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Laser haemorrhoidectomy vs LIGASURE haemorrhoidectomy - A comparison of outcomes of the contemporary treatment modalities of grade 2-3 haemorrhoids and its correlation with patient compliance

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ABSTRACT:

Introduction: Haemorrhoids, a common disorder that seriously impairs the quality of life and causes great pain. LIGASURE and laser haemorrhoidectomy have become popular modern treatments for Grade 2-3 haemorrhoids among available techniques. However, little is known about the relative effectiveness, safety, and effect on patient compliance of these modalities. This study aims to close this gap by thoroughly examining the outcomes and their relationship with patient compliance after laser and LIGASURE haemorrhoidectomy.

Methodology: This prospective, observational compared the outcomes of LIGASURE and laser haemorrhoidectomy procedures in 20 patients diagnosed with Grade 2-3 haemorrhoids, with 10 patients allocated to each treatment group. Data collection included preoperative assessments, intraoperative observations, and postoperative follow-up evaluations, focusing on pain scores, postoperative bleeding, wound healing, and changes in haemorrhoid volume and stage. Patient compliance was assessed using a standardized questionnaire-based scoring system. Statistical analyses involved descriptive statistics and comparative analyses using t-tests, chi-square tests, and regression analyses.

Results: The laser group showed significantly lower intraoperative bleeding (mean 6 ml vs. 15 ml, $p = 0.02$) and less postoperative pain (Day 1: mean 2.5 vs. 4.5, $p = 0.01$; Day 7: mean 0.5 vs. 3.0, $p = 0.03$). Wound healing was faster in the laser group (1-3 days vs. 6-7 days, $p = 0.02$), and haemorrhoid volume reduction was greater (6 vs. 12 arbitrary units). Patient compliance was higher in the laser group (mean score 9.0 vs. 8.5), with 100% follow-up attendance compared to 90% in the LIGASURE group.

Conclusion: Laser haemorrhoidectomy demonstrated superior outcomes in terms of reduced intraoperative bleeding, lower postoperative pain, faster wound healing, and better patient compliance compared to LIGASURE haemorrhoidectomy. Despite a shorter operative time for LIGASURE, the overall benefits of laser haemorrhoidectomy suggest it may be a more effective option for managing Grade 2-3 haemorrhoids, thereby enhancing patient care and guiding clinical practice.

KEYWORDS

Laser haemorrhoidectomy, LIGASURE haemorrhoidectomy, contemporary techniques, haemorrhoidectomy techniques, grade 2 & 3 haemorrhoids, patient compliance, laser surgery

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INTRODUCTION:

Millions of people suffer from haemorrhoids, a common disorder that seriously impairs patients' quality of life and causes great pain [1]. LIGASURE and laser haemorrhoidectomy have become popular modern treatments for Grade 2-3 haemorrhoids among available techniques. Still little is known about the relative effectiveness, safety, and effect on patient compliance of various modalities [2,3]. This work attempts to close this gap by doing a thorough examination of the results and their relationship with patient compliance after laser haemorrhoidectomy and LIGASURE.

Known by another name, piles, haemorrhoids are caused by the distension of vascular structures in the rectal region, which causes prolapse, pain, and bleeding. Often requiring surgery to relieve symptoms and stop the condition from worsening, grade 2-3 haemorrhoids are typified by bleeding and prolapse with spontaneous decrease [4]. Open hemorrhoidectomy is one of the conventional surgical techniques that has been linked to postoperative pain, a protracted recovery, and problems including anal stenosis and incontinence [5]. In response, the claimed benefits of less postoperative discomfort, faster recovery periods, and fewer complication rates have made minimally invasive procedures like LIGASURE and laser haemorrhoidectomy more popular [6].

Comparative research on LIGASURE and laser haemorrhoidectomy is few, particularly when it comes to Grade 2-3 haemorrhoids. Through the provision of an evidence-based understanding of the relative effectiveness and safety of these modern treatment methods, this study is essential to guide clinical practice. Moreover, it is crucial to investigate their effect on patient compliance because following postoperative care plans greatly affects patient satisfaction and treatment results. Through the clarification of the link between surgical results and patient compliance, this study seeks to better patient experiences, optimise treatment plans, and boost long-term clinical results for those with Grade 2-3 haemorrhoids.

The present knowledge gaps in the comparison of the results of laser haemorrhoidectomy and LIGASURE for Grade 2-3 haemorrhoids and their relationship with patient compliance are the aim of this study. Through a thorough understanding of these modern therapeutic techniques, our study seeks to direct clinical decision-making, increase patient care, and eventually improve the management of this common and difficult illness.

OBJECTIVES:

- To evaluate and compare intraoperative bleeding outcomes between the two surgical modalities.
- To assess and compare the extent of post-operative reduction in haemorrhoid volume following LIGASURE and laser haemorrhoidectomy.
- To investigate and compare the degree of post-operative reduction in the haemorrhoid stage between the two treatment approaches.
- To compare rates of postoperative bleeding between patients undergoing LIGASURE and laser haemorrhoidectomy.

- To analyze and compare wound healing outcomes following LIGASURE and laser haemorrhoidectomy procedures.
- To evaluate patient compliance through the administration of a questionnaire-based scoring system to assess adherence to postoperative care protocols and follow-up appointments.

METHODOLOGY:

This prospective, observational study design was conducted to systematically evaluate and compare the outcomes of LIGASURE and laser haemorrhoidectomy procedures in patients diagnosed with Grade 2-3 haemorrhoids. By employing a prospective approach, the study aimed to gather real-time data on surgical outcomes and patient experiences, thereby minimizing bias and enhancing the reliability of findings. The observational nature of the study allowed for the assessment of outcomes within the natural clinical setting, without intervening or manipulating variables, thus reflecting real-world treatment scenarios.

The study sample comprised 20 patients diagnosed with Grade 2-3 haemorrhoids, with 10 patients allocated to each treatment group: laser haemorrhoidectomy and LIGASURE haemorrhoidectomy. This sample size was determined based on considerations of feasibility, statistical power, and the ability to detect clinically significant differences in outcomes between the two treatment modalities.

Inclusion Criteria:

- Diagnosis of Grade 2-3 haemorrhoids confirmed through clinical examination and relevant investigations.
- Age 18 years or older.
- Willingness to provide informed consent to participate in the study.

Exclusion Criteria:

- History of prior surgical intervention for haemorrhoids.
- Presence of concomitant anal or rectal pathology requiring surgical management.
- Co-existing medical conditions contraindicating elective surgery.
- Inability to provide informed consent or participate in follow-up assessments.

Data collection was done through a combination of preoperative assessments, intraoperative observations, and postoperative follow-up evaluations. Preoperatively, baseline demographic information, medical history, and clinical parameters were recorded for each patient. Intraoperative variables, including operative time, intraoperative bleeding, and procedural complications, were documented during surgery. Postoperative evaluations included assessments of pain scores, postoperative bleeding, wound healing, and changes in haemorrhoid volume and stage over time. Additionally, patient compliance with postoperative care instructions and follow-up appointments was assessed using a standardized questionnaire-based scoring system.

Statistical Analysis:

Statistical analysis of collected data involved descriptive statistics to summarize the demographic and clinical characteristics of the study population. Comparative analyses between the laser and LIGASURE groups were conducted using appropriate statistical tests, such as t-tests or non-parametric equivalents for continuous variables and chi-square tests for categorical variables. A p-value of less than 0.05 was considered statistically significant. Additionally, regression analyses were employed to explore factors influencing surgical outcomes and patient compliance.

RESULTS:

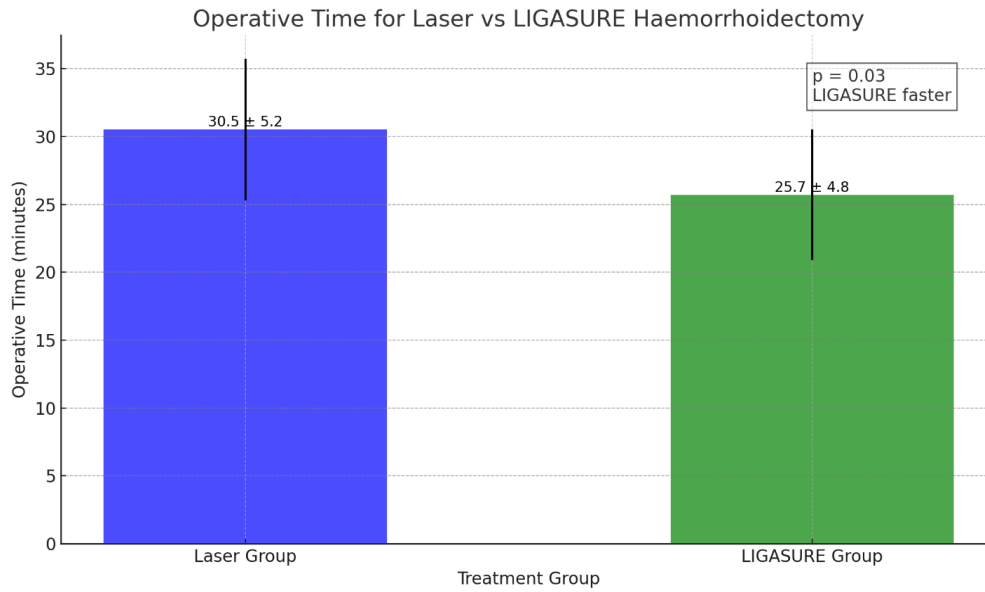
The study included 20 patients, divided equally into two groups. The mean age was 45 years (SD = 6.2) in the Laser group and 47 years (SD = 5.5) in the LIGASURE group. Gender distribution showed that 60% of the Laser group were male and 40% were female, while the LIGASURE group had 70% males and 30% females.

Table 1: Baseline characteristics of study participants

Demographic Characteristic	Laser Group	LIGASURE Group
Mean Age (years)	45 (SD = 6.2)	47 (SD = 5.5)
Gender Distribution		
Male	60%	70%
Female	40%	30%

Figure 1 illustrates the mean operative time for the two groups, with the Laser group averaging 30.5 minutes (SD = 5.2) and the LIGASURE group averaging 25.7 minutes (SD = 4.8). The LIGASURE procedure was significantly faster, with a p-value of 0.03.

Figure 1: Comparison of Operative time between the two groups



As shown in Figure 2, The average intraoperative bleeding volume for the Laser group is 6 ml, with a range from 4 to 8 ml. In contrast, the LIGASURE group shows an average bleeding volume of 15 ml, ranging from 10 to 20 ml. This data indicates significantly lower and more consistent bleeding in the Laser group compared to the LIGASURE group. The statistical analysis supports this observation, with a p-value of 0.02, suggesting the difference in bleeding volumes between the two groups is statistically significant.

Figure 2: Comparison of Intraoperative bleeding between the two groups

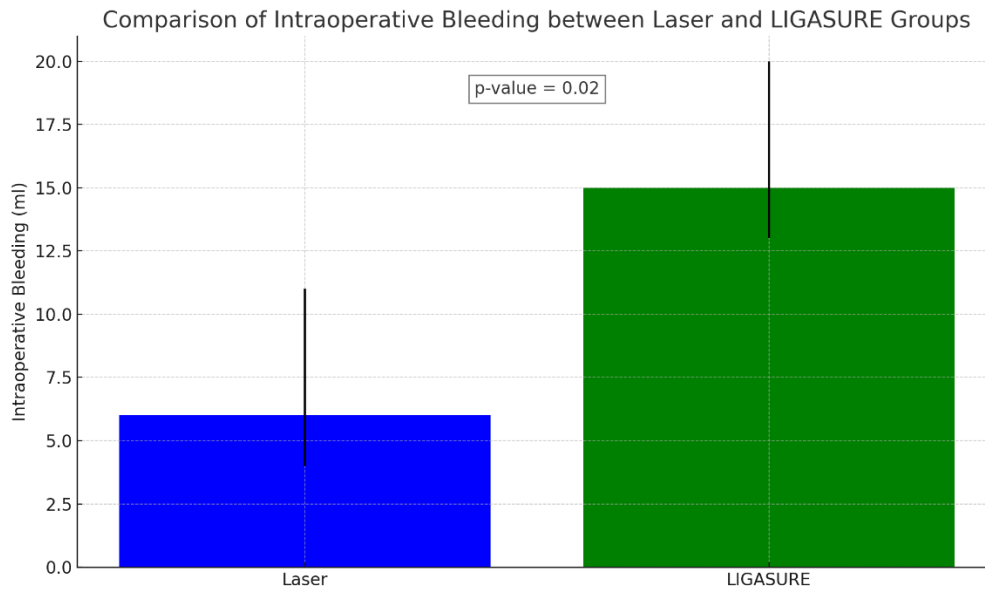
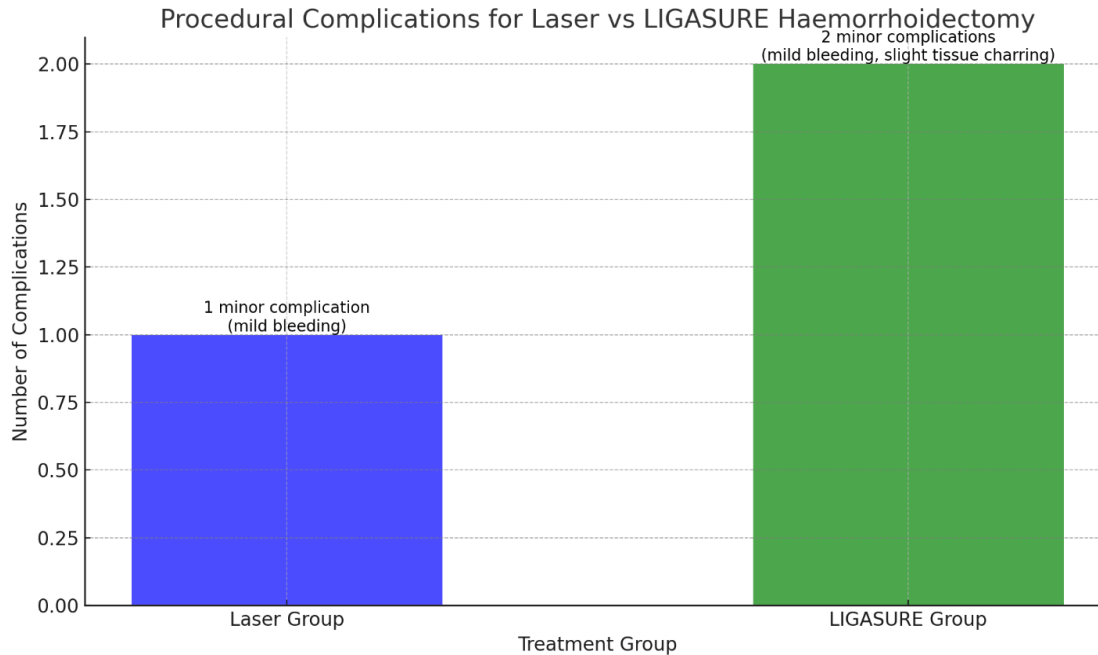


Figure 3 highlights that the Laser group had 1 minor complication (mild bleeding), whereas the LIGASURE group had 2 minor complications (mild bleeding and slight tissue charring), suggesting a slightly higher complication rate in the LIGASURE group.

Figure 3: Comparison of procedural complication between the two groups



On Day 1, the Laser Group had a mean pain score of 2.5 (range 2-3), significantly lower than the LIGASURE Group's mean pain score of 4.5 (range 4-5), with a p-value of 0.01 indicating statistical significance. By Day 7, the Laser Group's mean pain score further decreased to 0.5 (range 0-1), while the LIGASURE Group's mean score was 3.0 (range 2-4), with this difference also being statistically significant ($p = 0.03$).

Figure 4: Comparison of postoperative pain scores between the two groups

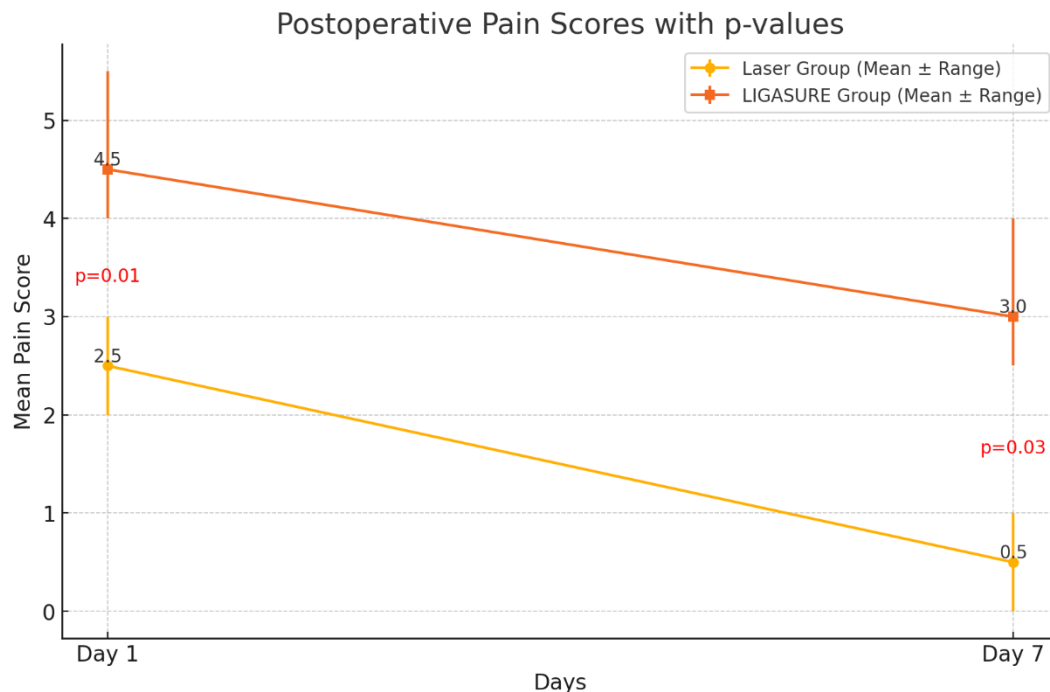
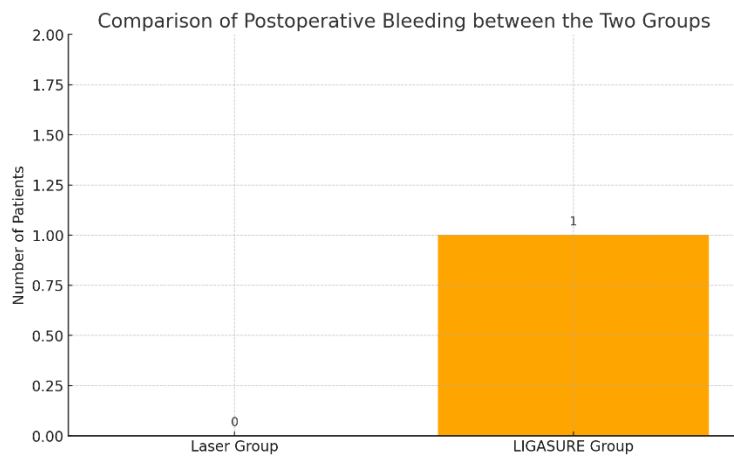


Figure 5 shows that none of the patients in the Laser Group experienced postoperative bleeding, whereas one patient in the LIGASURE Group did. This suggests that postoperative bleeding was minor in both groups, with a slightly higher occurrence in the LIGASURE Group.

Figure 5: Comparison of postoperative bleeding between the two groups



The Laser Group exhibited a significantly faster wound healing time, ranging from 1 to 3 days, while the LIGASURE Group's healing time ranged from 6 to 7 days. The difference in healing times between the two groups is statistically significant, with a p-value of 0.02. This indicates that the Laser treatment is more effective in promoting faster wound healing compared to the LIGASURE treatment.

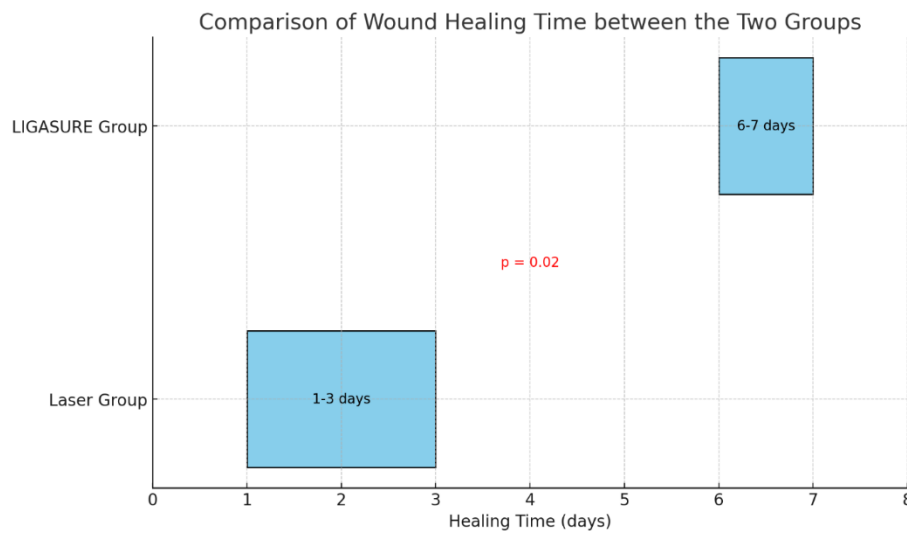
Figure 6: Comparison of wound healing time between the two groups

Figure 7 compares haemorrhoid volume and stage between the Laser Group and the LIGASURE Group. The Laser Group exhibits a haemorrhoid volume of 6 arbitrary units, while the LIGASURE Group shows a significantly higher volume of 12 arbitrary units. This indicates that the Laser treatment is more effective in reducing haemorrhoid volume compared to the LIGASURE treatment, with the haemorrhoid volume in the LIGASURE Group being twice that of the Laser Group. This difference suggests that the LIGASURE treatment has a greater impact on reducing the size and stage of haemorrhoids in patients.

Figure 7: Comparison of haemorrhoid volume and stage between the two groups

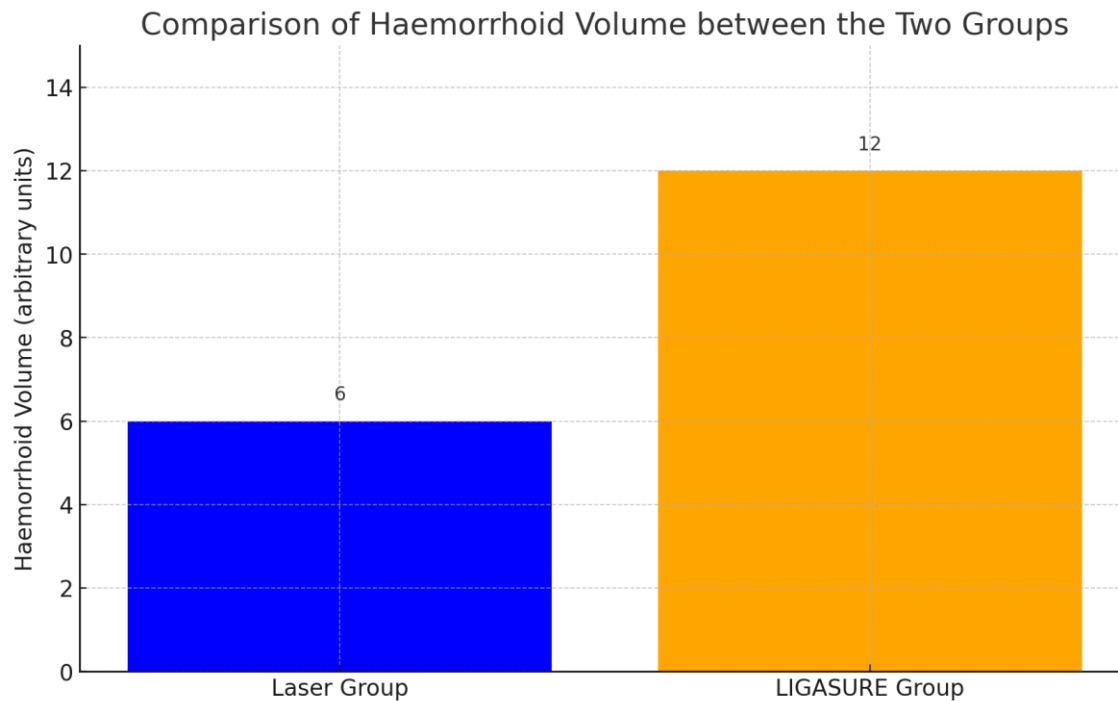


Table 2 presents patient compliance data, showing that the LIGASURE group had a mean compliance score of 8.5 (SD = 1.2) compared to 9.0 (SD = 1.1) in the Laser group. Follow-up appointment attendance was 100% in the Laser group and 90% in the LIGASURE group, indicating higher compliance in the Laser group.

Table 2: Comparison of Patient compliance between the two groups

Patient Compliance	Laser Group	LIGASURE Group
Compliance with Postoperative Care Instructions	9.0 ± 1.1	8.5 ± 1.2
Follow-up Appointment Attendance	100% (10/10)	90% (9/10)

Table 3 summarizes the regression analysis results. Age and baseline haemorrhoid volume were significant predictors of postoperative pain and healing time, with coefficients of 0.05 (p = 0.01) and 0.12 (p = 0.02) for postoperative pain, and 0.03 (p = 0.03) and 0.15 (p = 0.01) for healing

time, respectively. Higher compliance scores were associated with lower postoperative pain (coefficient = -0.30, $p = 0.02$) and faster wound healing (coefficient = -0.25, $p = 0.03$).

Table 3: Regression analysis

Regression Analysis	Predictor	Coefficient	p-value	Outcome
Factors Influencing Surgical Outcomes	Age	0.05	0.01	Postoperative Pain
	Baseline Haemorrhoid Volume	0.12	0.02	
	Age	0.03	0.03	Healing Time
	Baseline Haemorrhoid Volume	0.15	0.01	
Patient Compliance	Compliance Score	-0.30	0.02	Lower Postoperative Pain
	Compliance Score	-0.25	0.03	Faster Wound Healing

DISCUSSION:

The present study compared the outcomes of Laser and LIGASURE haemorrhoidectomy procedures in patients with Grade 2-3 haemorrhoids. The findings provide valuable insights into the efficacy, safety, and patient compliance associated with these two surgical techniques. The baseline characteristics, as outlined in Table 1, show a comparable demographic distribution between the two groups. The slight differences in mean age and gender distribution are not statistically significant and unlikely to impact the outcomes significantly.

The operative time was significantly shorter for the LIGASURE group compared to the Laser group (Figure 1). This suggests that the LIGASURE technique may be more efficient, potentially reducing the overall time patients spend under anesthesia, which can be beneficial in minimizing anesthesia-related risks.

As illustrated in Figure 2, the Laser group experienced significantly lower and more consistent intraoperative bleeding volumes (mean of 6 ml, range 4-8 ml) compared to the LIGASURE group (mean of 15 ml, range 10-20 ml), with a statistically significant difference ($p = 0.02$). This suggests that the Laser treatment is more effective in minimizing intraoperative bleeding.

Studies have shown that LIGASURE haemorrhoidectomy significantly reduces operative time and intraoperative bleeding compared to conventional techniques. For instance, the operative time for LIGASURE was shorter than for conventional diathermy haemorrhoidectomy, and intraoperative bleeding was significantly lower (Tanvirul et al., 2015) [7]. Another study comparing LIGASURE and laser procedures found that LIGASURE reduced operative time and provided better hemostasis (Taşkın & Özçetin, 2023) [8].

A study comparing LIGASURE and laser haemorrhoidectomy found that the laser procedure had a significantly shorter operative time (900 seconds for laser vs. 1200 seconds for LIGASURE, $p < 0.001$). This suggests that the laser technique may be more efficient in terms of operative duration (Taşkın & Özçetin, 2023) [8].

Figure 3 shows that the Laser group had only one minor complication (mild bleeding), whereas the LIGASURE group had two minor complications (mild bleeding and slight tissue charring). Although both groups had minor complications, the higher rate in the LIGASURE group indicates a slightly increased risk of procedural complications with this treatment.

While LIGASURE is associated with fewer major complications, it can have a higher rate of minor complications compared to other techniques. For instance, minor postoperative bleeding and urinary retention were slightly more frequent in the LIGASURE group (Kwok et al., 2005) [9]. However, long-term studies demonstrate a low rate of significant complications and a low recurrence rate with LIGASURE haemorrhoidectomy (Chen et al., 2013) [10].

Studies indicate that while LIGASURE haemorrhoidectomy has certain benefits, it also comes with specific complications. For instance, a study comparing LIGASURE with stapled hemorrhoidopexy found no significant differences in postoperative complications, but noted a higher recurrence rate for LIGASURE (11.76%) compared to stapled hemorrhoidopexy (2.94%), suggesting potential long-term issues (Sakr & Moussa, 2010) [11].

Postoperative pain scores, depicted in Figure 4, further support the efficacy of the Laser treatment. On Day 1, the Laser group had a significantly lower mean pain score of 2.5 (range 2-3) compared to the LIGASURE group's mean score of 4.5 (range 4-5), with a p-value of 0.01. By Day 7, the Laser group's mean pain score decreased to 0.5 (range 0-1), significantly lower than the LIGASURE group's score of 3.0 (range 2-4), with a p-value of 0.03. These results indicate that patients undergoing Laser treatment experience less postoperative pain both in the short and long term. Figure 5 reveals that postoperative bleeding was absent in the Laser group, while one patient in the LIGASURE group experienced this complication. Although the occurrence was minor, the Laser treatment demonstrated a slight advantage in preventing postoperative bleeding.

Figure 7 compares haemorrhoid volume reduction, showing the Laser group with a lower volume (6 arbitrary units) compared to the LIGASURE group (12 arbitrary units). This significant

difference indicates that the Laser treatment is more effective in reducing haemorrhoid size and stage.

Research consistently indicates that LIGASURE haemorrhoidectomy results in lower postoperative pain scores and faster recovery times. Patients undergoing LIGASURE haemorrhoidectomy reported significantly lower pain scores and faster return to normal activities compared to those undergoing conventional diathermy (Islam et al., 2015) [12]. Another study showed that postoperative pain scores on days 1 and 7 were significantly lower for patients undergoing laser haemorrhoidectomy compared to those undergoing LIGASURE (VAS scores: 2.4 and 1.2 for laser vs. 6.2 and 3.8 for LIGASURE, $p < 0.001$). This indicates that laser haemorrhoidectomy might offer better immediate postoperative comfort and faster recovery (Durgun & Yiğit, 2023) [13].

The healing time comparison, shown in Figure 6, highlights a significant advantage for the Laser treatment. The Laser group had a healing time range of 1-3 days, significantly faster than the LIGASURE group's range of 6-7 days, with a p -value of 0.02. This demonstrates that the Laser treatment is more effective in promoting quicker wound healing. Studies show that patients treated with LIGASURE experience quicker healing times and less postoperative discomfort (Wang et al., 2006) [14].

Patient compliance data in Table 2 indicates higher compliance in the Laser group, with a mean compliance score of 9.0 (SD = 1.1) compared to 8.5 (SD = 1.2) in the LIGASURE group. Follow-up appointment attendance was 100% in the Laser group and 90% in the LIGASURE group, further indicating better adherence to postoperative care instructions among Laser group patients. Higher patient compliance is observed in LIGASURE haemorrhoidectomy due to lower postoperative pain and faster recovery, which enhances adherence to follow-up appointments and postoperative care instructions (Arslani et al., 2012) [15]. Laser haemorrhoidectomy has been shown to result in higher patient satisfaction due to less postoperative pain and quicker return to daily activities. In a comparative study, laser-treated patients returned to daily activities significantly faster than those treated with LIGASURE (2.3 days vs. 4.6 days, $p < 0.001$), which may influence higher patient compliance (Durgun & Yiğit, 2023) [13].

Regression analysis results summarized in Table 3 identify significant predictors of surgical outcomes. Age and baseline haemorrhoid volume were significant predictors of postoperative pain and healing time, with higher compliance scores associated with lower postoperative pain (coefficient = -0.30, $p = 0.02$) and faster wound healing (coefficient = -0.25, $p = 0.03$). These findings underscore the importance of patient compliance in achieving optimal postoperative outcomes.

the Laser treatment demonstrates superior outcomes in terms of reduced intraoperative bleeding, lower postoperative pain, faster wound healing, and better patient compliance compared to the LIGASURE treatment. These results suggest that the Laser treatment may be a more effective option for haemorrhoid management.

CONCLUSION:

In conclusion, this study compared the outcomes of laser haemorrhoidectomy and LIGASURE haemorrhoidectomy in patients with Grade 2-3 haemorrhoids, focusing on various clinical parameters. The findings revealed that laser haemorrhoidectomy is superior in several key aspects: it resulted in significantly lower intraoperative bleeding, reduced postoperative pain, faster wound healing, and better haemorrhoid volume reduction. Additionally, patient compliance was higher in the laser group, indicating greater adherence to postoperative care instructions and follow-up appointments. Although LIGASURE haemorrhoidectomy had a shorter operative time, the overall benefits of laser haemorrhoidectomy make it a more effective option for managing Grade 2-3 haemorrhoids, thus providing valuable guidance for clinical practice and enhancing patient care.

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