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Research Article

A COMPARATIVE STUDY IN MANAGEMENT OF GRADE 1 AND 2 INTERNAL HAEMORRHOIDS BY RUBBER BANDING AND SCLEROTHERAPY

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Abstract: ***Introduction:*** Hemorrhoidal disease is a common anorectal condition encountered in surgical practice. While multiple treatment modalities exist, minimally invasive outpatient procedures such as injection sclerotherapy and rubber band ligation (RBL) are widely used for Grade I and II haemorrhoids. However, comparative evidence regarding their efficacy, safety, and patient outcomes remains variable.**Aim:**To evaluate and compare the effectiveness of injection sclerotherapy and rubber band ligation in the management of Grade I and II haemorrhoids.**Methods:**This prospective observational study was conducted in the Department of General Surgery at Gandhi Medical College and Hamidia Hospital, Bhopal, from May 2024 to November 2025. A total of 100 patients with Grade I and II haemorrhoids were included and divided into two groups: sclerotherapy (n=50) and rubber band ligation (n=50). Data on demographic characteristics, clinical presentation, procedural details, postoperative outcomes, complications, recurrence, and patient satisfaction were collected and analyzed using SPSS software. Statistical significance was set at $p < 0.05$.**Results:**Both groups were comparable in baseline characteristics. Rubber band ligation demonstrated superior outcomes compared to sclerotherapy. A single treatment session was sufficient in 88% of RBL patients versus 64% in the sclerotherapy group (p=0.007). Immediate post-procedure bleeding was significantly lower in the RBL group (12% vs 36%, p=0.006). Symptom relief was higher with RBL at 1 week (90% vs 68%, p=0.006) and 1 month (96% vs 84%, p=0.048). Recurrence rates were significantly lower in the RBL group at both 1 week (6% vs 30%, p=0.002) and 1 month (4% vs 20%, p=0.012). Patient satisfaction scores were also significantly higher in the RBL group (7.1 ± 1.2 vs 5.4 ± 1.6, p<0.001).**Conclusion:**Rubber band ligation is more effective than injection sclerotherapy for the treatment of Grade I and II haemorrhoids, offering better symptom relief, lower recurrence rates, fewer complications, and higher patient satisfaction. Although sclerotherapy remains a simple and cost-effective option, RBL should be preferred when feasible due to its superior clinical outcomes.

Keywords: Hemorrhoids ,Sclerotherapy ,Rubber Band Ligation ,Comparative Study Minimally Invasive Treatment

INTRODUCTION

Hemorrhoidal disease is one of the most common conditions encountered in general surgical practice. Although rarely life-threatening, it significantly affects patients' quality of life due to symptoms such as bleeding, pain, pruritus, and prolapse [1]. Hemorrhoids are normal vascular cushions within the anal canal that contribute to continence; however, when these cushions become enlarged and symptomatic, they are termed pathological hemorrhoids [2,3].

Management depends on symptom severity and disease grade. Initial treatment is usually conservative, including dietary modification, increased fibre intake, adequate hydration, and bowel habit regulation [4]. For patients with persistent symptoms, several minimally invasive and surgical options are available, including injection sclerotherapy, rubber band ligation, infrared coagulation, and conventional hemorrhoidectomy [5,6].

Conventional surgical techniques such as Milligan–Morgan and Ferguson hemorrhoidectomy are effective but are associated with postoperative pain, complications, and delayed recovery [7,8]. As a result, outpatient procedures like sclerotherapy and rubber band ligation have gained popularity due to their simplicity, cost-effectiveness, and minimal morbidity [9].

Injection sclerotherapy involves the submucosal injection of a sclerosant, leading to fibrosis and obliteration of hemorrhoidal vessels [10]. It is particularly effective in early-stage disease but may have higher recurrence rates in advanced grades [11]. Rubber band ligation, on the other hand, causes ischemic necrosis of hemorrhoidal tissue and is widely used for Grade II and III hemorrhoids [12].

Given the variety of available treatment options and the need for effective, minimally invasive therapies, this study aims to compare the efficacy of sclerotherapy and

rubber band ligation in the management of Grade I and II hemorrhoids.

Aim

To compare the effectiveness of sclerotherapy and rubber band ligation in the treatment of Grade I and II hemorrhoids.

Objectives

- To evaluate improvement in symptoms following both treatment modalities.
- To compare postoperative outcomes such as pain, bleeding, and recurrence.
- To determine the relative efficacy of sclerotherapy and rubber band ligation.

MATERIALS AND METHODS

Study Setting

The study was conducted in the Department of General Surgery at Gandhi Medical College and Associated Hospital, Bhopal, Madhya Pradesh

Study Duration

The study spanned from May 2024 to November 2025.

Study Design

A prospective observational study design was employed.

Study Population

The study population comprised patients with haemorrhoids admitted to the Department of General Surgery at Hamidia Hospital, Bhopal.

Inclusion/Exclusion Criteria, Method of Selection

Inclusion Criteria:

- Age group >18 years male and female
- Patients with Grade I and Grade II haemorrhoids will be included in the study.
- Patients giving consent and willing to participate

Exclusion Criteria;

- Patients with haemorrhoid grade 3 and 4.
- Patients not giving consent.

Method of Allocation:

Patients were allocated into two groups using an alternate allocation method. Patients with odd serial numbers were assigned to the Rubber Band Ligation group, while those with even serial numbers were assigned to the Sclerotherapy group.

Sample Size Calculation

All haemorrhoid patients admitted and operated in the General Surgery Department of Hamidia Hospital Bhopal from May 2024 to November 2025 were included in the study. The sample size was approximately 100 patients**.**

Intervention

This was a comparative study of two surgical interventions for haemorrhoids:

- Rubber Banding

Patients in this group underwent rubber band ligation of internal haemorrhoids. The procedure was performed in the outpatient setting using a standard hemorrhoidal band ligator. With the patient in the lithotomy or left lateral position, a proctoscope was introduced to visualize the hemorrhoidal cushions. The hemorrhoidal tissue was grasped and a rubber band was applied at the base of the hemorrhoidal mass above the dentate line to avoid pain. One or two hemorrhoidal cushions were banded per session depending on the number and size of haemorrhoids. Patients were observed for a short period after the procedure and were discharged with advice regarding diet, stool softeners, and analgesics if required.

Sclerotherapy;

Patients in this group were treated with injection sclerotherapy. Under proctoscopic guidance, 3–5 ml of 5% phenol in almond oil/ sodium tetradecyl sulphate was injected into the submucosal plane at the base of the hemorrhoidal cushion above the dentate line using a long injection needle. Care was taken to avoid deep injection to prevent complications. Usually, one or two hemorrhoidal cushions were treated in a single sitting. After the procedure, patients were observed briefly and discharged with advice regarding high-fibre diet and stool softeners.

Data Collection

Data were collected prospectively. The data was collected from the medical records and follow-up of the patients. The following data points were recorded for each patient:

a. Age
b. Sex
c. Post-operative duration of hospital stays
d. Post-operative pain
e. Post-operative bleeding
f. Recurrence history
g. Operating time
h. Wound discharge
I. Return to normal activity
j. Post operative treatment required
k. Additional surgical procedure

10) outcome measures

Grade of haemorrhoid-
Xylocaine Sensitivity-
Treatment Details;

Group A: Sclerotherapy –

- Type and concentration of Sclerosant used:
- Site of Injection
- Volume Used

Group B: Rubber band Ligation:

- No. of Bands Applied
- Position of Band

Outcome parameters:

- Immediate: (0-48 Hours)

- Pain (VAS):
- Bleeding:
- Complications:

Short-term (1-6 weeks):
Symptom resolution (Bleeding, Pain)
No. of Sittings required:
Any complications:
Ulceration Infection:

Data Management and Statistical Analysis
All collected data were entered into an MS Excel spreadsheet. Statistical analysis was performed using SPSS software. Categorical data were presented as frequencies and percentages. Continuous data were presented as means ± standard deviations. The appropriate statistical tests (e.g., t-tests, chi-square tests) were used to compare the two surgical groups. A p-value of <0.05 was considered statistically significant

Ethical Issues
Ethical Clearance: The study received approval from the Scientific Review Committee/Institutional Ethics Committee (IEC) of Gandhi Medical College, Bhopal.
Informed Consent: Informed consent was obtained from all patients prior to their participation in the study. The consent form explained the purpose of the study, the procedures involved, the potential risks and benefits, and the right to withdraw from the study at any time. Confidentiality of patient data was maintained throughout the study.

RESULTS

The collected data was analysed using IBM SPSS software version 27.0.
NOTE:

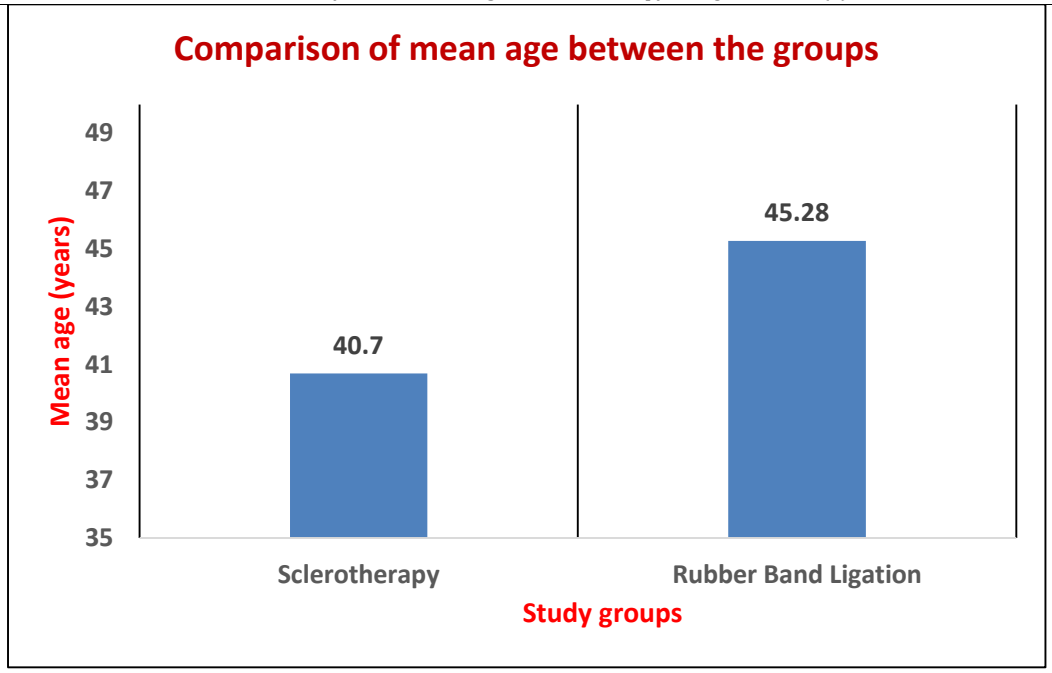
- The study consists of 100 samples (n=100).
- Kolmogorov – Smirnov test was used to test the normality of the data ($50 \leq n > 300$).
- Categorical variables are expressed in terms of frequency (n) and percentage (%)
- Continuous variables are expressed in terms of mean, standard deviation (SD).
- Chi-square test was used to compare categorical variables.
- Independent t test was used to compare continuous variables between the groups.
- p-value ≤ 0.05 considered as statistically significant

Comparison of Age (years) Between Treatment Groups:

Group	n	Mean age	t (df)	p value
Sclerotherapy	50	40.70 ± 12.66	−1.724 (98)	0.088
Rubber Band Ligation	50	45.28 ± 13.87		

The mean age in the Sclerotherapy group was 40.70 ± 12.66 years, whereas the Rubber Band Ligation group had a mean age of 45.28 ± 13.87 years.

An independent samples *t*-test demonstrated a mean difference of approximately 4.58 years, with $t(98) = -1.724$ and $p = 0.088$.

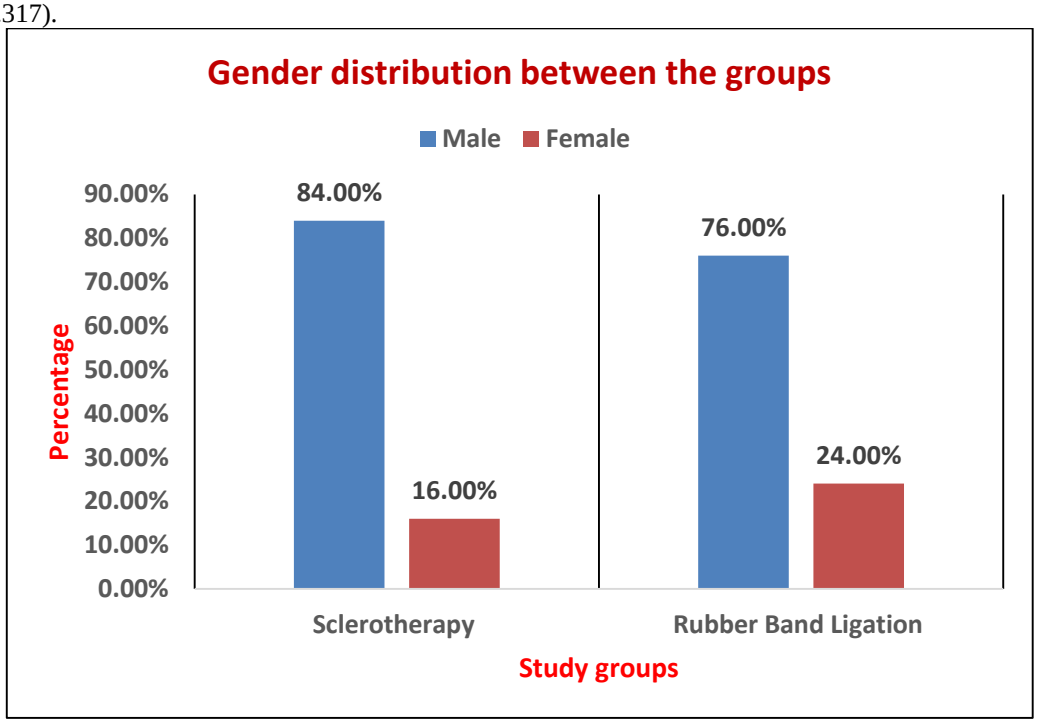


Sex Distribution Across Treatment Groups:

Sex	Sclerotherapy (n=50)	Rubber Band Ligation (n=50)	Total	χ^2, p-value
Male	42 (84.0%)	38 (76.0%)	80 (80.0%)	1.00, 0.317
Female	8 (16.0%)	12 (24.0%)	20 (20.0%)	

The majority of participants in both treatment groups were male. In the Sclerotherapy group, 42 of 50 patients (84.0%) were male and 8 (16.0%) were female. In the Rubber Band Ligation group, 38 of 50 patients (76.0%) were male and 12 (24.0%) were female. Overall, males constituted 80.0% of the study population.

A chi-square test demonstrated no statistically significant difference in sex distribution between the two groups ($\chi^2 = 1.00$, $p = 0.317$).

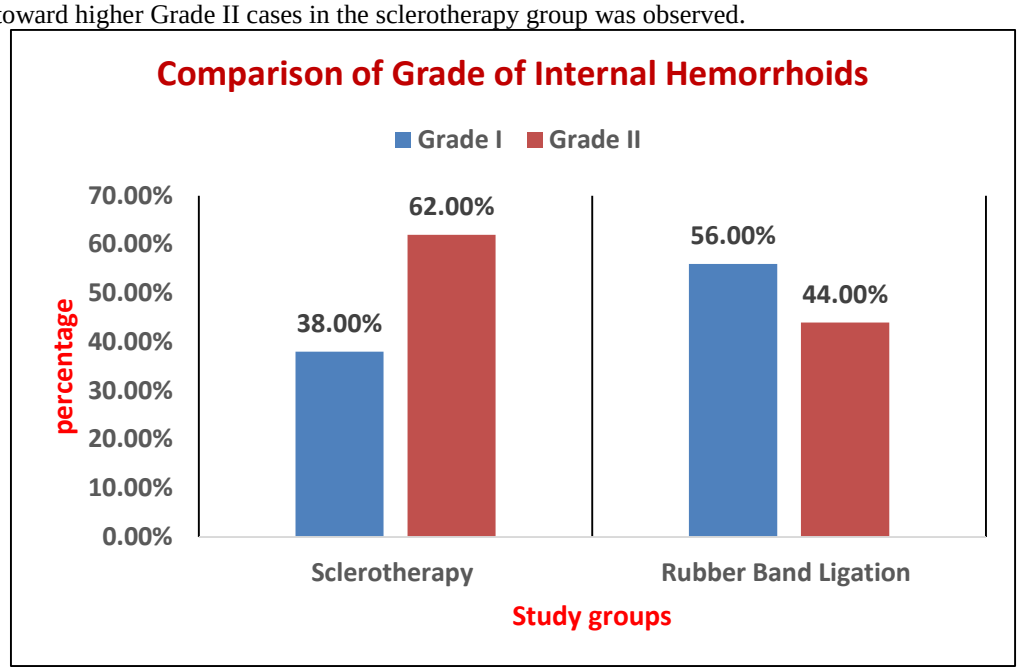


Distribution of Grade of Internal Hemorrhoids Across Treatment Groups:

Grade	Sclerotherapy (n=50)	Rubber Band Ligation (n=50)	Total	χ^2, p-value
Grade I	19 (38.0%)	28 (56.0%)	47 (47.0%)	3.25, 0.071
Grade II	31 (62.0%)	22 (44.0%)	53 (53.0%)	

Grade I hemorrhoids were more common in the Rubber Band Ligation group (56.0%), whereas Grade II hemorrhoids were more frequent in the Sclerotherapy group (62.0%). However, the difference in grade distribution between the two groups was not statistically significant ($\chi^2 = 3.25$, $p = 0.071$).

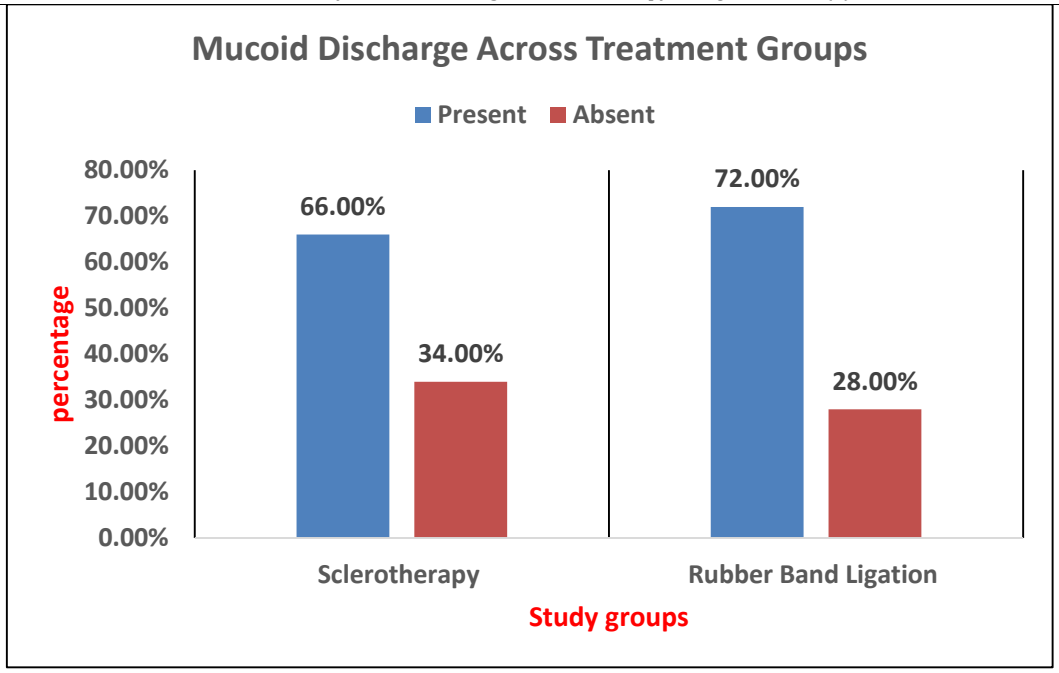
Thus, the baseline severity of internal hemorrhoids was broadly comparable between the treatment groups, although a trend toward higher Grade II cases in the sclerotherapy group was observed.



Baseline Mucoid Discharge Across Treatment Groups:

Mucoid Discharge	Sclerotherapy (n=50)	Rubber Band Ligation (n=50)	Total	χ^2, p-value
Present	33 (66.0%)	36 (72.0%)	69 (69.0%)	0.44, 0.507
Absent	17 (34.0%)	14 (28.0%)	31 (31.0%)	

Mucoid discharge was present in 66.0% of patients in the sclerotherapy group and 72.0% in the rubber band ligation group. The difference in distribution between the two treatment groups was not statistically significant ($\chi^2 = 0.44$, $p = 0.507$).



Distribution of Hemorrhoidal Columns Across Treatment Groups:

Column Involvement	Sclerotherapy (n=50)	Rubber Band Ligation (n=50)	Total	χ^2, p-value
3 o'clock	3 (6.0%)	1 (2.0%)	4 (4.0%)	5.94, 0.547
7 o'clock	18 (36.0%)	16 (32.0%)	34 (34.0%)	
11 o'clock	5 (10.0%)	7 (14.0%)	12 (12.0%)	
3 & 7 o'clock	10 (20.0%)	6 (12.0%)	16 (16.0%)	
3 & 11 o'clock	9 (18.0%)	13 (26.0%)	22 (22.0%)	
7 & 11 o'clock	5 (10.0%)	6 (12.0%)	11 (11.0%)	
3, 7 & 11 o'clock	0 (0%)	1 (2.0%)	1 (1.0%)	
Total	3 (6.0%)	1 (2.0%)	4 (4.0%)	

The involvement of hemorrhoidal columns at different anatomical positions (3, 7, and 11 o'clock, singly or in combination) showed variation between the two treatment groups. However, statistical analysis demonstrated no significant difference in the distribution of column involvement between the sclerotherapy and rubber band ligation groups ($\chi^2 = 5.94$, $p = 0.547$).

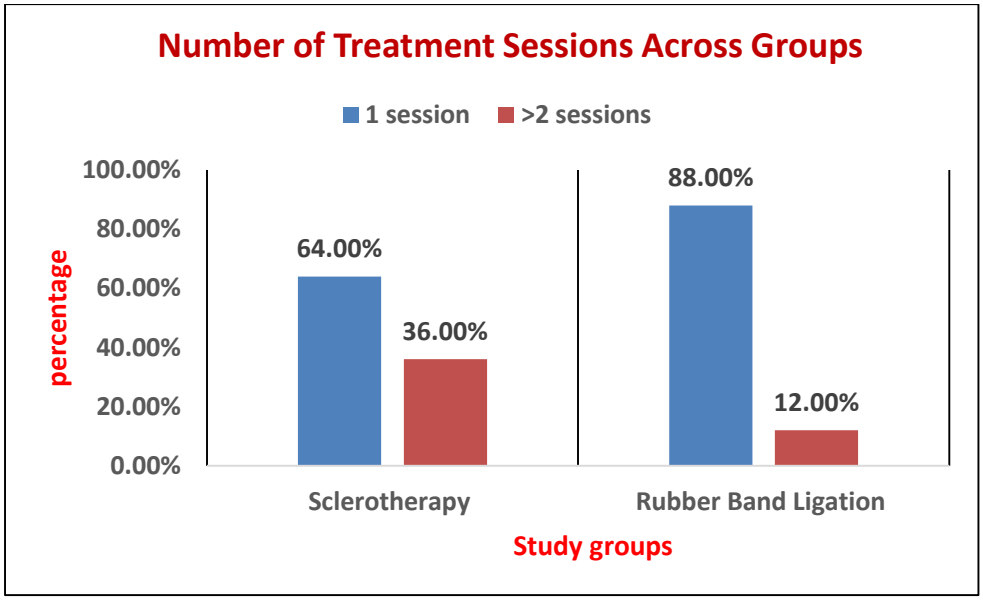
Number of Treatment Sessions Across Groups:

Sessions Required	Sclerotherapy (n=50)	Rubber Band Ligation (n=50)	Total	p-value
1 session	32 (64.0%)	44 (88.0%)	72 (72.0%)	0.007*
≥2 sessions	18 (36.0%)	6 (12.0%)	24 (24.0%)	
Total	50 (100.0%)	50 (100.0%)	100 (100.0%)	

A single treatment session was sufficient in 64% of patients undergoing sclerotherapy compared to 88% in the rubber band ligation (RBL) group. Conversely, more than two sessions were required in 36% of the sclerotherapy group versus 12% of the RBL group.

The difference was statistically significant (p = 0.007), indicating that patients treated with rubber band ligation were significantly more likely to achieve therapeutic success with fewer sessions.

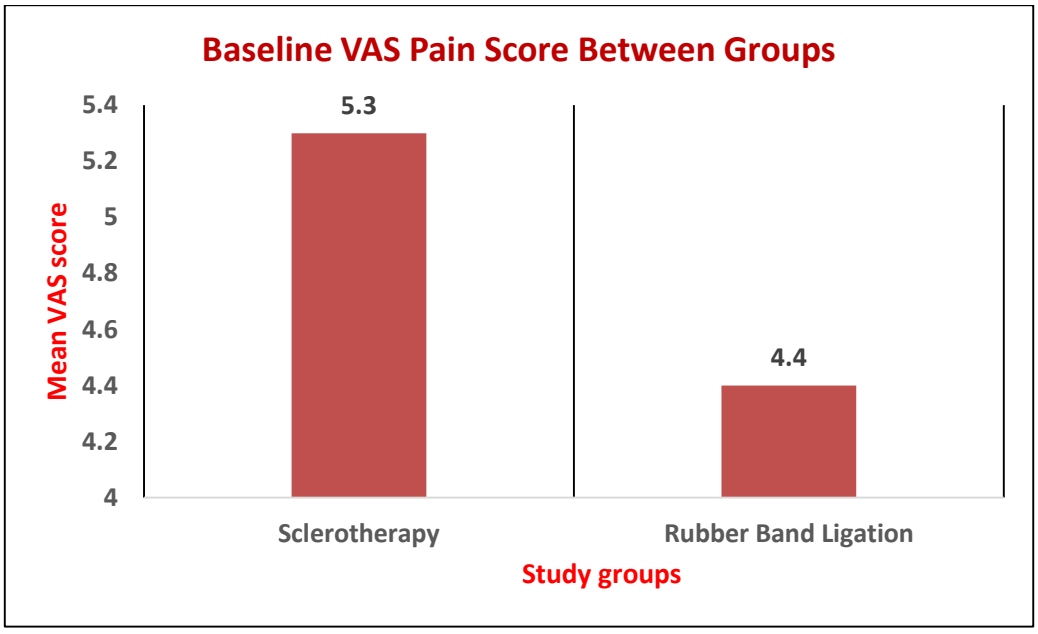
Overall, RBL demonstrates greater procedural efficiency compared to sclerotherapy.



Comparison of Baseline VAS Pain Score Between Groups:

Group	n	Mean age	t (df)	p value
Sclerotherapy	50	5.30 ± 1.10	3.98 (98)	**<0.001***
Rubber Band Ligation	50	4.40 ± 0.95		

The mean VAS pain score was significantly lower in the Rubber Band Ligation group compared to the Sclerotherapy group. This difference was **statistically significant (t = 3.98, p < 0.001)**, indicating better pain outcomes with Rubber Band Ligation

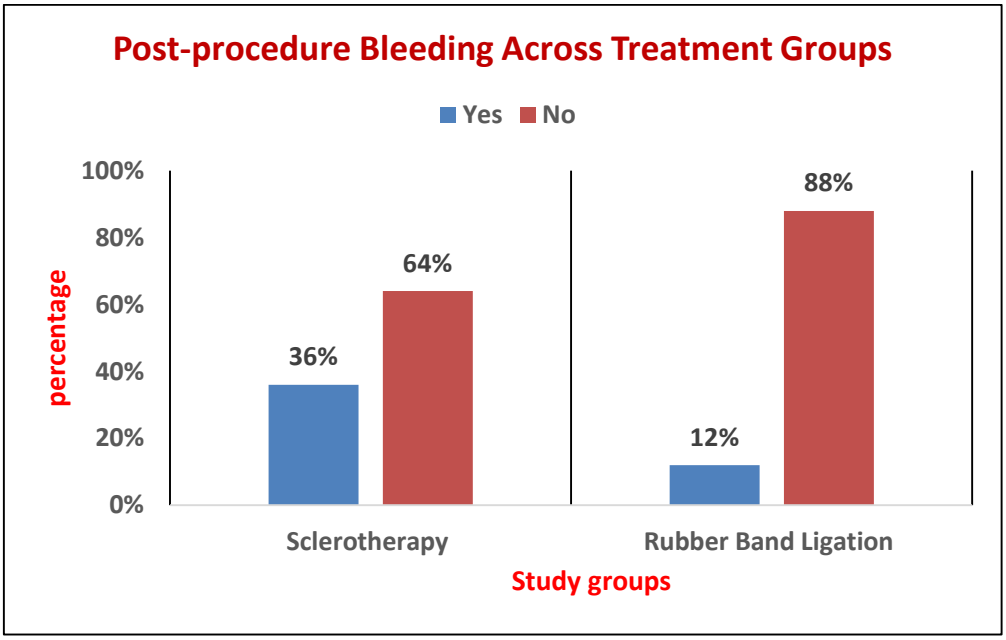


Immediate Post-procedure Bleeding Across Treatment Groups:

Immediate Bleeding	Sclerotherapy (n=50)	Rubber Band Ligation (n=50)	Total	p-value
Yes	18 (36%)	6 (12%)	24 (24.0%)	0.006
No	32 (64%)	44 (88%)	76 (76.0%)	
Total	50 (100.0%)	50 (100.0%)	100 (100.0%)	

Immediate post-procedure bleeding occurred significantly more frequently in the sclerotherapy group (36%) compared to the rubber band ligation group (12%). The difference was statistically significant (p = 0.006), indicating a clear association between treatment modality and bleeding risk.

These findings suggest that rubber band ligation is associated with a significantly lower incidence of immediate bleeding compared to sclerotherapy.



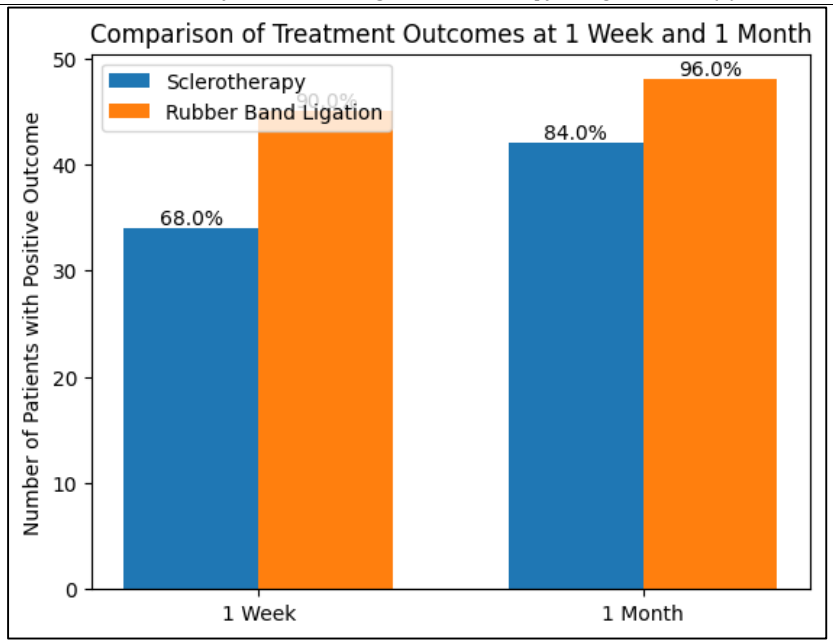
Symptom Relief at 1 Week and 1 Month:

Time Point	Outcome	Sclerotherapy (n = 50)	Rubber Band Ligation (n = 50)	Total	p-value
1 Week	Yes	34 (68.0%)	45 (90.0%)	79 (79.0%)	0.006*
	No	16 (32.0%)	5 (10.0%)	21 (21.0%)	
1 Month	Yes	42 (84.0%)	48 (96.0%)	90 (90.0%)	0.048*
	No	8 (16.0%)	2 (4.0%)	10 (10.0%)	

At **1 week**, symptom relief was significantly higher in the rubber band ligation (RBL) group (90%) compared to the sclerotherapy group (68%) (p = 0.006), indicating superior early clinical response with RBL.

At **1 month**, symptom relief remained significantly greater in the RBL group (96%) compared to sclerotherapy (84%) (p = 0.048). Although the difference narrowed over time, RBL continued to demonstrate a statistically significant advantage.

Overall, rubber band ligation provided both faster and more sustained symptom relief compared to sclerotherapy in this cohort.



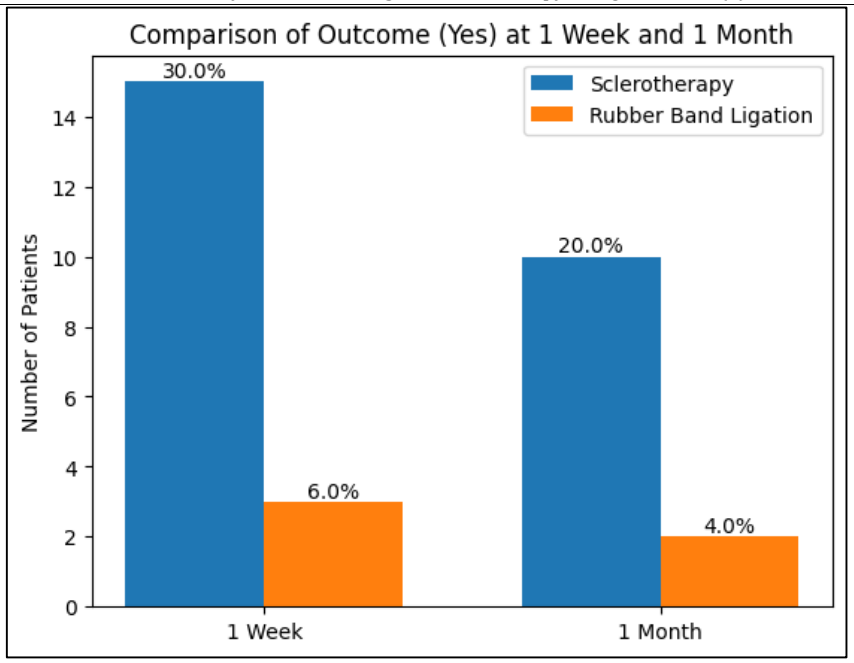
Recurrence at 2 Weeks and 1 Month:

Time Point	Outcome	Sclerotherapy (n = 50)	Rubber Band Ligation (n = 50)	Total	p-value
1 Week	Yes	15 (30.0%)	3 (6.0%)	18 (18.0%)	0.002*
	No	35 (70.0%)	47 (94.0%)	82 (82.0%)	
1 Month	Yes	10 (20.0%)	2 (4.0%)	12 (12.0%)	0.012*
	No	40 (80.0%)	48 (96.0%)	88 (88.0%)	

At **1 week**, recurrence was significantly higher in the sclerotherapy group (30%) compared to the rubber band ligation (RBL) group (6%) ($p = 0.002$).

At **1 month**, recurrence remained significantly greater in the sclerotherapy group (20%) versus the RBL group (4%) ($p = 0.012$).

These findings indicate that rubber band ligation is associated with a significantly lower recurrence rate at both early and short-term follow-up, suggesting superior durability of therapeutic response compared to sclerotherapy.



Comparison of Patient Satisfaction Scores Between Groups

Group	n	Mean age	t (df)	p value
Sclerotherapy	50	5.4 ± 1.6	−4.98 (97)	<0.001*
Rubber Band Ligation	50	7.1 ± 1.2		

Patient satisfaction scores were significantly higher in the rubber band ligation (RBL) group (7.1 ± 1.2) compared to the sclerotherapy group (5.4 ± 1.6).

The difference was statistically significant ($t = -4.98$, $df = 97$, $p < 0.001$), indicating a robust difference in patient-reported outcomes between the two treatment modalities.

These findings suggest that rubber band ligation is associated with greater patient satisfaction compared to sclerotherapy.

DISCUSSION

Hemorrhoidal disease is a common anorectal condition, and various minimally invasive procedures are available for its management [1]. This study compared sclerotherapy and rubber band ligation in patients with Grade I and II hemorrhoids to evaluate their relative efficacy and outcomes.

Both treatment groups were comparable in baseline characteristics, allowing valid comparison. The findings suggest that both treatment modalities are effective, consistent with previous studies [2,3].

Sclerotherapy was associated with minimal discomfort and ease of administration, supporting earlier reports describing it as a cost-effective outpatient procedure [4,5]. However, higher recurrence and need for multiple sessions were noted, particularly in Grade II hemorrhoids, as also reported in earlier literature [6].

Rubber band ligation demonstrated better control of symptoms, lower recurrence rates, and improved patient satisfaction. These findings align with existing studies showing superior long-term outcomes with rubber band ligation [7,8].

Overall, rubber band ligation proved superior across multiple clinical outcomes, including symptom relief, recurrence, and treatment efficiency, which is consistent with findings from other comparative studies [9,10].

Our study demonstrates that rubber band ligation is superior to sclerotherapy for grade I and II haemorrhoids across multiple clinically important outcomes including treatment sessions required, bleeding complications, symptom relief, recurrence, and patient satisfaction. These findings align with the preponderance of published evidence, though variations across studies highlight the importance of technique and patient selection.

The consistency of our findings with studies from diverse geographic settings. The alignment with international studies further supports generalizability.

For clinicians managing grade I-II haemorrhoids, our study provides strong evidence that rubber band ligation should be the office procedure of choice when feasible,

offering patients better outcomes with fewer treatment sessions and higher satisfaction. Sclerotherapy remains a valid option but appears inferior across most outcome measures, perhaps best reserved for specific clinical situations or patients who decline RBL.

SUMMARY

- This prospective comparative study evaluated the efficacy and outcomes of sclerotherapy versus rubber band ligation (RBL) in the management of grade I and II haemorrhoids among 100 patients (50 per group).

Baseline Characteristics:

- The study established excellent baseline comparability between groups. The mean age was 40.70 ± 12.66 years in the sclerotherapy group and 45.28 ± 13.87 years in the RBL group, with no statistically significant difference (p=0.088). Males predominated in both groups (84% vs 76%), yielding 80% males overall, with no significant gender difference between groups (p=0.317).
- Regarding disease characteristics, grade II haemorrhoids were more frequent in the sclerotherapy group (62.0%) while grade I was more common in the RBL group (56.0%), though this difference was not statistically significant (p=0.071). Mucoid discharge was present in 66.0% and 72.0% of patients respectively (p=0.507). The anatomical distribution of hemorrhoidal columns (3, 7, and 11 o'clock positions, singly or in combination) showed no significant difference between groups (p=0.547). Baseline VAS pain scores were also comparable (4.80 ± 1.14 vs 4.92 ± 1.05, p=0.585).

Treatment Efficiency:

- A statistically significant difference emerged in treatment sessions required. Single-session success was achieved in 64% of sclerotherapy patients compared to 88% in the RBL group. Conversely, 36% of sclerotherapy patients required more than two sessions versus only 12% in the RBL group (p=0.007), demonstrating superior procedural efficiency for rubber band ligation.

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