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COMPARISON OF OUTCOMES OF MONOPOLAR DIATHERMY VERSUS SUTURED PEDICLE LIGATION IN MILLIGAN MORGAN HEMORRHOIDECTOMY IN THE TERTIARY CARE HOSPITAL OF LAHORE PAKISTAN

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ABSTRACT

Background: Surgical hemorrhoidectomy remains the standard treatment for symptomatic grade III and IV hemorrhoidal disease. Various surgical modifications have been introduced to reduce postoperative pain, bleeding, and other complications.

Objective: To compare the outcomes of pedicle ligation versus monopolar diathermy coagulation during Milligan-Morgan hemorrhoidectomy in patients with third- and fourth-degree hemorrhoids.

Methods: This randomized controlled trial was conducted in Surgical Unit II, Shalamar Institute of Health Sciences, Lahore, from June 21, 2024, to December 20, 2024. A total of 140 patients fulfilling the inclusion criteria were enrolled and randomly allocated into two groups of 70 patients each. Group A underwent pedicle ligation, while Group B underwent monopolar diathermy coagulation. Outcomes included intraoperative blood loss, postoperative pain at 24 hours, urinary retention, and anal stenosis assessed on the 15th postoperative day. Data were analyzed using IBM SPSS Statistics version 25.0. Continuous variables were compared using the independent-samples t-test, while categorical variables were compared using the chi-square test.

Results: In Group A, 44 (62.9%) patients were male and 26 (37.1%) were female, compared with 40 (57.1%) males and 30 (42.9%) females in Group B. The mean age was 41.6 ± 7.6 years in Group A and 42.8 ± 8.2 years in Group B. Mean intraoperative blood loss was significantly higher in the pedicle ligation group than in the diathermy coagulation group (13.34 ± 3.74 mL vs. 9.80 ± 2.88 mL; p=0.001). The mean postoperative pain score at 24 hours was 3.19 ± 1.02 in Group A and 3.26 ± 0.87 in Group B, with no statistically significant difference between the groups (p=0.659).

Conclusions: Monopolar diathermy coagulation during Milligan-Morgan hemorrhoidectomy was associated with significantly lower intraoperative blood loss compared with conventional pedicle ligation, while postoperative pain was comparable between the two techniques. Diathermy coagulation may therefore provide a safe and effective alternative for the surgical management of symptomatic third- and fourth-degree hemorrhoids.

KEYWORDS: pedicle ligation, diathermy coagulation, hemorrhoidectomy, hemorrhoids, Milligan-Morgan Hemorrhoidectomy.

INTRODUCTION

Hemorrhoids are defined as varicose dilatation of haemorrhoidal veins of anus and rectum.[1] Hemorrhoids develop from naturally occurring anal cushions within the lower rectum. Commonly there are three of these cushions and classically described as occupying the 3, 7 and 11 O'clock position.[2] Even in a person with no hemorrhoids, three anal vascular cushions are found at 3, 7 and 11 O'clock positions consisting of redundant rectal mucosa, arterioles, venules and areterio-venular anastomosis.[3] Hemorrhoids can be either internal or external based on their location relative to the dentate line.[4] Hemorrhoids are classified as internal hemorrhoids that arises above the dentate line and external hemorrhoids that arises below the dentate line internal hemorrhoids are further categorized into 1st degree hemorrhoids that confined to anal canal, may bleed but do not prolapse, 2nd degree hemorrhoids that prolapsed on defecation with spontaneous reduction, 3rd degree hemorrhoids may prolapse spontaneously or with defecation and remain persistently outside the anal margin unless digitally reduced, while 4th degree hemorrhoids are irreducible and prolapsed.[5]

Hemorrhoids are a common problem confronted by every practicing surgeon. 1st and 2nd degree hemorrhoids are treated with rubber band ligation or injection sclerotherapy. 3rd and 4th degree hemorrhoids require surgical intervention. Hemorrhoidectomy is considered to be an efficient but painful treatment for hemorrhoids.[5] In Europe, the Milligan-Morgan operation is used most frequently, but in the United States, closed hemorrhoidectomy is the most popular. In this procedure, some artery forceps is applied to skin and to the mucosal elements of each hemorrhoid.[6]

A “v” shaped incision is made beneath the external skin element of hemorrhoid and the hemorrhoid is dissected off the underlying internal sphincter followed by transfixation and ligation of pedicle at proximal extremity of

hemorrhoid.[7] In 1957, Ferguson described "closed technique where on completion of the operation, mucosal edges and skin can be closed with absorbable sutures with aim to improve post-operative pain.[8] Closed hemorrhoidectomy is supposed to be less painful and may preserve anal sensory function better and lead to faster wound healing, but it has a reputation in Europe for wound dehiscence and infection.[9-11]

Objective

To compare the outcomes of pedicle ligation versus cauterization using monopolar diathermy in Milligan Morgan hemorrhoidectomy for 3rd and 4th degree hemorrhoids.

METHODOLOGY

This randomized controlled trial was conducted in Surgical Unit II, Shalamar Institute of Health Sciences, Lahore, from June 21, 2024, to December 20, 2024. The study was conducted after approval from the Institutional Ethical Committee of Shalamar Institute of Health Sciences. Written informed consent was obtained from all participants before enrollment. A non-probability consecutive sampling technique was used to recruit eligible patients presenting to the outpatient department. The calculated sample size was 140 patients, with 70 patients in each group. The sample size was calculated using an expected frequency of postoperative urinary retention of 29.3% in the pedicle ligation group and 12.3% in the diathermy coagulation group, as reported in previous literature [10]. A level of significance of 5% and statistical power of 80% were used for the calculation. Patients aged 25–65 years of either sex with third- or fourth-degree hemorrhoids according to the predefined operational definitions were included in the study. Patients with Crohn's disease, decompensated liver disease, or pregnancy were excluded from the study. A total of 140 eligible patients were randomly allocated into two equal groups of 70 patients each using the lottery method. All surgical procedures were performed by the Surgical Unit II team under the supervision of Prof. Humad Naeem Rana at Shalamar Hospital. The use of the same surgical team and standardized perioperative management was intended to minimize variability in operative technique between the two groups.

Group A: Milligan-Morgan Hemorrhoidectomy with Pedicle Ligation

Patients in Group A underwent conventional Milligan-Morgan hemorrhoidectomy with pedicle ligation. With the patient in the lithotomy position, the anal sphincter was gently stretched and traction was applied to the hemorrhoidal mass to expose the pedicle. Each pedicle was grasped, and a V-shaped incision was made with each limb positioned on either side of the clamp. The hemorrhoidal mass was dissected approximately 1–2 cm above the dentate line. The pedicle was then doubly transfixed and ligated using 3-0 Vicryl suture.

Group B: Milligan-Morgan Hemorrhoidectomy with Monopolar Diathermy Coagulation

Patients in Group B underwent Milligan-Morgan hemorrhoidectomy with pedicle cauterization using monopolar diathermy. The hemorrhoidal pedicle was exposed in the same manner as in Group A. Monopolar diathermy was applied to the base of the pedicle to achieve coagulation, after which the hemorrhoidal tissue was excised using cautery. The resulting mucosal defect was left open.

Data Collection

Demographic and clinical information, including age, sex, body mass index, duration of hemorrhoidal disease, and degree of hemorrhoids, was recorded on a predesigned study proforma. Intraoperative and postoperative outcomes were documented for each participant. Postoperative pain was assessed 24 hours after surgery using the predefined 0–10 pain assessment scale, where higher scores represented greater pain intensity. Intraoperative blood loss was recorded according to the operational definition used in the study. Postoperative urinary retention was assessed according to the predefined operational criteria. Anal stenosis was evaluated on the 15th postoperative day and subsequently at one, three, five, and six months after surgery. Fecal incontinence and other postoperative complications were also documented during follow-up. The primary outcomes included postoperative pain at 24 hours, intraoperative blood loss, urinary retention, and anal stenosis. Additional postoperative outcomes, including fecal incontinence, were recorded during follow-up. Potential confounding variables included age, sex, body mass index, and degree of hemorrhoids. These factors were recorded at baseline and controlled through stratification during statistical analysis. The use of a single surgical team and standardized operative and perioperative protocols further reduced procedure-related variability between the groups.

Statistical Analysis

Data were entered and analyzed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Quantitative variables, including age, body mass index, postoperative pain score, and intraoperative blood loss, were summarized as mean ± standard deviation. The distribution of continuous variables was assessed for normality before inferential analysis. Between-group comparisons of normally distributed continuous variables were performed using the independent-samples Student's t-test. Categorical variables, including sex, urinary retention, anal stenosis, and fecal incontinence, were presented as frequencies and percentages and compared using the chi-square test or Fisher's exact test, where appropriate. Data were stratified according to age, sex, body mass index, and degree of

hemorrhoids, followed by appropriate post-stratification statistical tests. A two-sided p-value ≤0.05 was considered statistically significant.

RESULTS

The two groups were comparable in their baseline characteristics. The mean age was 41.6 ± 7.6 years in the pedicle ligation group and 42.8 ± 8.2 years in the diathermy coagulation group. Males constituted 44 (62.9%) and 40 (57.1%) patients, while females constituted 26 (37.1%) and 30 (42.9%), respectively. In the pedicle ligation and diathermy groups, 23 (32.9%) and 20 (28.6%) patients were aged 25–40 years, whereas 47 (67.1%) and 50 (71.4%) were aged 41–65 years.

Table 1. Baseline characteristics of the study participants

Characteristic	Pedicle ligation (n=70)	Diathermy coagulation (n=70)
Age, years, mean ± SD	41.6 ± 7.6	42.8 ± 8.2
Male	44 (62.9%)	40 (57.1%)
Female	26 (37.1%)	30 (42.9%)
Age 25–40 years	23 (32.9%)	20 (28.6%)
Age 41–65 years	47 (67.1%)	50 (71.4%)
Normal BMI	12 (17.1%)	10 (14.3%)
Overweight	50 (71.4%)	52 (74.3%)
Obese	8 (11.4%)	8 (11.4%)
Grade III hemorrhoids	45 (64.3%)	44 (62.9%)
Grade IV hemorrhoids	25 (35.7%)	26 (37.1%)

Mean intraoperative blood loss was significantly higher in the pedicle ligation group than in the diathermy coagulation group (13.34 ± 3.74 mL vs. 9.80 ± 2.88 mL; p=0.001). The mean pain score at 24 hours was comparable between the groups (3.16 ± 1.02 vs. 3.26 ± 0.87; p=0.659).

Table 2. Comparison of primary postoperative outcomes between the groups

Outcome	Pedicle ligation (n=70)	Diathermy coagulation (n=70)	p-value
Intraoperative blood loss, mL, mean ± SD	13.34 ± 3.74	9.80 ± 2.88	0.001
Pain score at 24 hours, mean ± SD	3.16 ± 1.02	3.26 ± 0.87	0.659
Anal stenosis, n (%)	4 (5.7%)	2 (2.9%)	0.404
Urinary retention, n (%)	16 (22.9%)	7 (10.0%)	0.040

Among male patients, mean blood loss was significantly higher with pedicle ligation than with diathermy coagulation (14.30 ± 3.60 mL vs. 9.63 ± 2.94 mL; p=0.001), while pain scores were similar (3.18 ± 0.97 vs. 3.25 ± 0.89; p=0.740). Anal stenosis was observed in 2/44 (4.5%) versus 2/40 (5.0%) patients (p=0.922), and urinary retention in 13/44 (29.5%) versus 5/40 (12.5%) patients (p=0.057).

Table 3. Outcomes stratified according to sex

Sex	Outcome	Pedicle ligation	Diathermy coagulation	p-value
Male	Blood loss, mL, mean ± SD	14.30 ± 3.60	9.63 ± 2.94	0.001
Male	Pain score, mean ± SD	3.18 ± 0.97	3.25 ± 0.89	0.740
Male	Anal stenosis, n (%)	2/44 (4.5%)	2/40 (5.0%)	0.922
Male	Urinary retention, n (%)	13/44 (29.5%)	5/40 (12.5%)	0.057
Female	Blood loss, mL, mean ± SD	11.73 ± 3.47	10.03 ± 2.83	0.049
Female	Pain score, mean ± SD	3.19 ± 1.13	3.27 ± 0.86	0.782
Female	Anal stenosis, n (%)	2/26 (7.7%)	0/30 (0.0%)	0.122
Female	Urinary retention, n (%)	3/26 (11.5%)	2/30 (6.7%)	0.524

Among patients aged 25–40 years, mean blood loss was significantly greater in the pedicle ligation group (13.09 ± 3.27 mL) than in the diathermy group (10.70 ± 2.57 mL; p=0.012), while pain scores were similar (3.17 ± 1.23 vs. 3.05 ± 0.75; p=0.698). Anal stenosis occurred in 2/23 (8.7%) versus 0/20 (0.0%) patients (p=0.177), while no case of urinary retention occurred in either group.

Table 4. Outcomes stratified according to age

Age group	Outcome	Pedicle ligation	Diathermy coagulation	p-value
25–40 years	Blood loss, mL, mean ± SD	13.09 ± 3.27	10.70 ± 2.57	0.012
25–40 years	Pain score, mean ± SD	3.17 ± 1.23	3.05 ± 0.75	0.698
25–40 years	Anal stenosis, n (%)	2/23 (8.7%)	0/20 (0.0%)	0.177
25–40 years	Urinary retention, n (%)	0/23 (0.0%)	0/20 (0.0%)	N/A

41–65 years	Blood loss, mL, mean ± SD	13.47 ± 3.98	9.44 ± 2.94	0.001
41–65 years	Pain score, mean ± SD	3.19 ± 0.92	3.34 ± 0.91	0.429
41–65 years	Anal stenosis, n (%)	2/47 (4.3%)	2/50 (4.0%)	0.950
41–65 years	Urinary retention, n (%)	16/47 (34.0%)	7/50 (14.0%)	0.020

In patients with Grade III hemorrhoids, mean blood loss was significantly higher with pedicle ligation than with diathermy coagulation (13.84 ± 3.64 mL vs. 10.05 ± 2.79 mL; p=0.001), while pain scores did not differ significantly (3.11 ± 1.01 vs. 3.34 ± 0.86; p=0.250). Anal stenosis occurred in 3/45 (6.7%) versus 0/44 (0.0%) patients (p=0.081), and urinary retention in 7/45 (15.6%) versus 4/44 (9.1%) patients (p=0.354).

Table 5. Outcomes stratified according to hemorrhoid grade

Grade	Outcome	Pedicle ligation	Diathermy coagulation	p-value
Grade III	Blood loss, mL, mean ± SD	13.84 ± 3.64	10.05 ± 2.79	0.001
Grade III	Pain score, mean ± SD	3.11 ± 1.01	3.34 ± 0.86	0.250
Grade III	Anal stenosis, n (%)	3/45 (6.7%)	0/44 (0.0%)	0.081
Grade III	Urinary retention, n (%)	7/45 (15.6%)	4/44 (9.1%)	0.354
Grade IV	Blood loss, mL, mean ± SD	12.44 ± 3.83	9.38 ± 3.03	0.003
Grade IV	Pain score, mean ± SD	3.32 ± 1.06	3.12 ± 0.90	0.464
Grade IV	Anal stenosis, n (%)	1/25 (4.0%)	2/26 (7.7%)	0.575
Grade IV	Urinary retention, n (%)	9/25 (36.0%)	3/26 (11.5%)	0.040

Among patients with normal BMI, mean blood loss was significantly higher in the pedicle ligation group (13.25 ± 3.22 mL) than in the diathermy group (10.20 ± 2.74 mL; p=0.028), while pain scores were similar (3.17 ± 1.03 vs. 3.00 ± 0.66; p=0.665). Anal stenosis occurred in 1/12 (8.3%) versus 0/10 (0.0%) patients (p=0.350), and urinary retention in 2/12 (16.7%) versus 1/10 (10.0%) patients (p=0.650). Among overweight patients, blood loss was 13.36 ± 4.06 versus 9.98 ± 2.86 mL (p=0.001), while pain scores were 3.16 ± 1.03 versus 3.31 ± 0.94 (p=0.453). Anal stenosis occurred in 2/50 (4.0%) versus 1/52 (1.9%) patients (p=0.535), and urinary retention in 11/50 (22.0%) versus 6/52 (11.5%) patients (p=0.156).

Table 6. Outcomes stratified according to BMI

BMI category	Outcome	Pedicle ligation	Diathermy coagulation	p-value
Normal	Blood loss, mL, mean ± SD	13.25 ± 3.22	10.20 ± 2.74	0.028
Normal	Pain score, mean ± SD	3.17 ± 1.03	3.00 ± 0.66	0.665
Normal	Anal stenosis, n (%)	1/12 (8.3%)	0/10 (0.0%)	0.350
Normal	Urinary retention, n (%)	2/12 (16.7%)	1/10 (10.0%)	0.650
Overweight	Blood loss, mL, mean ± SD	13.36 ± 4.06	9.98 ± 2.86	0.001
Overweight	Pain score, mean ± SD	3.16 ± 1.03	3.31 ± 0.94	0.453
Overweight	Anal stenosis, n (%)	2/50 (4.0%)	1/52 (1.9%)	0.535
Overweight	Urinary retention, n (%)	11/50 (22.0%)	6/52 (11.5%)	0.156
Obese	Blood loss, mL, mean ± SD	13.38 ± 2.56	8.13 ± 2.94	0.002
Obese	Pain score, mean ± SD	3.38 ± 1.06	3.25 ± 0.70	0.786
Obese	Anal stenosis, n (%)	1/8 (12.5%)	1/8 (12.5%)	1.000
Obese	Urinary retention, n (%)	3/8 (37.5%)	0/8 (0.0%)	0.055

DISCUSSION

Hemorrhoids are defined as varicose dilatation involving one or more radicals of haemorrhoidal veins. Infact, hemorrhoidal mass is not a varicose vein but is a vascular complex with multiple channels fed by many small vessels. Traditionally, surgeons have depended upon mass ligature of haemorrhoid “pedicle” for achieving haemostasis. The policy ignores the fact that small arteries penetrate the internal sphincter and enter the operative field. Also the numerous vessels are divided when incising the mucosa to dissect the pedicle.

Bleeding from these small vessels can be controlled better by electrocoagulation than simple ligation and excision.[12] A conventional method for accomplishing the goal is careful and accurate application of coagulating electrocautery. Diathermy involves use of high frequency (300 KHz to 3 MHz) electric current to produce heat. The amount of coagulation around the electrode is dependent on amount of current and length of time which it is applied.[13]

Our study involved 140 patients irrespective of their age and sex suffering from the late third and fourth degree internal haemorrhoids. They were divided into two groups of 70 patients each. Patients in this study were between 25 to 65 years of age which showed that haemorrhoids are present in younger as well as older age groups. In this study 60% of patients were males, but this could not be concluded whether the piles are less common in females or they do not come to doctor for treatment. Most of the patients in present study presented with prolapsed piles, bleeding and constipation. Another study conducted by Bensal D in which study it was noted that on first day, median pain score was 7 in both the groups. There was statistically no significant difference in the pain score of both the groups during post-operative stay.[14] They also noticed post-operative bleeding that was 33.3% in pedicle ligation (group-A) on day 1, while in coagulation group that was 20%. On day 2, the no. of patients was 26.6% for group A and 20% for group B. On day

3 there was little increase in no. of patients who had mild bleeding probably because of removal of packs on 3rd day. But at the end of 6 days, there was no difference, hence statistically not significant.[15-18]
The subgroup analyses further supported the main finding for blood loss. Diathermy coagulation resulted in significantly lower blood loss in males and females, both age groups, Grade III and Grade IV hemorrhoids, and all BMI categories. Urinary retention was particularly different among patients aged 41–65 years, where it occurred in 34.0% following pedicle ligation compared with 14.0% after diathermy coagulation (p=0.020). Similarly, among patients with Grade IV hemorrhoids, urinary retention occurred in 36.0% and 11.5% of patients, respectively (p=0.040).[19] These subgroup findings should, however, be interpreted cautiously because some strata contained relatively small numbers of patients and the study was not primarily powered for subgroup comparisons.

LIMITATIONS

This study has several limitations. First, it was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. Second, although patients were randomized, blinding of the surgical team was not possible because of the nature of the procedures. Third, some subgroup analyses included small numbers of patients, which may have reduced the statistical power to detect differences between groups. Fourth, postoperative pain was assessed only at a limited time point, while other patient-centered outcomes such as return to normal activity, satisfaction, and quality of life were not evaluated. Finally, although longer follow-up was planned for complications such as anal stenosis, recurrence and other long-term outcomes were not fully reported in the available results.

CONCLUSION

Diathermy coagulation haemorrhoidectomy has been found advantageous method when assessing the urinary retention and blood loss. Hence diathermy coagulation haemorrhoidectomy can be adapted as a safe and effective alternate method for treating symptomatic hemorrhoids.

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