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Original Research Article

# Outcomes of open and ligasure hemorrhoidectomy in Grade III and IV hemorrhoids – A prospective study

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## Abstract

**Background:** Hemorrhoids are enlarged anal cushions causing rectal bleeding and classified by location and prolapse degree. Treatments range from dietary changes to surgery. LigaSure, a vessel-sealing device, offers advantages over conventional hemorrhoidectomy, including less blood loss, reduced pain, and faster recovery. This study compares LigaSure's efficacy with traditional surgical methods.

**Materials and Methods**: A randomized controlled hospital-based comparative study was conducted in a tertiary care hospital in Amritsar, Punjab. Patients aged 20–70 years with hemorrhoids, meeting the inclusion criteria, were enrolled after obtaining informed consent. Exclusion criteria included inflammatory bowel diseases, previous anal surgery, local pathology, recent anticoagulant use, and pregnancy. A total of 80 eligible patients were randomized into two equal groups (40 each) using One EPI software. Group A underwent Milligan & Morgan hemorrhoidectomy, while Group B was treated with LigaSure. Patients were assessed for anal pain, discomfort, bleeding, recurrence and bowel control. Anorectal examinations were performed to evaluate edge edema, wound healing and anal stenosis.

**Result:** A total of 80 patients were randomized into two groups of 30 each. Group A underwent Milligan-Morgan hemorrhoidectomy, while Group B underwent LigaSure hemorrhoidectomy. The mean age was $45.05 \pm 13.94$ years in Group A and $41.92 \pm 15.93$ years in Group B. The average operative time was significantly shorter in the LigaSure group (16.33 minutes) compared to the conventional group (26.65 minutes) ($P = 0.001$). Mean intraoperative blood loss was also lower in the LigaSure group (15.2 ml) versus the Milligan-Morgan group (69.18 ml). According to the Wong-Baker pain scale at 12 and 24 hours postoperatively, patients in the LigaSure group reported significantly less pain than those in the conventional group.

**Conclusion:** Ligasure hemorrhoidectomy is a safer surgical procedure as it has less postoperative pain. Also, operative time and blood loss during surgery is less in ligasure hemorrhoidectomy than in conventional hemorrhoidectomy.

**Keywords:** Hemorrhoids, LigaSure, Milligan & Morgan.

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## 1. Introduction

Hemorrhoids are defined as the symptomatic enlargement and distal displacement of the normal anal cushions. The most common symptom of hemorrhoids is rectal bleeding associated with bowel movement. The abnormal dilatation and distortion of the vascular channel, together with destructive changes in the supporting connective tissue within the anal cushion, is a paramount finding of hemorrhoids.[1]

Hemorrhoids are generally classified on the basis of their location and degree of prolapse. Internal hemorrhoids originate from the inferior hemorrhoidal venous plexus above the dentate line[2] and are covered by mucosa, while external hemorrhoids are dilated venules of this plexus located below the dentate line and are covered with squamous epithelium. Mixed (internoexternal) hemorrhoids arise both above and below the dentate line. Internal hemorrhoids are further graded based on their appearance and degree of prolapse, known as Goligher's classification:[3]

1. First-degree hemorrhoids (Grade I): The anal cushions bleed but do not prolapse;
2. Second-degree hemorrhoids (Grade II): The anal cushions prolapse through the anus on straining but reduce spontaneously;
3. Third-degree hemorrhoids (Grade III): The anal cushions prolapse through the anus on straining or

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exertion and require manual replacement into the anal canal; and.

4. Fourth-degree hemorrhoids (Grade IV): The prolapse stays out at all times and is irreducible.

*1.1. There are theories describing hemorrhoid:4*

1. Varicose vein and portal hypertension. John Hunter (1848) in accordance to Hunterian Museum Descriptive Catalogue found that hemorrhoids found secondary to dilated veins as the impact of increased the pressure of local veins in addition to local defect of veins wall. Increased pressure of the local vein found as impairment or absence of valves in portal vein and its branches which related to vein system in anal canal. Any defect of portal vein lead to stagnation of flow in hemorrhoid plexus.

2. Vascular hyperplasia. This explain that the anal protrusion as the results of tissue metaplasia. According to Virchow and Allingham, hemorrhoids indeed is a hemangioma as there is a similarity to cavernous hemangioma.

3. Prolapse of anal cushion. Anal cushion protruded due to degenerated supporting tissue of anal canal.[5] Study showed fragmentation of supporting tissue let the anal cushion prolapsed permanently or temporarily which is might be reduced manually. The submucosal smooth muscle which is supporting tissue prevents the anal cushion prolapse. Such a theory described is held nowadays as the rationale for the current treatment.

First-line conservative treatment of hemorrhoids consists of a high-fiber diet[4] (25 to 35 g per day), fiber supplementation, increased water intake, warm water (sitz) baths, and stool softeners. Warm water baths decrease pain temporarily.[4] There are multiple topical overthecounter hemorrhoid remedies.[6] These may provide temporary relief, but most have not been studied for effectiveness or safety for long-term use. Office-based and surgical procedures can effectively treat hemorrhoids refractory to medical therapies.

In general, the lower the grade, the more likely an office-based procedure will be successful, whereas recurring and grade III or IV hemorrhoids are more amenable to excisional hemorrhoidectomy. Surgical excision is primarily accomplished through closed hemorrhoidectomy or open hemorrhoidectomy. Conventional hemorrhoidectomy has been modified to include two alternative energy devices, Ligasure and Harmonic Scalpel, which use diathermy and ultrasonic energy, respectively, to limit blood loss and postoperative pain as the instruments cut through tissue.

**Figure 1:** Ligasure device

Moreover, LigaSure seals a vessel with a diameter of up to 7mm, and the mean operative time is reduced to a great extent.[7] One added advantage in the implication of LigaSure is an automated vessel sealing device associated with minimal tissue bleeding and damage with reduced postoperative pain and a shorter duration required to return to normal activities. The study aims to compare the efficacy of LigaSure hemorrhoidectomy with conventional methods of haemorrhoidectomy.

## 2. Materials and Methods

Randomized control hospital based comparative study as conducted in the Department of General Surgery at tertiary care hospital, Amritsar, Punjab. Patients were selected for this study for a limited time period. Patients (20-70 years of age) presenting with hemorrhoids who fit into inclusion criteria were taken into study after an informed consent explaining the full details about the operative procedure. Patients with history of inflammatory bowel diseases, previous anal surgery, local pathology, recent use of anticoagulation and pregnant females were excluded from the study.

80 Patients fulfilling the inclusion criteria were randomized using One EPI software to create 2 groups of equal size (40). Patients were allocated group A/B. Group A patients underwent Milligan & Morgan haemorrhoidectomy and patients in group B were treated with LigaSure. Patients were discharged 2 – 5 days postoperatively according to their condition. On post op day 1 rectal packing was removed, following which symptoms of anal pain and/or discomfort, bleeding, recurrence of the original complaint(s) and control of flatus and stool was inquired during the hospital stay. Anorectal examination was carried out, inspecting for edge edema, wound healing and anal stenosis. Follow-up visits were planned at 1,2,3,4 weeks.

## 3. Results

A total of 80 patients were randomized into two groups containing 40 patients each. **Table 1** indicates the demographic profile of the patients enrolled in the study. Group A patients underwent Milligan morgan hemorrhoidectomy, and Group B patients underwent Ligasure hemorrhoidectomy. The mean age calculated in both groups was 45.050±13.94 yrs (group A) and 41.92±15.93 yrs (group B).

**Table 1:** Comparison between gender and degree of hemorrhoids between group A and group B

| Variables | Group A (Milligan Morgan) | Group B (Ligasure) |
|---|---|---|
| Gender Male | 28 | 32 |
| Female | 12 | 8 |
| Degree of Hemorrhoids | | |
| 3rd Degree | 37 | 35 |
| 4th Degree | 3 | 5 |

In the Ligasure group, the average time of surgery was16.325 minutes, whereas 26.650 minutes in the other group, with a statistically significant difference (P = 0.001). The mean blood loss in the Ligasure group was 15.200 ml compared to 69.175 ml for conventional hemorrhoidectomy. According to wong baker scale of pain 12hrs and 24 hrs postoperatively, patients in the LigaSure group experienced significantly lower postoperative pain compared to those in the Milligan & Morgan group.

**Table 2:** Comparison of average operative time and blood loss during surgery between group A and group B

| Variables | Group A (Milligan Morgan) | Group B (Ligasure) |
|---|---|---|
| Average Operative Time (minutes) | 26.650 min | 16.325 minutes |
| Average blood loss (ml) | 69.175 ml | 15.200 ml |

## 4. Discussion

In recent years, conventional methods have been implied to treat grade 4 and 3 haemorrhoids. The old conventional methods are associated with a high risk of complications. However, various new modalities have been explored in recent years to reduce the risk of per-operative and postoperative complications. One method uses LigaSure devices,[7] which can coagulate a vessel up to a diameter of 7mm. Which significantly reduces the risk of per-operative and postoperative bleeding. The additional benefit of using LigaSure is less mean operative time, less blood loss and less pain score assessed by the wong baker scale.

Post operative pain based on Wong Baker scale at 12 and 24 hrs and post operative pain at POD-3 was significantly reduced in patients who underwent ligasure hemorrhoidectomy compared to patients who underwent milligan morgan hemorrhoidectomy.

According to study conducted by Baig AA et al[8] in 2022 patients who underwent ligaSure hemorrhoidectomy had a significantly lower postoperative pain scores (4.20±0.88 vs. 5.23±0.89; p=0.000) compared to the milligan morgan group.

Similar results was shown by study done by Ahmed Talha et al[9] 180 patients who were randomized to Ligasure, Harmonic Scalpel and diathermy haemorrhoidectomy, 60 patients for each group. The median number of analgesic ampoules during the first 24 h post-operatively was lower in the Ligasure and Harmonic Scalpel groups (P < 0.001).

Studies conducted by Onur Gülseren M et al[10] (2015), Aslam S et al.[11] (2019), Amir A et al.[12] (2023), Bibi S et al.[13] (2023), Mustapha B et al.[14] (2024), Ahmed M et al.[15] (2020), Alhamdany A et al.[16] (2022) also compared ligasure and milligan morgan hemorrhoidectomy and showed reduced postoperative pain in patients who underwent ligasure hemorrhoidectomy.

Our study is in agreement with most studies which emphasized significant difference in pain in milligan morgan and ligasure hemorrhoidectomy.

In our study mean duration of surgery in milligan morgan hemorrhoidectomy was 26.65 ± 3.26 minutes whereas in ligasure hemorrhoidectomy mean duration was 16.33 ± 3.56 minutes making it statistically significant with p value of 0.001.

**Table 3:** Showing comparison of time taken for surgery

| Author | Mean Time Taken | | 'p' value |
|---|---|---|---|
| | Group A (Milligan Morgan) | Group B (Ligasure) | |
| El Sisi AA et al.[17] (2015) | 21.7 ± 4.3 min | 6.6 ± 4.3 min | < 0.001 |
| Bibi S et al.[13] (2023) | 51.7 ± 2.60 min | 38.4 ± 2.77 min | < 0.00001 |
| Mustapha B et al.[14] (2024) | 34.19 min | 18.04 min | 0.0001 |
| Abdulrahman Mohammed Abdullatif et al.[18] (2021) | 17.28 min | 9.85 min | < 0.001 |

Our results are in agreement with most of results in literature where statistically significant reduction in operative time is seen in ligasure hemorrhoidectomy than conventional open haemorrhoidectomy. This is because of less damage to tissues, better haemostasis, and more local control of the surgical site in ligasure hemorrhoidectomy than conventional haemorrhoidectomy.

1. Blood Loss During Surgery
2. According to our study, mean blood loss during milligan morgan hemorrhoidectomy is 69.18 ± 11.81 mL, whereas in ligasure hemorrhoidectomy is 15.20 ± 3.22 mL which shows significantly less blood loss during ligasure hemorrhoidectomy (p value- 0.001).

**Table 4:** Showing comparison of time taken for surgery

| Author | Mean Blood Loss During Surgery (ml) | | 'p' value |
|---|---|---|---|
| | Group A (Milligan Morgan) | Group B (Ligasure) | |
| El Sisi AA et al.[17] (2015) | 22.2 ± 6.58 ml | 1.2 ± 1.6 ml | 0.0001 |
| Aslam S et al.[19] (2019) | 4.83 ± 4.44 mL | 2.47 ± 1.22 mL | 0.0001 |
| Mustapha B et al.[14] (2024) | 26.5 mL | 10.0 mL | 0.0001 |
| Naz S et al.[20] (2015) | 83.59 ± 34.34 ml | 124.84 ± 37.56 ml | |
| Abdulrahman Mohammed Abdullatif A f et al.[18] (2021) | 65 ml | 17 ml | 0.001 |

In our study the mean blood loss in ligasure haemorrhoidectomy was less than in conventional open haemorrhoidectomy because 'ligasure' coagulates tissue before cutting, thus preventing bleeding, whereas conventional scissors cut and induce bleeding. And our results were similar to previous studies conducted as mentioned above.

## 5. Conclusion

Ligasure hemorrhoidectomy is a safer surgical procedure as it has less postoperative pain. Also, operative time and blood loss during surgery is less in ligasure hemorrhoidectomy than in conventional hemorrhoidectomy.

## 6. Conflict of Interest

None.

## 7. Source of Funding

None.

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