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**Original Research Article**

# Application of rubber band ligation as a treatment of internal hemorrhoids

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## ABSTRACT

**Background:** Aim was to more than three-quarters of the whole population will experience complaints of hemorrhoids at some point in their lifetime. The treatment of internal hemorrhoids includes medical, minimally invasive and surgical treatments. The aim of the study was to evaluate the data of patients who were applied with rubber band ligation (RBL) as a minimally invasive treatment method of internal hemorrhoids.
**Method:** The study conducted in the gastroenterology department of Izmir Tepecik training and research hospital between December 2015 and December 2019. Demographic and laboratory data of the patients, the success and the complications rates of the procedure were evaluated retrospectively .
**Results:** Evaluation was carried out in 45 consecutive patients, comprising 23 (51.1%) females and 22 (48.9%) males with a mean age of 54.62±7.82 years (range, 40-82 years). Procedural success rate was 91.1% and failure of treatment was seen in 8.9% of the patient. Recurrence rate of RBL procedure determined with control rectoscopy was found as 5.26% at 1 year follow-up. No major complications developed in any patient. Significant correlation was determined between the development of bleeding and the use of anticoagulants and anti-aggregants (p=0.003). No significant relationship was seen between the number of band ligation procedures and the development of complications (p=0.275).
**Conclusions:** The application of RBL, which is widely used in the treatment of internal hemorrhoids, is a reliable and low-cost method that shortens the length of stay in hospital, which can be preferred in patients with high comorbidity risk for surgery.

**Keywords:** Rubber band ligation, Hemorrhoids, Rigid anoscope

## INTRODUCTION

More than three-quarters of the whole population will experience complaints of hemorrhoids at some point in their lifetime. It is seen more in males than females and approximately half of those over the age of 50 years require medical treatment.[1] The risk factors for the development of hemorrhoids include a low-fibre diet, chronic constipation, alcohol consumption, obesity, low levels of physical activity, pregnancy, and advanced age.[2,3] Hemorrhoids are evaluated in two groups as internal or external. Those which are located proximal of the dentate line, which is the line between the columnar epithelium of the rectum and the multi-layer smooth epithelium of the anal canal are called internal hemorrhoids and those located distally from this line are known as external hemorrhoids. Internal hemorrhoids are covered with non-sensitive anorectal mucosa. Internal hemorrhoids may present in the form of a palpable lesion prolapsed from the anus and with clinical complaints such as bleeding and itching. They do not cause pain unless there is thrombosis and the development of necrosis.[4] The treatment of internal hemorrhoids includes medical, minimally invasive and surgical treatments. For patients who do not respond to medical treatment, minimally invasive procedures should be selected before

surgery as these are reliable and low-cost methods that do not require hospitalisation. These methods include hemorrhoid elastic band ligation, injection therapy (sclerotherapy) and coagulation (infrared, laser or bipolar cauterisation). The most widely used minimally invasive procedure with the highest success rates is elastic band ligation. Following band ligation, ischaemia develops in the hemorrhoid pocket which prevents bleeding, and this area heals with fibrosis.[5] In 90% of patients with symptomatic internal hemorrhoids, treatment is successful with medical treatment and minimally invasive methods.[6]

The aim of this study was to evaluate the data of patients who presented at our centre with complaints of internal hemorrhoids and were applied with hemorrhoid band ligation as a minimally invasive treatment method.

## METHODS

The study included patients who were applied with elastic band ligation as internal hemorrhoid treatment in the gastroenterology department of Izmir Tepecik training and research hospital between December 2015 and December 2019. Retrospective evaluation was made of patient demographic data, laboratory data, the success of the procedure applied and complications that developed after the procedure. Band ligation treatment was applied to all the patients by a single endoscopist using a Heine anoscope and Rudd hemorrhoid ligator (Figure 1). After successful RBL procedure, patients were checked for failure of treatment and recurrence at 1 month and 1 year with rectosigmoidoscopy. Failure of treatment was defined as persisted symptoms beginning 1 month after ligation. Recurrence was defined as re-detection of internal hemorrhoids in rectosigmoidoscopy performed at end of 1 year.

**Figure 1: The heine rigid anoscope and rudd hemorrhoid ligator and light set used in the hemorrhoid band ligation procedure.**

### *Statistical analysis and ethics*

Data obtained in the study were analyzed statistically using SPSS vn. 20 software. Conformity of the data to normal distribution was assessed with the Kolmogorov-Smirnov test. Variables showing normal distribution were evaluated with the independent Samples t-test, and those not showing normal distribution were applied with the non-parametric Mann Whitney U-test. The chi-square test was used in the analysis of categorical data. Continuous variables were stated as mean±standard deviation (SD), minimum and maximum values, and categorical data as number (n) and percentage (%). A value of $p<0.05$ was accepted as statistically significant. The study was conducted in accordance with the latest version of the declaration of Helsinki. All subjects were informed about the study protocol, and written informed consent was obtained from each volunteer. Approval for the study was granted by the medical ethics committee.

## RESULTS

Evaluation was made of 45 patients, comprising 23 (51.1%) females and 22 (48.9%) males with a mean age of 54.62±7.82 years (range, 40-82 years). The complaints on presentation were rectal bleeding in 30 (66.7%) patients, itching in 9 (20%) and lesions in the anal region in 6 (13.3%). Demographic and clinical characteristics of the patients are represented in Table 1. Internal hemorrhoids were determined of grade 2 in 11 (24.4%) patients, grade 2-3 in 12 (26.7%) and grade 3 in 22 (48.9%). The band ligation procedure was applied once to 21 (46.7%) patients, twice to 19 (42.2%) and 3 times to 5 (11.1%). To the patients who underwent the procedure more than once, the band ligation was applied again after an interval of 2 weeks. During the procedure, lidocaine spray was used as local anaesthetic.

For local antibotherapy after the procedure, all the patients were administered kemicetine (chloramphenicol) vaginal suppositories rectally for 5 days. Total colonoscopy was performed on all patients in respect of accompanying colon disease. As a result of the colonoscopy, 5 patients were determined with diverticulitis and 4 with colon polyps. Polypectomy was applied to the 4 patients with polyps and all were reported as benign in the pathology examination.

Patients with findings such as anal fissure, rectum ulcer, inflammatory bowel disease, anal fistula, or perianal abscess were excluded from the study. One or more than one concomitant chronic systemic disease was present in 34 (75.6%) patients, and no chronic disease was determined in 11 (24.4%) patients. The chronic systemic diseases were determined as hypertension in 12 patients, diabetes mellitus in 9, atrial fibrillation in 8, coronary artery disease in 3, chronic obstructive pulmonary disease in 4, chronic renal failure in 3 (1 patient with kidney transplantation), aortic valve replacement in 2, a history of cerebrovascular event in 2, and cirrhosis of liver in 1.

**Table 1: Demographic characteristics of the patients.**

| Demographic characteristics | |
|---|---|
| **Age (years)** | 54.62±7.82 (40-82) |
| **Gender** | Female (23%, 51.1) |
| | Male (22%, 48.9) |
| **Complaint on presentation** | Rectal bleeding (n=30) (66.7%) |
| | Itching (n=9) (20%) |
| | Palpable lesion (n=6) (13.3%) |
| **Hemorrhoid grade** | Grade 2 (n=11) (24.4%) |
| | Grade 2-3 (n=12) (26.7%) |
| | Grade 3 (n=22)_ (48.9%) |
| **Comorbid diseases** | Hypertension (n=12) |
| | Diabetes mellitus (n=9) |
| | Atrial fibrillation (n=8) |
| | Coronary artery disease (n=3) |
| | Chronic obstructive pulmonary disease (n=4) |
| | Chronic renal failure (n=3) (1 patient with kidney transplantation) |
| | Aortic valve replacement (n=2) |
| | Cerebrovascular event (n=2) |
| | Cirrhosis of the liver (n=1) |
| **Anticoagulant-anti-aggregant use** | Oral anticoagulant (n=12) (26.7%) |
| | Anti-aggregant (n=6) (13.3%) |

In 2 patients there was a history of left hemicholectomy operation because of a mass in the left colon. Oral anticoagulants and/or anti-aggregants (clopidogrel and aspirin) were being used by 12 (26.7%) patients. Before the procedure, thrombocyte count was >100,000 and the INR value was <1.5. In the patients with atrial fibrillation and aortic valve replacement, the oral anti-coagulants used before the procedure were bridged with low-molecular weight heparin treatment and they were admitted for the procedure when the INR value was seen to be <1.5. At 1 hour before the procedure, intravenous ampicillin antibotherapy was administered as prophylaxis to the two patients with aortic valve replacement. The treatments of patients using anti-aggregants were terminated 5 days before the procedure. In the evaluation of complications that developed after the procedure, they were determined as pain in the anal region continuing for 3-4 days after the procedure in 8 patients, mild rectal bleeding around the 10$^{th}$ day in 7 patients, and difficulty in urinating for a few days in 6 patients. No complication developed after the procedure in 24 (53.33%) patients.

A statistically significant relationship was determined between the presence of chronic disease and the development of complications (p=0.007). No statistically significant difference was determined in the development of complications according to gender (p=0.877), age (p=0.567), or repeated application of band ligation (p=0.275). A statistically significant positive corrrelation was determined between the use of anti-aggregants/anticoagulants and the development of bleeding after band ligation (p=0.003).

No major complications were observed in any patient in this series. In all the patients, symptoms were brought under control after hemorrhoid band ligation. In rectoscopy examination made at 1 months after ligation, grade 1 hemorrhoid was still present in 4 patients. According to this result, the success rate of RBL was 91.1% and failure of treatment was seen in 8.9% of the patient. At 1 year after the RBL procedure, 38 patients undergo rectoscopy evaluation in respect of recurrence while 3 patients lost on follow-up. In 36 of these 38 patients with successful treatment, no hemorrhoid was determined. 1 year RBL recurrence was seen in 2 (5.26%) patients; 1 patient at grade 1, and 1 patient at grade 2. Neither of these 2 patients had any symptoms. Procedural success rate at 1 year was found as 94.74%.

## DISCUSSION

The application of band ligation is a widely used treatment method for internal hemorrhoids which do not respond to medical treatment. Compared to surgical treatment, the length of stay in hospital is shorter, and fewer complications develop with band ligation treatment. In addition, band ligation is a reliable and low cost method which can be preferred for patients with comorbid systemic disease at high surgical risk. There are significant advantages of no requirement for general anaesthesia or total colon cleaning before the procedure.[7] The long-term efficacy of hemorrhoid band ligation treatment is higher compared to the other minimally invasive methods of sclerotherapy and infrared coagulation.[8] In literature, the success rate of band ligation has been reported to vary between 69% and 97%.[9] In the current study, the success rate of band ligation was found to be 91.11%, and thus significant success was achieved in hemorrhoid treatment. Different techniques can be used in the application of band ligation. Using a flexible endoscope, band ligation can be applied in retroflexion, or band ligation methods can be applied using a band ligator with a rigid proctoscope.[10] Although many band ligations can be applied in a single procedure with a flexible endoscope, this method has the disadvantages of being more expensive and more pain is experienced after the procedure. There is no evident superiority of either of these two methods over the other.[11] In the current study, a rigid anoscope and hemorrhoid ligator set were used for band ligation. The hemorrhoid grade is important in patients to be applied with band ligation. This procedure is suitable for grade 1, 2, and 3 hemorrhoids, and band ligation is contra-indicated in grade 4 hemorrhoids. The degrees of prolapse of internal hemorrhoids are shown in Table 2.

The application of local anaesthesia during ligation is important for pain control. However, previous studies have reported that this is not effective for pain that develops after the procedure.[12] In the current study,

lidocaine spray was used with the aim of reducing pain during the procedure, and patient comfort in respect of pain was achieved. Some complications, defined as minor and major complications, may develop following the hemorrhoid band ligation procedure.[13] Mild bleeding, pain, tenesmus, vasovagal symptoms, band dislocation, priapism, difficulty in urinating, anal fissure, and chronic ulcer are minor complications which may be seen after the procedure. Massive bleeding, hemorrhoid thrombosis, severe pain, urinary retention of a severity requiring catheterisation, Fournier's gangrene, pelvic abscess, tetanus, and infectious states such as bacterial endocarditis are major complications which may be seen after hemorrhoid band ligation. Previous studies have reported the probability of development of complications following hemorrhoid band ligation as 3%-18.8%.[14,15] In current study, no major complications developed, but minor complications were seen in some patients.

**Table 2: Classification of internal hemorrhoids.**

| Grade | Hemorrhoid anal canals |
|---|---|
| **Grade 1** | Hemorrhoid during defecation and prolapses outside the anus with straining but spontaneously recedes |
| **Grade 2** | Hemorrhoid during defecation and prolapses outside the anus with straining, and has to be pushed back inside with the hand |
| **Grade 3** | Hemorrhoid emerges outside the anus, cannot be pushed inside with the hand and there is a risk of strangulation. It is extremely painful. |

The most common complications that develop are pain and bleeding. Severe bleeding may be seen in patients using anti-platelets and anti-aggregants during falling of the band on the 10-14$^{th}$ days.[16] In up to 25-50% of patients, mild pain may be seen in the first 48 hours after ligation.[12] In the current study, the development of pain and bleeding were seen most often after hemorrhoid band ligation, consistent with the findings in literature. No severe bleeding developed in any patient of the current series although mild rectal bleeding that did not require intervention was observed in 7 patients.

Consistent with the data in literature, a significant correlation was determined in the current study between the development of bleeding and the use of anticoagulants and anti-aggregants (p=0.003). It has been reported in literature that complications such as pain and tenesmus are determined more in patients with a need for more than one band ligation than in patients applied with ligation once only.[17] However, in this study, no significant relationship was seen between the number of band ligation procedures and the development of complications (p=0.275). In a study by Su et al, the recurrence rate at the end of 1 year was determined as 3.7%.[18] This rate in our study was found to be 5.26% at the end of the first year.

## CONCLUSION

In conclusion, hemorrhoid band ligation is a low-cost method which can be easily applied with low complication rates. It can be safely selected for cases with relatively high surgical morbidity risk. There is a need for these findings to be supported by further studies of elderly patients and patient with high comorbidities.

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