

Original Research Article

Impact of hemorrhoidectomy with lateral internal sphincterotomy on resting anal pressure in grade III and IV haemorrhoids with elevated anal pressure (>90 mmHg): a prospective observational study

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ABSTRACT

Background: Grade III and IV hemorrhoids commonly present with pain, bleeding and prolapse, often associated with elevated resting anal pressure. This study assessed postoperative changes in anal pressure and their relationship with disease grade, surgical procedure and outcomes.

Methods: This 18-month prospective study included 79 patients with Grade III–IV hemorrhoids and elevated resting anal pressure, evaluating postoperative pressure changes and their association with symptoms, disease severity and hemorrhoidectomy type.

Results: The mean age was 44.6 ± 12.4 years; 67.1% were male, with most patients aged 31–40 years. Perianal pain was present in all patients, followed by bleeding ($n=44$) and prolapse ($n=34$). Grade III and IV hemorrhoids were seen in 43% ($n=34$) and 57% ($n=45$), respectively; 53.2% underwent open and 46.8% stapler hemorrhoidectomy. Preoperative VAS scores were similar between groups ($p=0.898$). Median VAS significantly decreased from 6 (IQR 5–7) preoperatively to 2 (IQR 1–2) on POD1 and 1 (IQR 0–1) on POD7 ($p<0.001$). On POD1, 84.8% had mild pain, 11.4% no pain and 3.8% moderate pain; by POD7, 36.7% were pain-free and 63.3% had mild pain. Complications included bleeding ($n=17$), urinary retention ($n=12$) and faecal incontinence ($n=3$). Mean resting anal pressure decreased from 122.9 ± 7.50 mmHg preoperatively to 83.4 ± 7.42 mmHg at 1 week and 90.9 ± 7.63 mmHg at 2 months ($p<0.001$), with recurrence in only two stapler hemorrhoidectomy patients at 3 months.

Conclusions: Grade III–IV hemorrhoid surgery significantly reduces symptoms and resting anal pressure, with both open and stapler hemorrhoidectomy showing similar efficacy, low complications and minimal recurrence.

Keywords: Anal spasm, Hemorrhoids, Lateral internal sphincterotomy, Open hemorrhoidectomy, Stapler hemorrhoidectomy

INTRODUCTION

Hemorrhoids are a common anorectal condition, affecting nearly 10 million individuals annually with a prevalence of approximately 4.4% and represent a frequent cause for surgical consultation. They are vascular submucosal cushions that contribute nearly 15–20% of resting anal canal pressure and play an important role in continence.

Clinical disease results from dilation of these cushions along with weakening of supporting connective tissue, often precipitated by factors such as constipation, straining, pregnancy and aging. Patients typically present with bleeding per rectum, mass per rectum and perianal pain, particularly in advanced stages (Grade III and IV), which require surgical intervention. Despite multiple operative techniques, postoperative pain remains a

significant concern and no single procedure has been proven superior in all aspects.^{1,2} Resting anal pressure (RAP), which normally ranges between 40 and 80 mmHg, reflects internal anal sphincter tone and is elevated in patients with symptomatic hemorrhoids, contributing to symptom severity and recurrence.

Anal manometry provides an objective assessment of sphincter function and is useful in guiding management. Elevated RAP (>90 mmHg) is often an indication for lateral internal sphincterotomy in addition to hemorrhoidectomy. In this context, the present study was undertaken to evaluate changes in resting anal pressure following surgical treatment and to analyse its correlation with clinical outcomes in patients with advanced hemorrhoids.^{3,4}

METHODS

This prospective observational study was conducted in the Department of General Surgery at KIMSHEALTH, a tertiary care centre in Thiruvananthapuram, Kerala, over 18 months from August 2023 to January 2025. A total of 79 patients with Grade III and IV symptomatic hemorrhoids associated with elevated resting anal pressure were included after obtaining written informed consent and institutional ethics committee approval. Demographic details were collected from electronic medical records and all patients underwent detailed clinical evaluation, including digital rectal examination to assess hemorrhoid grade and anal tone.

Inclusion and exclusion criteria

Patients with Grade III and IV hemorrhoids and resting anal pressure >90 mmHg were included. Exclusion criteria comprised abdominal malignancy, inflammatory bowel disease, dermatitis, poor general condition, prior anal trauma, previous anorectal surgery, neurological disorders, normal or low resting anal pressure, prior hemorrhoid treatment, age <18 or >80 years and lack of consent.

Resting anal pressure was measured one day prior to surgery using the Anopress portable anal manometry system. Following bowel preparation, the procedure was performed in the left lateral position after digital rectal examination.

A catheter with a 1–2 ml water-filled balloon was positioned at the level of the internal anal sphincter and three readings were obtained; the highest stable value (mmHg) was recorded. A pressure >90 mmHg indicated anal spasm and the need for lateral internal sphincterotomy. Patients underwent open or stapler hemorrhoidectomy with lateral internal sphincterotomy based on surgeon discretion. Postoperative outcomes, including pain, bleeding, urinary retention and faecal incontinence, were documented. Resting anal pressure was reassessed at 1 week and 2 months, with follow-up up to 3 months for recurrence.

Statistical analysis

Data were analysed using SPSS version 25.0. Categorical variables were expressed as frequencies and percentages and continuous variables as mean±standard deviation. Statistical tests included chi-square/Fisher's exact test, Student's t-test, ANOVA, Mann–Whitney test and Pearson correlation. A p value <0.05 was considered statistically significant.

RESULTS

A total of 79 patients were included in the analysis, with a mean age of 44.6±12.4 years and the majority belonging to the 31–40-year age group. There was a male predominance (53; 67.1%). Perianal pain was the most common presenting complaint, observed in all patients, followed by bleeding per rectum (44) and mass per rectum (34), with some patients presenting with multiple symptoms.

The median preoperative pain score was 6 (Interquartile Range (IQR): 5–6). Regarding disease severity, 34 (43%) patients had Grade III hemorrhoids, while a higher proportion, 45 (57%), had Grade IV disease. In terms of surgical management, 42 (53.2%) patients underwent open hemorrhoidectomy and 37 (46.8%) underwent stapler hemorrhoidectomy. Overall, the findings indicate a predominance of advanced hemorrhoidal disease with perianal pain as the principal symptom (Table 1).

Post-operative outcomes

The most common post-operative symptom was perianal pain, reported by 70 patients on POD 1 and persisting in 50 patients on POD 7. Other postoperative symptoms included bleeding in 17 patients, urinary retention in 12 patients and faecal incontinence in 3 patients. Some patients experienced more than one symptom. On postoperative day 1, the majority of patients (84.8%) experienced mild pain (VAS 1–3), while 11.4% reported no pain and only 3.8% had moderate pain (VAS 4–6). By postoperative day 7, pain had further improved, with 36.7% of patients reporting no pain and 63.3% experiencing only mild pain. Notably, no patients reported moderate or severe pain at this stage.

Perianal pain VAS scores showed a significant reduction from the preoperative period to postoperative day 1. The median preoperative VAS score was 6 (IQR 5–7), which decreased to 2 (IQR 1–2) on POD 1, with a mean difference of 4.00 (p<0.001). Perianal pain scores decreased markedly from the preoperative period to postoperative day 7.

The median preoperative VAS score was 6 (IQR 5–7), which declined to 1 (IQR 0–1) on POD 7, with a mean difference of 5.00 (p<0.001). When comparing postoperative pain between POD 1 and POD 7, a further significant reduction in perianal pain was observed. The

median VAS score decreased from 2 (IQR 1–2) on POD 1 to 1 (IQR 0–1) on POD 7, with a mean difference of 1.0 ($p<0.001$). Preoperative pain severity assessed by VAS scores did not differ significantly between the two surgical groups ($p=0.898$). The majority of patients in both the open (70.5%) and stapler (74.3%) hemorrhoidectomy groups reported moderate pain (VAS 4–6), while severe pain (VAS 7–10) was noted in 27.3% and 22.9%, respectively. Only a small proportion of patients in each group reported mild pain (VAS 1–3).

Comparison of pre-operative and post-operative resting anal pressures

The mean baseline resting anal pressure was 122.9 ± 7.50 mmHg, which decreased to 83.4 ± 7.42 mmHg at 1 week and slightly increased to 90.9 ± 7.63 mmHg at 2 months ($p<0.001$).

Repeated measures ANOVA showed a significant change over time ($p<0.001$), with pressures significantly reduced from baseline at both 1 week and 2 months. Although there was a rise from 1 week to 2 months ($p<0.001$), values remained below baseline (Figure 1).

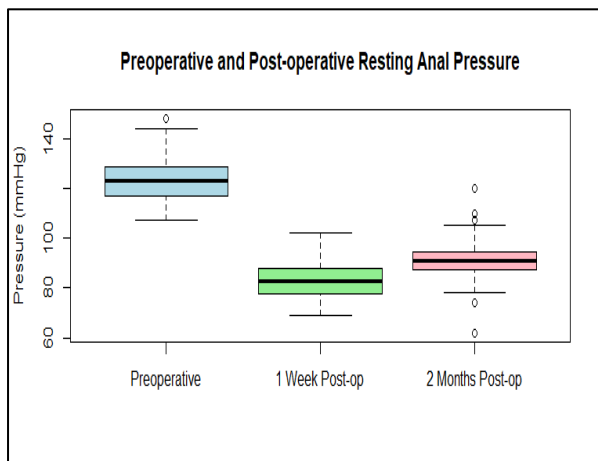


Figure 1: Comparison of pre-operative and post-operative resting anal pressure.

Changes in resting anal pressure before and after surgery and their association with clinical factors

Subgroup analysis showed no significant difference in pressure reduction between genders at 1 week and 2 months. Patients with Grade IV hemorrhoids had a greater reduction compared to Grade III ($p=0.003$ and $p=0.005$). Open hemorrhoidectomy demonstrated a significantly greater reduction than stapler hemorrhoidectomy ($p=0.013$ at 1 week and $p<0.001$ at 2 months). Anal spasms were noted in two patients at the three-month follow-up and were managed conservatively. No significant differences were observed based on presenting complaints, postoperative symptoms or recurrence of anal spasm at 3 months (Table 2).

Association of clinical factors with grade III and IV symptomatic hemorrhoids with elevated resting anal pressure

Age was significantly associated with hemorrhoids grade ($p=0.013$), with higher proportions of Grade IV disease in older patients. Gender distribution was comparable and was not statistically significant. Postoperative VAS pain scores and postoperative complications showed no significant differences between the groups (Table 3).

Association of clinical factors with hemorrhoidectomy type and resting anal pressure

Age was significantly associated with the type of hemorrhoidectomy ($p=0.038$), with younger patients more likely to undergo stapler procedures and older patients open surgery. Gender distribution was comparable and not statistically significant. Hemorrhoids grade strongly influenced the choice of procedure ($p<0.001$), with most Grade III cases treated by stapler and Grade IV by open surgery. Baseline resting anal pressure was higher in the stapler group (124.9 ± 7.82 mmHg) than the open group (120.3 ± 6.25 mmHg) ($p=0.006$). However, postoperative pressures at 1 week and 2 months, pain scores and complications were similar between groups, with no significant differences (Table 4).

Table 1: Characteristics.

Variable	No. of patients (n=79)	(%)
Age category (in years)		
18-30	6	7.6
31-40	28	35.4
41-50	22	27.8
51-60	12	15.2
61-80	11	13.9
Gender		
Male	53	67.1
Female	26	32.9
Presenting complaints*		
Perianal pain	79	100
Bleeding per rectum	44	55.7

Continued.

Variable	No. of patients (n=79)	(%)
Mass per rectum	34	43.0
Degree of hemorrhoids		
Grade 3	34	43.0
Grade 4	45	57.0
Hemorrhoidectomy type		
Open hemorrhoidectomy	42	53.20
Stapler hemorrhoidectomy	37	46.80

*Some patients had more than one symptom.

Table 2: Changes in resting anal pressure before and after surgery and their association with clinical factors.

Variable	Difference (baseline to 1 week) median (IQR)	P value	Difference (baseline to 2 months) median (IQR)	P value
Gender				
Male (n=53)	40 (35-47)	0.796	31 (28.5-36)	0.141
Female (n=26)	37 (33.5-42)		27.5 (23-32.3)	
Hemorrhoids grade (3/4)				
Grade 3 (n=34)	38.5 (28.5-42)	0.003	29 (25-33.8)	0.005
Grade 4 (n=45)	40 (36-47)		32 (29-39)	
Hemorrhoidectomy type				
Open (n=42)	41(37-47.8)	0.013	34 (30-41)	<0.001
Stapler (n=37)	37 (30-42)		28 (25-33)	
Presenting complaints				
Mass per rectum (n=34)	39 (35.3-43.8)	0.917	31.5 (29-38.8)	0.349
Bleeding per rectum (n=44)	39.5 (35-43.3)	0.560	31 (26-35.3)	0.480
Post-operative symptoms (some patients had more than one symptom)				
Bleeding	39 (35-42)	0.558	33 (27-41)	0.554
Urinary retention	47 (35.8-53.3)	0.068	33 (26.3-42.8)	0.561
Faecal incontinence	41 (39-58.5)	0.376	31 (29-45)	0.599
Follow up at 3 months to assess clinical recurrence of anal spasm (anal spasm n=2)				
No	40 (35-45)	0.829	31 (27-36)	0.672
Yes	38 (36.5-39.5)		29 (29-29)	

Table 3: Association of clinical factors with grade III and IV symptomatic hemorrhoids with elevated resting anal pressure.

Variable	Hemorrhoids grade		P value
	Grade III (n=34)	Grade IV (n=45)	
Age category (in years)			
18-30	1(2.9%)	5(11.1%)	0.013
31-40	17 (50.0%)	11 (24.4%)	
41-50	12 (35.3%)	10 (22.2%)	
51-60	2 (5.9%)	10 (22.2%)	
61-80	2 (5.9%)	9 (20%)	
Gender			
Male	22 (64.7%)	31 (68.9%)	0.695
Female	12 (35.3%)	14 (31.1%)	
Pre-operative pain VAS Score			
Median (IQR)	6 (5-7)	6 (4-7)	0.612
Post-operative pain VAS Score POD 1			
Median (IQR)	1.50(1-2)	2(1-2)	0.360
Post-operative pain VAS Score POD 7			
Median (IQR)	1 (0-1)	1 (0-1)	0.134
Post-operative symptoms (some patients had more than one symptom)			
Bleeding	7	10	0.861
Urinary retention	4	8	0.461
Faecal incompetence	0	3	0.125

Table 4: Association of clinical factors with hemorrhoidectomy type and resting anal pressure.

Variable	Hemorrhoidectomy type		P value
	Open (n=42)	Stapler (n=37)	
Age category (in years)			
18-30	5 (11.9%)	2 (2.7%)	0.038
31-40	10 (23.8%)	18 (48.6%)	
41-50	10 (23.8%)	12 (32.4%)	
51-60	9 (21.4%)	3 (8.10%)	
61-80	8 (19%)	3 (8.10%)	
Gender			
Male	30 (71.40%)	23 (62.20%)	0.382
Female	12 (28.6%)	14 (37.8%)	
Hemorrhoids grade			
Grade III	1 (2.3%)	33 (89.2%)	<0.001
Grade IV	41 (97.6%)	4 (10.8%)	
Baseline resting anal pressure (mmHg)			
Mean±SD	120.3 ±6.25	124.9 ±7.82	0.006
Resting anal pressure at 1 week post intervention (mmHg)			
Mean±SD	84.5±7.87	82.5 ±7.04	0.253
Resting anal pressure at 2 months post intervention (mmHg)			
Mean±SD	91.8 ±4.89	91.2±5.29	0.642
Pre-operative pain VAS score			
Median (IQR)	6 (4-7)	6 (5-7)	0.690
Post-operative pain VAS score - POD 1			
Median (IQR)	2 (1-2)	1 (1-2)	0.195
Post-operative pain VAS score - POD 7			
Median (IQR)	1 (0-1)	1 (0-1)	0.243
Post-operative symptoms (Some patients had more than one symptom)			
Bleeding	10	7	0.598
Urinary retention	7	5	0.697
Faecal incompetence	3	0	0.097

DISCUSSION

Grade III and IV hemorrhoids are advanced stages often associated with symptoms such as perianal pain, bleeding and mass per rectum. Elevated resting anal pressure contributes to symptom severity and recurrence. Evaluating its relationship with hemorrhoids grade and surgical outcomes is essential for optimizing management. The mean age of the study population was 44.6±12.4 years, with the highest proportion in the 31–40 years age group, indicating a predominance of younger to middle-aged individuals.

A male predominance was observed (67.1% vs 32.9%), consistent with previous studies.⁵ Perianal pain was the most common presenting symptom, seen in all patients, followed by bleeding per rectum and mass per rectum, with some patients having multiple complaints. Similar symptom patterns have been reported in earlier studies, with bleeding and prolapse being common presentations.⁶ In terms of disease severity, 43% of patients had grade III hemorrhoids, while the majority (57%) had grade IV disease, reflecting a higher prevalence of advanced-stage

hemorrhoids, comparable to findings by Kang et al.⁷ Regarding management, 53.2% of patients underwent open hemorrhoidectomy and 46.8% underwent stapler hemorrhoidectomy, with the choice guided by hemorrhoids grade and patient affordability. All patients additionally underwent lateral internal sphincterotomy for elevated resting anal pressure (>90 mmHg).

This approach aligns with current evidence, as studies have shown that stapled hemorrhoidopexy is associated with reduced postoperative pain and faster recovery, though with a potential risk of higher recurrence.⁸ Postoperative outcomes in the cohort showed that perianal pain was the most common symptom, affecting 88.6% of patients on POD 1 and persisting in 63.3% by POD 7. Other complications included bleeding in 21.5%, urinary retention in 15.2% and faecal incontinence in 3.8%, with some patients experiencing multiple symptoms. These findings are broadly comparable to large series, although reported complication rates are lower in some studies; for instance, Moldovan et al reported postoperative pain in approximately 90%, bleeding in 1.5%, urinary retention in 0.2% and faecal incontinence in 0.5%.⁹ Despite such variations, perianal pain remains the predominant

postoperative concern, emphasizing the need for effective pain control strategies.

Pain severity, assessed by VAS, showed a significant reduction from a median of 6 preoperatively to 2 on POD 1 and 1 on POD 7 ($p<0.001$), with no patients reporting moderate or severe pain by POD 7. Pain scores were comparable between open and stapled groups. These findings are consistent with existing literature, where stapled hemorrhoidectomy demonstrates lower pain scores (2.7 vs 6.3 on POD 1 and improved recovery).^{10,11} Additionally, the use of lateral internal sphincterotomy has been shown to significantly reduce postoperative pain (standardized mean difference=-0.75; $p=0.0002$) and resting anal pressure ($p<0.0001$), though with a risk of transient incontinence.^{12,13} In our study, the routine addition of sphincterotomy in patients with resting pressure >90 mmHg likely contributed to the observed reduction in pain, supporting its role in improving postoperative outcomes.

In the cohort, the mean baseline resting anal pressure was 122.9 ± 7.50 mmHg, which significantly decreased following surgery ($p<0.001$) to 83.4 ± 7.42 mmHg at 1 week and 90.9 ± 7.63 mmHg at 2 months, remaining below baseline despite a slight rise. Greater reductions were observed in Grade IV compared to Grade III hemorrhoids and in open versus stapled hemorrhoidectomy, while factors such as gender, presenting symptoms, postoperative complications and recurrence at 3 months had no significant influence.

These findings are consistent with previous studies, where resting anal pressure decreased from approximately 54 mmHg to 40 mmHg postoperatively across techniques and from 108 mmHg to 103 mmHg at 12 months following sphincterotomy with hemorrhoidectomy, though still higher than normal controls (73 mmHg).^{14,15}

Additionally, conventional hemorrhoidectomy has been shown to produce a greater reduction in resting pressure compared to stapled techniques at 6 months ($p<0.05$).¹⁶ Overall, these findings support that surgical intervention, particularly open hemorrhoidectomy with sphincterotomy, effectively reduces anal sphincter hypertonia, with more pronounced effects in advanced disease.

In the study, age was significantly associated with hemorrhoids grade, with younger patients (31–40 years) more frequently presenting with grade IV disease, while gender distribution showed no significant difference. The postoperative pain scores and symptom profiles were comparable between grade III and IV groups, suggesting similar surgical outcomes irrespective of grade. Comparison of surgical approaches in the study showed that stapler hemorrhoidectomy was more commonly performed in younger patients, while open surgery predominated in older age groups ($p=0.038$), with no significant difference in gender distribution ($p=0.382$). The grade of disease strongly influenced procedure selection ($p<0.001$), with most grade III cases managed by

stapler techniques and nearly all grade IV cases undergoing open surgery.

These findings are consistent with previous reports showing similar distribution of Grade IV cases between stapled and open groups (52% vs 54%), while other series noted a lower proportion of grade IV patients (34.4%) undergoing stapled hemorrhoidopexy compared to Grade III (65.6%).^{17,18} Baseline resting anal pressure was higher in the stapler group ($p=0.006$), although postoperative pressures at 1 week and 2 months, pain scores and most complications were comparable, except for faecal incontinence observed only in the open group (3 cases, $p=0.097$). Similar findings have been reported in literature, where stapled hemorrhoidopexy resulted in a modest reduction in resting pressure (132.7 mmHg to 125 mmHg, $p=0.019$) and was associated with reduced pain and faster recovery compared to open techniques, indicating that despite baseline differences, both approaches yield comparable clinical outcomes.^{19,20}

Limitations

This study is limited by its single-centre design and relatively small sample size, which may affect the generalizability of the findings. The non-randomized selection of surgical procedures could introduce selection bias and the follow-up duration for recurrence of anal spasm was relatively short. Additionally, objective functional outcomes beyond resting anal pressure were not extensively evaluated.

CONCLUSION

The present study demonstrates that surgical management of Grade III and IV hemorrhoids with elevated resting anal pressure is effective in achieving significant reduction in anal sphincter hypertonia and substantial symptomatic relief. Both open and stapler hemorrhoidectomy, when combined with lateral internal sphincterotomy, provide comparable postoperative outcomes with progressive pain reduction, minimal complications and low recurrence rates. These findings support the role of tailored surgical intervention in optimizing both functional and clinical outcomes in advanced hemorrhoidal disease.

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