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Bipolar vaporization of hemorrhoidal nodes in stage III chronic hemorrhoids: a single-centre comparative study involving laser hemorrhoidoplasty, transanal dearterialization, and Longo surgery

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Objective – to compare the effectiveness and safety of bipolar vaporization (BPV) of hemorrhoidal nodes with laser hemorrhoidoplasty (LHP), transanal dearterialization (THD), and stapled hemorrhoidopexy (Longo surgery) in patients diagnosed with stage III chronic hemorrhoids.

Materials and methods. A single-centre, prospective, comparative study was conducted involving 63 patients (35 women and 28 men) with symptomatic stage III chronic hemorrhoids treated between 2021 and 2024. The mean age was 45.3 ± 11.1 years, the mean body mass index was 26.8 kg/m^2, and the mean disease duration was 10.3 ± 6.7 years. Patients were allocated to four groups based on the treatment method: BPV (n = 18, 28.6 %), LHP (n = 15, 23.8 %), THD (n = 16, 25.4 %), and Longo surgery (n = 14, 22.2 %). Bipolar vaporization was performed according to the author's method using the biowelding generator EK-300M (Svarmed, Ukraine) with multi-cycle vaporization of the node. Outcomes assessed included symptoms, complications, recurrences, patient satisfaction, duration of surgery, and length of hospital stay.

Results. The mean duration of surgery was 45.2 ± 6.3 minutes in the BPV group, 44.5 ± 7.5 minutes in the LHP group, 43.4 ± 6.2 minutes in the THD group, and 41.1 ± 4.9 minutes in the Longo surgery group ($p > 0.05$). Blood loss ranged from 10.4 to 16.4 ml across all groups ($p > 0.05$). The incidence of submucosal hematomas did not exceed 35 % in any group. All techniques resulted in a significant reduction in hemorrhoid symptoms postoperatively ($p < 0.05$ within groups). At one year post-surgery, recurrence rates were 5.6 % for BPV, 6.7 % for LHP, 18.8 % for THD, and 21.4 % for Longo surgery ($p = 0.422$). Patient satisfaction scores at 12 months ranged from 7.7 to 8.1 points.

Conclusions. Bipolar vaporization demonstrates effectiveness comparable to other minimally invasive techniques for the treatment of grade III chronic hemorrhoids, with minimal trauma and a short postoperative recovery period. The method is cost-effective due to the use of reusable electrodes. Bipolar vaporization is recommended for broader adoption in proctological practice, particularly in resource-limited settings.

Keywords
stage III hemorrhoids, bipolar vaporization, laser hemorrhoidoplasty, THD, Longo surgery, minimally invasive proctology.

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Stage III chronic hemorrhoids (CH) are among the most frequent reasons for referral to a coloproctologist, accounting for approximately 40 % of all proctological pathologies [20, 25].

For most patients with stage III disease, conservative therapy is ineffective, while traditional hemorrhoidectomy is associated with significant trauma [26, 27]. Consequently, minimally invasive technologies have been developed to eliminate pathologically altered hemorrhoidal nodes with minimal tissue damage and to facilitate rapid patient recovery.

Current treatment modalities include laser hemorrhoidoplasty (LHP) [14, 18], transanal dearterialization (THD/HAL-RAR) [11, 16, 19], stapled

hemorrhoidopexy (Longo surgery) [23, 26], and other energy-based methods such as ultrasonic or radiofrequency coagulation [9]. However, the majority of these techniques require costly equipment or disposable instruments, limiting their accessibility in middle-income countries.

Currently, there are no well-substantiated recommendations for selecting optimal treatment strategies for patients with stage III hemorrhoids. The international Delphi consensus highlights the necessity for a unified outcome assessment system but does not specify the superiority of any particular technique [30].

Systematic reviews further indicate that none of the existing procedures, including transanal dearterialization, stapled hemorrhoidopexy, or laser coagulation, demonstrate a definitive advantage regarding effectiveness, safety, or recurrence rates for stage III hemorrhoids [7, 13]. As a result, the selection of treatment methods in clinical practice is often influenced not only by clinical indications but also by the clinic's technical resources, equipment costs, and surgeon experience.

Bipolar vaporization of hemorrhoidal nodes (BPV), developed by a Ukrainian research group, represents a novel approach that offers ease of implementation, low cost, and consistent morphological outcomes [1, 2]. In contrast to laser technology, BPV utilizes reusable electrodes and a tissue biowelding generator, EK-300M (Svarmed, Ukraine), which produces a controlled zone of coagulation necrosis without carbonization [2]. Morphometric analyses have demonstrated that the necrosis zone following a single vaporization cycle is ellipsoidal, measuring approximately 3.9 mm in length, ensuring predictable depth and uniformity of thermal exposure [1].

Objective – to compare the effectiveness and safety of bipolar vaporization (BPV) of hemorrhoidal nodes with laser hemorrhoidoplasty (LHP), transanal dearterialization (THD), and stapled hemorrhoidopexy (Longo surgery) in patients diagnosed with stage III chronic hemorrhoids.

Materials and methods

The study cohort comprised 63 patients diagnosed with stage III chronic hemorrhoids, including 35 women (55.6 %) and 28 men (44.4 %), aged 28 to 71 years (mean age 45.3 ± 11.1 years), who received treatment between 2021 and 2024. The mean body mass index (BMI) was 26.8 kg/m^2 (range: 19.8 to 37.0 kg/m^2). The mean duration of the disease was 10.3 ± 6.7 years (range: 2 to 40 years).

The primary indications for surgical intervention, in addition to hemorrhoidal prolapse, were persistent bleeding from the nodes of varying intensity in 59 patients (93.7 %), perineal pain in 51 (81.0 %), hemorrhoidal thrombosis in 30 (47.6 %), anal canal itching in 33 (52.4 %), and soiling in the perianal area in 27 (42.9 %).

Patients were allocated to four treatment groups based on the intervention received: bipolar vaporization (BPV) using the original method (18 patients, 28.6 %), laser hemorrhoidoplasty (LHP; 15 patients, 23.8 %), transanal hemorrhoidal dearterialization (THD; 16 patients, 25.4 %), and stapled hemorrhoidopexy (Longo surgery; 14 patients, 22.2 %).

Bipolar vaporization was performed using the biowelding generator EK-300M. The technique for introducing a bipolar electrode into the hemorrhoidal node is described in detail for the treatment of stage I–II hemorrhoids [2]. Our previous studies have demonstrated that the necrosis zone after a single intratissue BPV is consistently ellipsoidal, with a characteristic thickening in the middle and an average length of approximately 3.93 mm [1]. Because stage III hemorrhoidal nodes exceed the length of a single vaporization zone, a **sequential multi-cycle technique** was employed. The electrode was introduced 2 mm below the proximal apex of the node for the initial vaporization cycle. It was then withdrawn 4 mm distally, and the procedure was repeated until the node was completely destroyed.

Laser hemorrhoidoplasty was performed according to a standard protocol [31] using a diode laser with a wavelength of 980–1470 nm. A laser fibre probe was introduced into the lumen of the hemorrhoidal node to achieve sequential coagulation of the cavernous tissue. This technique results in reduced node size and decreased blood supply due to thermal exposure.

Transanal hemorrhoidal dearterialization (THD/HAL-RAR) was performed using a proctoscope equipped with a Doppler sensor to identify branches of the superior rectal artery, which were then stitched and ligated. In cases of severe prolapse, mucopexy was also performed. The procedure followed the widely accepted technique described by P. Dal Monte et al. [5].

Stapled hemorrhoidopexy (Longo surgery, PPH machine) was performed using a standard circular stapler. A purse-string suture was applied 2–4 cm above the dentate line, followed by resection of a circular strip of mucosa and simultaneous suturing, in accordance with the classic Longo description [17, 23].

Inclusion criteria comprised symptomatic stage III chronic hemorrhoids according to the Hollinger classification [4, 8], age ≥ 18 years, absence of severe concomitant pathology (ASA 4), and provision of written informed consent for surgical treatment and outpatient monitoring during the postoperative period.

Exclusion criteria included a history of infectious or undifferentiated colitis within six months prior to screening, malignant neoplasms of the rectum and anal canal, inflammatory diseases of the rectum, exacerbation of chronic gastroenterological diseases (such as pancreatitis, cholecystitis, hepatitis, gastritis, or colitis), logistical issues such as failure to appear for examination within established deadlines, and non-compliance with the diagnostic and treatment plan.

Treatment effectiveness was evaluated using the indicators recommended for hemorrhoidal disease in the international Delphi study [30] (Table 1).

Statistical analysis was conducted using IBM SPSS Statistics v. 22.0.

Comparisons between two independent samples were performed using the Student t-test for normally distributed data or the Mann–Whitney U-test for non-normally distributed data. For two dependent samples, either the paired t-test or the Wilcoxon signed-rank test was applied. Quantitative indicators across more than two groups were analysed using analysis of variance (ANOVA) with a post hoc Bonferroni correction. Qualitative indicators were compared using the χ^2-test or Fisher's exact test. Mean values are presented as M ± SD, and relative values as n (%).

The null hypothesis was rejected at $p < 0.05$.

The study was conducted in accordance with the principles of the Declaration of Helsinki (2013) and was approved by the local ethics committee (No. 21-E/2021, dated 12/15/2021).

Results

Baseline patient characteristics across the study groups were comparable. No statistically significant differences were observed between the groups regarding age, sex, BMI, disease duration, frequency of thrombosis in the anamnesis, or severity of hemorrhoid symptoms (all $p > 0.05$). These findings indicate that the samples were homogeneous with respect to initial parameters (Table 2).

Analysis of the primary intraoperative and postoperative indicators revealed specific characteristics associated with each method (Table 3).

A comparison of the primary intraoperative and postoperative indicators revealed no statistically significant differences across any of the parameters studied.

The average surgical intervention duration ranged from 41 to 45 minutes, with no significant differences between the groups. This finding suggests comparable technical complexity and procedure duration for all techniques performed by a standardized surgical team. Intraoperative blood loss was minimal (10–16 ml) and did not differ significantly between the groups, further supporting the low-traumatic nature of all interventions.

The incidence of submucosal hematomas ranged from 22.2 % to 35.7 % across the groups. However, this difference was not statistically significant ($p = 0.852$). This result may be attributed to the small sample size and the limited clinical significance of these complications. Postoperative pain, as measured by the average ketorolac doses administered during the first three days, also did not differ between groups (all $p > 0.05$), indicating comparable postoperative comfort regardless of the technique used.

The hospital stay (2.8–3.3 days) and temporary disability (5.4–5.9 days) were similar across all groups, reflecting a rapid recovery after minimally invasive interventions.

All techniques (BPV, LHP, THD, and Longo surgery) produced comparable outcomes regarding key intraoperative and postoperative parameters,

Table 1. **Criteria for evaluating the effectiveness of treatment**

Endpoints	Indicators	Assessment method	Time frame
Primary Symptoms of hemorrhoids	Pain, prolapse, itching, soiling, bleeding	Scale 0–9 points; frequency (%)	Basic level, 7 days, 6 months, 1 year
Secondary Complications	Incontinence	Wexner scale [19]	1 year
	Abscess, anal stenosis	Physical examination	7 days (abscess), 1 year (stenosis)
	Urinary retention	Ultrasound	7 days
	Fistula	MRI in case of questionable clinical data	1 year
Patient satisfaction	Subjective patient assessment	Scale 0–9 points	Basic level, 7 days, 6 months, 1 year
Recurrence	Recurrence of symptoms	Patient complaints	6 months, one year

Table 2. **Baseline characteristics of patients with stage I–II chronic hemorrhoids**

Parameter	BPV (n = 18)	LHP (n = 15)	THD (n = 16)	Longo surgery (n = 14)	Total (n = 63)
Age, years	46.5 ± 12.5	51.0 ± 11.9	42.9 ± 9.1	40.5 ± 8.0	45.3 ± 11.1
Males Females	19 (59.4 %) 13 (40.6 %)	11 (54.4 %) 10 (47.6 %)	23 (54.8 %) 19 (45.2 %)	14 (60.9 %) 9 (39.1 %)	28 (44.4 %) 35 (55.6 %)
BMI, kg/m^2	27.5 ± 3.8	27.5 ± 3.3	28.1 ± 4.1	24.5 ± 4.3	27.0 ± 4.1
Disease duration, years	9.5 ± 8.9	12.7 ± 6.2	9.2 ± 4.8	10.1 ± 6.0	10.3 ± 6.7
Deep venous thrombosis in the anamnesis	8 (44.4 %)	8 (53.3 %)	7 (43.8 %)	7 (50.0 %)	30 (47.6 %)
Hemorrhoid Symptoms					
Pain	15 (83.3 %)	12 (80.0 %)	13 (81.3 %)	11 (78.6 %)	51 (81.0 %)
points	3.5 ± 1.2	3.3 ± 1.0	3.7 ± 1.8	3.8 ± 1.7	3.5 ± 1.4
Prolapse	18 (100 %)	15 (100 %)	16 (100 %)	14 (100 %)	63 (100 %)
Itching	9 (50.0 %)	8 (53.3 %)	9 (56.3 %)	7 (30.4 %)	33 (52.4 %)
points	6.2 ± 1.5	5.0 ± 1.0	6.1 ± 1.8	5.8 ± 3.2	5.8 ± 1.7
Soiling	8 (44.4 %)	7 (46.7 %)	6 (37.5 %)	6 (42.9 %)	27 (42.9 %)
points	4.1 ± 1.0	3.7 ± 1.1	4.6 ± 1.6	4.0 ± 0.8	4.1 ± 1.2
Bleeding	18 (100 %)	14 (93.3 %)	14(87.5 %)	13 (92.9 %)	59 (93.7 %)
points	5.2 ± 0.3	5.1 ± 0.4	5.4 ± 0.7	5.4 ± 0.4	5.3 ± 0.6

Note. Categorical variables are presented as the number of cases and percentage, while quantitative indicators are presented as M ± SD. The average scores were determined based on the number of patients exhibiting the corresponding symptoms. Across all baseline parameters, there were no statistically significant differences between the study groups (all $p > 0.05$).

Table 3. **Comparison of the main intraoperative and postoperative outcomes in patients with stage III chronic hemorrhoids by surgical technique**

Parameter	BPV (n = 18)	LHP (n = 15)	THD (n = 16)	Longo surgery (n = 14)	p
Duration of surgery, min	45.2 ± 6.3	44.5 ± 7.5	43.4 ± 6.2	41.1 ± 4.9	> 0.05
Intraoperative blood loss, ml	10.4 ± 4.2	10.9 ± 4.2	16.4 ± 4.5	13.9 ± 5.3	> 0.05
Frequency of submucosal hematomas	4 (22.2 %)	4 (26.4 %)	5 (31.3 %)	5 (35.7 %)	0.852
Average doses of ketorolac					
Day 1	2.9 ± 0.7	2.7 ± 0.7	2.8 ± 0.8	3.0 ± 0.7	> 0.05
Day 2	2.0 ± 0.5	2.0 ± 0.4	2.4 ± 0.5	2.0 ± 0.1	> 0.05
Day 3	0.9 ± 0.3	0.7 ± 0.6	0.9 ± 0.6	0.8 ± 0.8	> 0.05
Average length of hospital stay, day	2.8 ± 0.7	2.9 ± 0.7	3.2 ± 0.7	3.3 ± 0.9	> 0.05
Average duration of disability, days	5.4 ± 0.8	5.7 ± 0.7	5.9 ± 0.9	5.8 ± 1.6	> 0.05

Note. Categorical variables are presented as the number of cases and percentage, while quantitative indicators are presented as M ± SD. p-value is based on ANOVA results, or χ^2-test.

supporting their safety and effectiveness for treating stage III chronic hemorrhoids.

A comparative analysis of the dynamics within the «Hemorrhoid symptoms» cluster identified distinct characteristics among the groups (Table 4).

A comparative analysis of the progression of primary clinical symptoms (pain, prolapse, itching, soiling, and bleeding) in patients with stage III chronic hemorrhoids revealed no statistically significant differences between treatment groups at any observation point ($p > 0.05$ according to χ^2 or Fisher's exact test).

Pain syndrome. Prior to surgery, 78–83 % of patients reported pain across all treatment groups. One week post-intervention, the incidence of pain decreased by more than twice in all groups (44–63 %), and the mean visual analogue scale score ranged from 1.25 to 1.80, with no significant differences between methods. At 6 and 12 months postoperatively, pain frequency remained low, not exceeding 15–20 %, indicating a sustained long-term effect irrespective of the surgical technique.

Prolapse of nodes. Complete resolution of prolapse occurred in all patients within the first

Table 4. **Postoperative dynamics within the «Hemorrhoid symptoms» cluster**

Parameter	BPV (n = 18)	LHP (n = 15)	THD (n = 16)	Longo surgery (n = 14)	p
Pain					
Before surgery	83.3 %	80.0 %	81.3 %	78.6 %	0,988
7 days	8 (44.4 %)	7 (46.7 %)	10 (62.5 %)	8 (57.1 %)	0,697
6 months	1 (5.6 %)	2 (13.3 %)	2 (12.5 %)	2 (14.3 %)	0.847
12 months	1 (5.6 %)	2 (13.3 %)	3 (18.8 %)	3 (21.4 %)	0.578
Prolapse					
Before surgery	100 %	100 %	100 %	100 %	1
7 days	0	0	0	0	1
6 months	0	0	6.3 %	7.1 %	0.736
12 months	11.1 %	13.3 %	18.8 %	21.4 %	0.849
Itching					
Before surgery	9 (50,0 %)	8 (53.3 %)	9 (56.3 %)	7 (30.4 %)	0.964
7 days	27.8 %	33.3 %	25.0 %	28.6 %	0.965
6 months	11.1 %	20.0	18.8 %	21.4 %	0.863
12 months	16.7 %	20.0 %	18.8 %	21.4 %	0.988
Soiling					
Before surgery	8 (44,4 %)	7 (46.7 %)	6 (37.5 %)	6 (42.9 %)	0.985
7 days	50,0 %	60.0 %	56.3 %	42.9 %	0.802
6 months	16.7 %	20.0 %	18.8 %	21.4 %	0.988
12 months	16.7 %	20.0 %	18.8 %	21.4 %	0.988
Bleeding					
Before surgery	18 (100 %)	14 (93.3 %)	14(87.5 %)	13 (92.9 %)	0.094
7 days	0	6.7 %	12.5 %	7.1 %	0.521
6 months	5.6 %	13.3 %	6.3 %	7.1 %	0.847
12 months	11.1 %	13.3 %	12.5 %	14.3 %	0.994

Note. p between the groups – according to the results of χ^2 or Fisher's exact test.

postoperative week. Isolated recurrences (6–21 %) were observed at 12 months, primarily following THD and Longo surgery, but these differences were not statistically significant. These findings support the comparable effectiveness of all four methods in correcting prolapse.

Itching and soiling. The incidence of anal itching and soiling declined progressively over the year in all groups, with no significant differences between groups ($p > 0.8$). In most patients, these symptoms either resolved or were minimal, indicating improved quality of life following minimally invasive interventions.

Rectal bleeding. Prior to surgery, bleeding was the predominant symptom in 88–100 % of patients. One week postoperatively, bleeding either resolved completely or persisted only in isolated cases (up to 12 %). At 6–12 months, the incidence of bleeding remained low (6–14 %) and did not differ significantly between methods, demonstrating reliable hemostasis across all intervention types.

In summary, all evaluated methods (BPV, LHP, THD, and Longo surgery) demonstrated comparable clinical effectiveness in resolving the primary symptoms of chronic hemorrhoids during both early and late postoperative periods. Therefore, selection of a specific technique may be guided primarily by the clinic's technical resources, cost considerations, and patient-specific factors.

The mean values of the «Satisfaction» cluster score also did not differ significantly between groups at any time point during the study (Table 5).

A comparison of the mean «Satisfaction» cluster scores over time shows that all four surgical methods for treating stage III chronic hemorrhoids achieve high levels of postoperative comfort and patient satisfaction.

Seven days following the intervention, the mean satisfaction scores ranged from 6.3 to 7.1, with no statistically significant differences between groups ($p > 0.05$). The highest scores were observed in the BPV and LHP groups, potentially attributable to reduced postoperative pain and more rapid resumption of daily activities.

At six months postoperatively, all groups showed a further increase in satisfaction scores (7.3–8.1), reflecting sustained positive functional outcomes and reduced recurrent symptoms. Nevertheless, no statistically significant differences were observed between the surgical methods ($p > 0.05$), indicating comparable long-term effectiveness.

At twelve months, the mean satisfaction scores decreased slightly (to 6.7–7.7), possibly reflecting partial recurrence of minor symptoms or individual variation in outcome perception. Despite this, satisfaction levels remained high in all groups, consistently exceeding 6 points.

In summary, irrespective of the surgical method employed, most patients rated their treatment outcomes as good or very good. The lack of statistically significant differences between groups suggests that all four methods are comparable in terms of clinical and subjective effectiveness in managing stage III chronic hemorrhoids.

Analysis of hemorrhoid recurrence rates in the long-term postoperative period revealed that, at six months post-treatment, symptom recurrence occurred only in isolated cases (6.3–7.1 %) following LHP, THD, and Longo surgery, with no recurrences observed after BPV. No statistically significant differences were identified between groups ($p = 0.736$), indicating comparable effectiveness among the methods during the early follow-up period (Table 6).

One year following the intervention, all groups exhibited a modest increase in recurrence rates. The lowest recurrence rates were observed in the BPV (5.6 %) and LHP (6.7 %) groups, whereas higher rates were reported in the THD (18.8 %) and Longo surgery (21.4 %) groups. However, these differences did not reach statistical significance ($p = 0.422$).

All studied methods demonstrated sustained effectiveness over one year. However, vaporization technologies, including bipolar and laser methods, were associated with a trend toward lower recurrence frequency. This outcome may result from more uniform coagulation of the hemorrhoidal plexus

Table 5. **Average values for the «Satisfaction» cluster by group across assessment dates**

Period	BPV (n = 18)	LHP (n = 15)	THD (n = 16)	Longo surgery (n = 14)	p
7 days	7.1 ± 0.8 (5–8)	6.9 ± 0.9 (5–8)	6.3 ± 1.6 (4–9)	6.4 ± 1.4 (4–9)	> 0.05
6 months	8.1 ± 1.0 (6–9)	8.0 ± 1.8 (4–10)	7.3 ± 1.5 (4–10)	7.6 ± 1.4 (4–10)	> 0.05
12 months	7.7 ± 1.4 (5–10)	7.5 ± 1.6 (4–10)	6.7 ± 2.1 (3–10)	7.0 ± 0.9 (3–10)	> 0.05

Note. Indicators are presented as M ± SD (min–max).

Table 6. **Distribution of patients within the «Recurrence» cluster during the long-term postoperative period across the study groups**

Period	BPV (n = 18)	LHP (n = 15)	THD (n = 16)	Longo surgery (n = 14)	p
6 months	0	1 (6.7 %)	1 (6.3 %)	1 (7.1 %)	0.736
1 year	1 (5.6 %)	1 (6.7 %)	3 (18.8 %)	3 (21.4 %)	0.422

vessels, which avoids the development of ischemic areas or excessive scarring.

Bipolar and laser vaporization offer effectiveness comparable to other methods, with a tendency toward improved long-term outcomes. These techniques also maintain minimal invasiveness and facilitate a short recovery period.

No complications anticipated within the relevant clinical domain were recorded in any group during the study. However, one patient (7.1 %) experienced urinary retention on the first postoperative day following the Longo procedure.

Discussion

Minimally invasive technologies for the treatment of stage III chronic hemorrhoids represent an optimal balance between therapeutic effectiveness and patient safety [6, 10, 12].

Transanal dearterialization (THD/HAL-RAR), stapled hemorrhoidopexy (Longo surgery), and laser hemorrhoidoplasty (LHP) are among the most widely recognized methods globally. However, despite their technical advancements, these procedures are costly and require disposable instruments, which restricts their widespread adoption in public healthcare settings [6, 7, 29].

THD reduces arterial inflow to the corpora cavernosa but does not remove existing hemorrhoidal nodes. The recurrence rate after one year is reported to be 10–20 % [7, 11].

The Longo procedure provides a good initial effect; however, safety remains the key argument of critics of the technique. A systematic review of 78 studies (14,232 patients) showed a wide range of complications, 3.3–81%, including bleeding, sepsis, stenosis, severe pelvic pain, and 5 fatal cases [22]. According to Ravo B, in 1,107 patients the complication rate was 15 %, including bleeding (4.2 %) [24], which occurs suddenly and requires immediate surgical revision [21].

Laser hemorrhoidoplasty results in minimal tissue trauma but is associated with high procedural costs. Additionally, precise control over the depth of coagulation remains challenging [18, 28].

Bipolar vaporization of hemorrhoids is technically simpler and more cost-effective, enabling localized intratissue necrosis and subsequent reduction of cavernous tissue [1, 2].

Utilization of the EK-300M generator enables the formation of a stable coagulation zone without increasing the risk of mucosal perforation or excessive thermal injury [2].

Morphometric studies have demonstrated that the depth of coagulation can be effectively controlled, thereby preserving intact mucosal areas [1].

The recurrence rate one year after BPV was 5.6 %, which was lower than that observed after THD (18.8 %) and the Longo procedure (21.4 %). However, this difference did not reach statistical significance, likely due to the limited sample size.

Patient satisfaction following BPV was the highest across all follow-up periods. Additionally, the durations of hospital stay and disability were the shortest, at 2.8 and 5.4 days, respectively.

BPV enables targeted treatment of each node, avoids mucosal resection, and is associated with a low risk of bleeding and hematoma formation. The use of reusable electrodes further reduces the overall cost of the intervention.

In contrast to laser coagulation, bipolar energy produces uniform tissue heating and permits multicycle treatment of large nodes in stage III chronic hemorrhoids [1, 2].

The present findings align with previous studies that highlight the effectiveness of intratissue thermocoagulation methods, including radiofrequency, infrared, and bipolar techniques, in reducing complication rates and preserving anal canal anatomy [3, 9, 15].

Despite its positive results, this study has several limitations, including its single-centre design, small sample size, and absence of randomization, which may introduce selection bias. Nevertheless, group homogeneity and the use of a standardized methodology help mitigate these limitations.

Although various minimally invasive approaches are available, there is a lack of conclusive evidence-based recommendations for selecting the optimal treatment for stage III chronic hemorrhoids. The present results support the feasibility of conducting comparative research on BPV and other methods to establish unified clinical protocols.

Conclusions

Bipolar vaporization demonstrates effectiveness comparable to other minimally invasive treatments for stage III chronic hemorrhoids, while offering minimal trauma, a brief postoperative recovery, and reduced costs through the use of reusable electrodes. This technique is suitable for broad adoption in proctological practice, particularly in settings with limited resources.

Declaration of interests

The authors declare no conflict of interest.

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Authors contributions

L. S. Bilianskyi: conception and design, critical revision of the manuscript; I. V. Voloshyn: acquisition, analysis and interpretation of data, statistical analysis, drafting, critical revision of the manuscript.

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Біполярна вапоризація гемороїдальних вузлів при хронічному геморої III стадії: одноцентрове порівняльне дослідження з лазерною вапоризацією, трансанальною деартеріалізацією та операцією Лонго

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Мета — порівняти ефективність та безпечність біполярної вапоризації (БПВ) гемороїдальних вузлів із лазерною вапоризацією (ЛВ), трансанальною деартеріалізацією (THD) та степлерною гемороїдопексією (операцією Лонго) у хворих на хронічний геморой III стадії.

Матеріали та методи. Проведено одноцентрове проспективно-порівняльне дослідження 63 пацієнтів (35 жінок та 28 чоловіків) із симптомним хронічним гемороєм III стадії, пролікованих у 2021—2024 рр. Середній вік пацієнтів становив (45,3 ± 11,1) року, індекс маси тіла — 26,8 кг/м^2, тривалість захворювання — (10,3 ± 6,7) року. Пацієнтів розподілили на чотири групи залежно від методу лікування: БПВ — 18 (28,6 %), ЛВ — 15 (23,8 %), THD — 16 (25,4 %), операція Лонго — 14 (22,2 %). Біполярну вапоризацію виконували за авторською методикою з використанням біозварювального генератора «ЕК-300М» («Свармед», Україна) із багатоцикловою вапоризацією вузла. Оцінювали симптоми, ускладнення, рецидиви, задоволення результатом, тривалість операції та госпіталізації.

Результати. Середня тривалість операції становила (45,2 ± 6,3) хв у групі БПВ, (44,5 ± 7,5) хв у групі ЛВ, (43,4 ± 6,2) хв у групі THD, (41,1 ± 4,9) хв у групі операції Лонго ($p > 0,05$). Крововтрата — 10,4—16,4 мл у всіх групах ($p > 0,05$). Частота підслизових гематом не перевищувала 35 %. Усі методики сприяли значному зниженню симптомів геморою після операції ($p < 0,05$ усередині груп). Через рік після операції рецидиви зареєстровано в 5,6 % пацієнтів після БПВ, у 6,7 % — після ЛВ, у 18,8 % — після THD, у 21,4 % — після операції Лонго ($p = 0,422$). Оцінка задоволеністю результатом через 12 міс становила 7,7—8,1 бала.

Висновки. Біполярна вапоризація забезпечує ефективність, порівнянну з такою при використанні інших малоінвазивних методик лікування хронічного геморою III ст., мінімальну травматичність, короткий післяопераційний період. Цей метод має низьку вартість через можливість застосування багаторазових електродів. Біполярна вапоризація може бути рекомендована для широкого впровадження в проктологічну практику, особливо в умовах обмежених ресурсів.

Ключові слова: геморой III стадії, біполярна вапоризація, лазерна вапоризація, трансанальна деартеріалізація, операція Лонго, малоінвазивна проктологія.

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