronoff JS, Cohen FS, Weinstein MA. Transanal hemorrhoidal dearterialization is an alternative to operative hemorrhoidectomy. *Am J Surg* 2001; 182: 515-9.
- Ratto C. THD Doppler procedure for hemorrhoids: the surgical technique. *Tech Coloproctol* 2014; 18: 291-8.
- Mulita F, Verras GI, Iliopoulos F, et al. Analgesic effect of paracetamol monotherapy vs. the combination of paracetamol/parecoxib vs. the combination of pethidine/paracetamol in patients undergoing thyroidectomy. *Prz Menopauz* 2021; 20: 226-30.
- Mulita F, Parchas N, Solou K, et al. Postoperative pain scores after open inguinal hernia repair: comparison of three postoperative analgesic regimens. *Med Arch* 2020; 74: 355-8.
- Mulita F, Karpetas G, Liolis E, et al. Comparison of analgesic efficacy of acetaminophen monotherapy versus acetaminophen combinations with either pethidine or parecoxib in patients undergoing laparoscopic cholecystectomy: a randomized prospective study. *Med Glas (Zenica)* 2021; 18: 27-32.
- Verras GI, Mulita F, Theofanis G, et al. A combined method for the treatment of grade IV internal haemorrhoidal disease. *Gastroenterology Rev* 2023; 18: 123-4.
- Ratto C, Giordano P, Donisi L, et al. Transanal haemorrhoidal dearterialization (THD) for selected fourth-degree hemorrhoids. *Tech Coloproctol* 2011; 15: 191-7.
- Theodoropoulos GE, Sevrisianos N, Papaconstantinou J, et al. Doppler-guided haemorrhoidal artery ligation (DGHAL), rectoanal repair (RAR), sutured haemorrhoidopexy (SHP), and minimal mucocutaneous excision (MMCE) for grade III-IV haemorrhoids: a multicenter prospective study of safety and efficacy. *Colorectal Dis* 2010; 12: 125-34.
- Dursun A, Tuncer GK, Tuncer K, et al. Effectiveness of laser hemorrhoidoplasty in the treatment of hemorrhoidal disease. *Cir Cir* 2023; 91: 179-85.
- Simillis C, Thoukididou SN, Slesser AA, et al. Systematic review and network meta-analysis comparing clinical outcomes and effectiveness of surgical treatments for haemorrhoids. *Br J Surg* 2015; 102: 1603-18.
- Loganathan A, Das A, Luck A, Hewett P. Transanal haemorrhoidal dearterialization for the treatment of grade III and IV haemorrhoids: a 3-year experience. *ANZ J Surg* 2016; 86: 59-62.
- Giordano P, Tomasi I, Pascariello A, et al. Transanal dearterialization with targeted mucopexy is effective for advanced haemorrhoids. *Colorec Dis* 2014; 16: 373-6.
- Kjær S, Lund HH, Schulze S, Bisgaard T. Limited success in patients treated with transanal haemorrhoidal dearterialisation. *Dan Med J* 2014; 61: A4971.
- Atallah S, Maharaja GK, Martin-Perez B, et al. Transanal hemorrhoidal dearterialization (THD): a safe procedure for the anticoagulated patient? *Tech Coloproctol* 2016; 20: 461-6.
- Ratto C, de Parades V. Doppler-guided ligation of hemorrhoidal arteries with mucopexy: a technique for the future. *J Visc Surg* 2015; 152: 15-21.
- LaBella GD, Main WPL, Hussain LR. Evaluation of transanal hemorrhoidal dearterialization: a single surgeon experience. *Tech Coloproctol* 2015; 19: 153-7.
- Lucaelli P, Picchio M, Caporossi M, et al. Transanal haemorrhoidal dearterialisation with mucopexy versus stapler haemorrhoidopexy: a randomised trial with long-term follow-up. *Ann R Coll Surg Engl* 2013; 95: 246-51.
- Faucheron JL, Poncet G, Voirin D, et al. Doppler-guided hemorrhoidal artery ligation and rectoanal repair (HAL-RAR) for the treatment of grade IV hemorrhoids: long-term results in 100 consecutive patients. *Dis Colon Rectum* 2011; 54: 226-31.
- Genova P, Damiano G, Lo Monte AI, Genova G. Transanal hemorrhoidal dearterialization versus Milligan-Morgan hemorrhoidectomy in grade III/IV hemorrhoids. *Ann Ital Chir* 2019; 90: 145-51.
- Bjelanovic Z, Draskovic M, Veljovic M, et al. Transanal hemorrhoid dearterialization is a safe and effective outpatient procedure for the treatment of hemorrhoidal disease. *Cir Esp* 2016; 94: 588-94.
- Ain QU, Bashir Y, Eguare E. Evaluation of the effectiveness and patients' contentment with transanal haemorrhoidal artery dearterialisation and mucopexy (THD) for treatment of haemorrhoidal disease: a 6-year study. *Ir J Med Sci* 2018; 187: 647-55.
- Verre L, Gallo G, Grassi G, et al. Transanal hemorrhoidal dearterialization (THD) for hemorrhoidal disease: an Italian single-institution 5-year experience analysis and updated literature review. *Front Surg* 2022; 9: 1088546.

28. Giuliani A, Romano L, Necozone S, et al. Excisional hemorrhoidectomy versus dearterialization with mucopexy for the treatment of grade III hemorrhoidal disease: the EMODART3 Multicenter Study. *Dis Colon Rectum* 2023; 66: e1254-63.
29. Trenti L, Biondo S, Espin-Basany E, et al. Transanal hemorrhoidal dearterialization with mucopexy versus vessel-sealing device hemorrhoidectomy for grade III to IV hemorrhoids: long-term outcomes from the THDLIGA randomized controlled trial. *Dis Colon Rectum* 2023; 66: e818-25.
30. Tradi F, Louis G, Giorgi R, et al. Embolization of the superior rectal arteries for hemorrhoidal disease: prospective results in 25 patients. *J Vasc Interv Radiol* 2018; 29: 884-92.
31. Giurazza F, Corvino F, Cavaglià E, et al. Emborrhoid in patients with portal hypertension and chronic hemorrhoidal bleeding: preliminary results in five cases with a new coiling release fashion "spaghetti technique. *Radiol Med* 2020; 125: 1008-11.
32. El Tawab KA, Salem AA, Khafagy R. New technique of embolization of the hemorrhoidal arteries using embolization particles alone: retrospective results in 33 patients. *Arab J Interv Radiol* 2020; 4: 27-31.
33. Küçükay MB, Küçükay F. Superior rectal artery embolization with tri-acryl-gelatin particles: a randomized comparison of particle size. *J Vasc Interv Radiol* 2021; 10: 3537.
34. Moussa N, Bonnet B, Pereira H, et al. Mid-term results of superior rectal artery and coils for hemorrhoidal embolization with particles bleeding. *Cardiovasc Interv Radiol* 2020; 43: 1062-9.

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