

A Prospective Comparative Study of Suture Mucopexy, Stapled Hemorrhoidopexy, Laser Hemorrhoidoplasty, Hemorrhoidal Glue Procedure, and Conventional Open Hemorrhoidectomy in the Management of Grade II–IV Hemorrhoids

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ABSTRACT

Background: Hemorrhoidal disease is one of the most common anorectal disorders encountered in surgical practice, affecting approximately 4–5% of the general population and nearly 40% of patients presenting with anorectal symptoms. Numerous operative techniques have been introduced over the past three decades to reduce postoperative pain, shorten hospital stay, hasten return to work, and minimize recurrence. The present study aim to compare the clinical outcomes of suture mucopexy, stapled hemorrhoidopexy, laser hemorrhoidoplasty, hemorrhoidal glue procedure, and conventional hemorrhoidectomy in patients with symptomatic hemorrhoids.

Materials and Methods: A prospective comparative study was conducted in the Department of General Surgery involving 150 patients diagnosed with Grade II–IV hemorrhoids. Patients were equally allocated into five treatment groups (n = 30 each) Primary outcome measures included operative time, postoperative pain using the Visual Analog Scale (VAS), intraoperative blood loss, duration of hospital stay, postoperative complications, time to return to normal activity, recurrence, and patient satisfaction. Statistical analysis was performed using appropriate statistical test.

Results: The mean operative time was shortest in the glue group and longest in the conventional hemorrhoidectomy group. Laser hemorrhoidoplasty and glue procedures demonstrated significantly lower postoperative pain scores compared with conventional hemorrhoidectomy ($p < 0.001$). Mean blood loss and duration of hospital stay were significantly lower in the laser and glue groups ($p < 0.001$). Stapled hemorrhoidopexy and suture mucopexy showed favourable recovery with low postoperative morbidity. Conventional hemorrhoidectomy demonstrated the lowest recurrence rate but the highest postoperative pain and longest recovery period.

Conclusion: Suture mucopexy is a safe, effective, and economical alternative to advanced hemorrhoid procedures. It provides outcomes comparable to stapled hemorrhoidopexy and laser hemorrhoidoplasty while avoiding the high cost of disposable devices.

Keywords: Hemorrhoids, Suture Mucopexy, Stapled Hemorrhoidopexy, Laser Hemorrhoidoplasty, Tissue Glue, Conventional Hemorrhoidectomy

How to cite this article: Zulfikar Rupani¹ Dr. Nitin Appasaheb Raje² Dr. Michelle Pereira Raje^{3*} Dr. Seema Rupani⁴. A Prospective Comparative Study of Suture Mucopexy, Stapled Hemorrhoidopexy, Laser Hemorrhoidoplasty, Hemorrhoidal Glue Procedure, and Conventional Open Hemorrhoidectomy in the Management of Grade II–IV Hemorrhoids. *Int J Drug Deliv Technol.* 2026;16(80s):1156-1162. DOI: 10.25258/ijddt.16.80s.145

INTRODUCTION

Hemorrhoidal disease is among the most frequently encountered benign anorectal disorders worldwide and constitutes a major proportion of patients attending general surgical and colorectal clinics.¹ It is estimated that nearly half of the adult population experiences symptomatic hemorrhoids by the age of 50 years.² The disease adversely affects quality of life by causing bleeding per rectum, prolapse, pain, itching, mucous discharge, and difficulty in maintaining hygiene.^{2,3}

Hemorrhoids are vascular cushions located within the anal canal that contribute to continence by providing approximately 15–20% of resting anal closure pressure.

⁴ Enlargement and distal displacement of these vascular cushions due to degeneration of supporting connective tissue, increased venous pressure, chronic constipation, prolonged straining, pregnancy, obesity, sedentary lifestyle, and advancing age result in symptomatic hemorrhoidal disease.^{4,5}

Conventional open hemorrhoidectomy, originally described by Milligan and Morgan, has long been regarded as the gold standard because of its low recurrence rate and excellent long-term efficacy. Nevertheless, the procedure is associated with considerable postoperative pain, prolonged wound healing, delayed return to normal activities, urinary retention, bleeding, and anal stenosis.^{6,7}

To overcome these limitations, minimally invasive techniques have been developed. Stapled hemorrhoidopexy, introduced by Longo, corrects mucosal prolapse by excising a circumferential ring of rectal mucosa above the dentate line, thereby reducing postoperative pain.⁸ Laser hemorrhoidoplasty employs laser energy to shrink hemorrhoidal tissue while preserving the anoderm and minimizing tissue trauma.⁹ Tissue adhesive (glue) techniques aim to obliterate hemorrhoidal vascularity with minimal dissection, thereby reducing postoperative discomfort.¹⁰ Suture mucopexy, based on the principle of lifting and fixing

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prolapsed hemorrhoidal cushions, restores normal anatomy without tissue excision and has gained popularity due to its simplicity, cost-effectiveness, and favorable postoperative recovery.^{11,12}

Although individual procedures have demonstrated promising results, direct prospective comparison among these five commonly practiced techniques remains scarce. Such comparative evaluation is essential to determine the optimal balance between efficacy, postoperative pain, complications, recovery, recurrence, patient satisfaction, and cost.^{11,12}

The present study was therefore undertaken to prospectively compare the clinical outcomes of suture mucopexy, stapled hemorrhoidopexy, laser hemorrhoidoplasty, hemorrhoidal glue procedure, and conventional open hemorrhoidectomy in patients with symptomatic Grade II–IV hemorrhoids.

MATERIALS AND METHODS

A present prospective, comparative, hospital-based interventional study was conducted in the Department of General Surgery at a tertiary care teaching hospital over a period of 24 months. The study included 150 consecutive patients diagnosed with symptomatic hemorrhoidal disease who fulfilled the eligibility criteria and provided written informed consent for participation. The participants were equally allocated into five treatment groups comprising 30 patients each. Group A underwent suture mucopexy, Group B underwent stapled hemorrhoidopexy, Group C underwent laser hemorrhoidoplasty, Group D underwent the hemorrhoidal glue procedure, and Group E underwent conventional open hemorrhoidectomy (Milligan–Morgan technique).

Patients aged between 18 and 70 years with symptomatic Grade II hemorrhoids refractory to conservative treatment, Grade III hemorrhoids, or Grade IV hemorrhoids without associated anorectal malignancy were considered eligible for inclusion. Only patients who were medically fit for surgery under spinal or general anaesthesia and who provided written informed consent were enrolled. Patients presenting with acute thrombosed hemorrhoids, associated anal fissure requiring sphincterotomy, complex fistula-in-ano, perianal abscess, inflammatory bowel disease, colorectal malignancy, previous anorectal surgery, pregnancy, bleeding disorders, or unwillingness to participate were excluded from the study.

The study protocol was approved by the Institutional Ethics Committee before commencement of the study. Written informed consent was obtained from all participants prior to enrollment. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Confidentiality of patient information was maintained throughout the study, and participation was entirely voluntary.

All enrolled patients underwent a detailed preoperative evaluation, including comprehensive history taking, general physical examination, digital rectal examination, and proctoscopic assessment. Laboratory investigations included complete blood count, blood sugar estimation,

renal function tests, liver function tests, coagulation profile, and viral markers. Electrocardiography was performed in all patients, while chest radiography was obtained whenever indicated. Patients older than 45 years presenting with rectal bleeding underwent colonoscopy to exclude proximal colorectal pathology.

Preoperative preparation consisted of a high-fiber diet for three days prior to surgery, followed by a liquid diet on the day before surgery. Mechanical bowel preparation was administered when indicated. Intravenous prophylactic antibiotics were administered at the time of induction of anesthesia, and spinal anesthesia was used in the majority of patients.

Patients in Group A underwent suture mucopexy. After anal dilatation, the prolapsed hemorrhoidal cushions were identified, and continuous locking absorbable 2-0 polyglactin sutures were placed approximately 3–4 cm above the dentate line. The mucosa and submucosa were plicated to reposition the prolapsed hemorrhoidal cushions while preserving the anoderm and normal vascular cushions. Hemostasis was ensured before completion of the procedure.

Patients in Group B underwent stapled hemorrhoidopexy. A circular anal dilator was inserted, followed by placement of a circumferential purse-string suture approximately 3–4 cm above the dentate line. A circular stapling device was introduced and fired after confirming complete incorporation of tissue within the stapler housing. The staple line was inspected carefully, and any bleeding points were secured.

Group C patients underwent laser hemorrhoidoplasty. Under anoscopic guidance, a laser fiber was introduced into each hemorrhoidal cushion, and diode laser energy was delivered circumferentially until adequate tissue shrinkage was achieved. No hemorrhoidal tissue was excised during the procedure.

Patients assigned to Group D underwent the hemorrhoidal glue procedure. Following identification of the hemorrhoidal cushions, tissue adhesive was injected or applied into the hemorrhoidal pedicle according to a standardized protocol. Adequate compression was maintained to facilitate fixation and vascular obliteration, and hemostasis was confirmed before completion of the surgery.

Group E underwent conventional open hemorrhoidectomy using the Milligan–Morgan technique. The hemorrhoidal pedicle was ligated using absorbable sutures, followed by excision of the hemorrhoidal tissue while preserving adequate mucocutaneous bridges. The surgical wounds were left open in accordance with the standard technique.

Postoperatively, all patients received intravenous fluids, intravenous antibiotics for the first 24 hours followed by oral antibiotics for five days, non-steroidal anti-inflammatory drugs and paracetamol for analgesia, sitz baths three times daily, stool softeners for two weeks, a high-fiber diet, and advice regarding adequate oral hydration.

Patients were followed up on postoperative Day 1, Day 7, at 1 month, 3 months, 6 months, and 12 months after

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surgery. The primary outcome measure was overall surgical success. Secondary outcome measures included operative time, estimated intraoperative blood loss, postoperative pain assessed using the Visual Analogue Scale (VAS), analgesic requirement, duration of hospital stay, time to first bowel movement, time to return to work, postoperative bleeding, urinary retention, wound infection, anal stenosis, fecal incontinence, recurrence, and patient satisfaction.

Postoperative pain was assessed using the Visual Analogue Scale (VAS), with scores ranging from 0 (no pain) to 10 (worst imaginable pain). Pain scores were recorded at 6 hours, 24 hours, Day 3, and Day 7 following surgery.

Recurrence was defined as the occurrence of symptomatic hemorrhoidal prolapse or bleeding requiring repeat intervention during the 12-month follow-up period.

All data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 24.0. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 150 patients with symptomatic Grade II–IV hemorrhoids were included in the study. Each treatment group comprised 30 patients.

Table 1. Baseline Demographic Characteristics of Study Participants (n=150)

Variable	Gro up A (n=30)	Gro up B (n=30)	Gro up C (n=30)	Gro up D (n=30)	Gro up E (n=30)	P value
Age (Mean $\pm$ SD, years)	43.8 $\pm$ 9.6	44.5 $\pm$ 8.8	42.9 $\pm$ 9.1	43.6 $\pm$ 8.9	44.8 $\pm$ 9.3	0.932
Male (%)	21 (70.0)	20 (66.7)	22 (73.3)	21 (70.0)	22 (73.3)	0.978
BMI (kg/m ²)	25.2 $\pm$ 2.6	25.4 $\pm$ 2.4	24.9 $\pm$ 2.5	25.1 $\pm$ 2.8	25.5 $\pm$ 2.7	0.881

The above table no. 1 shows that, the baseline demographic and disease characteristics were comparable among all five study groups with no statistically significant differences.

Table 2. Intraoperative Outcomes

Variable	Gro up A	Gro up B	Gro up C	Gro up D	Gro up E	P value
Operative time (min)	30.8 $\pm$ 4.2	27.9 $\pm$ 3.8	24.6 $\pm$ 3.1	21.8 $\pm$ 2.7	39.5 $\pm$ 5.3	<0.001
Estimated blood loss (mL)	25.6 $\pm$ 6.1	20.4 $\pm$ 5.8	12.8 $\pm$ 3.2	10.6 $\pm$ 2.5	48.2 $\pm$ 8.4	<0.001

blood loss (mL)						
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The above table no. 2 shows that, Glue procedure demonstrated the shortest operative time and least blood loss, whereas conventional hemorrhoidectomy had the highest blood loss. Stapled hemorrhoidopexy was the most expensive procedure.

Table 3. Postoperative Recovery Outcomes

Variable	Gro up A	Gro up B	Gro up C	Gro up D	Gro up E	P value
Pain score (VAS at 24 hrs)	3.8 $\pm$ 0.9	3.0 $\pm$ 0.8	2.0 $\pm$ 0.6	1.8 $\pm$ 0.6	5.8 $\pm$ 1.0	<0.001
Hospital stay (days)	1.8 $\pm$ 0.6	1.5 $\pm$ 0.5	1.1 $\pm$ 0.3	1.0 $\pm$ 0.2	3.4 $\pm$ 0.8	<0.001
First bowel movement (days)	1.3 $\pm$ 0.5	1.2 $\pm$ 0.4	1.1 $\pm$ 0.3	1.1 $\pm$ 0.3	1.8 $\pm$ 0.6	<0.001
Return to normal activities (days)	6.8 $\pm$ 1.5	5.6 $\pm$ 1.3	3.8 $\pm$ 1.1	3.5 $\pm$ 0.9	12.6 $\pm$ 2.4	<0.001

The above table no. 3 shows that, Laser hemorrhoidoplasty and glue procedure resulted in significantly less postoperative pain, reduced analgesic requirement, shorter hospital stay, earlier bowel movement, and faster recovery compared with conventional hemorrhoidectomy.

Table 4. Postoperative Complications

Complication	Gro up A n (%)	Gro up B n (%)	Gro up C n (%)	Gro up D n (%)	Gro up E n (%)	P value
Reactionary bleeding	1 (3.3)	1 (3.3)	0	0	2 (6.7)	0.624
Urinary retention	2 (6.7)	1 (3.3)	1 (3.3)	1 (3.3)	4 (13.3)	0.471
Wound infection	1 (3.3)	0	0	0	3 (10.0)	0.180
Severe postoperative pain	2 (6.7)	1 (3.3)	0	0	8 (26.7)	0.006
Anal stenosis	0	0	0	0	2 (6.7)	0.130

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Chronic pain (>3 months)	1 (3.3)	1 (3.3)	0	0	3 (10.0)	0.332
Fecal incontinence	0	0	0	0	0	—

The above table no. 4 shows that, Conventional hemorrhoidectomy demonstrated the highest incidence of postoperative complications, particularly severe pain, whereas laser hemorrhoidoplasty and glue procedure showed the lowest complication rates.

Table 5. Functional Outcomes, Patient Satisfaction and Recurrence

Outcome	Group A n (%)	Group B n (%)	Group C n (%)	Group D n (%)	Group E n (%)	P value
Excellent patient satisfaction	21 (70.0)	22 (73.3)	26 (86.7)	25 (83.3)	15 (50.0)	0.014
Excellent overall clinical outcome	22 (73.3)	23 (76.7)	26 (86.7)	25 (83.3)	18 (60.0)	0.041
Recurrence at 12 months	2 (6.7)	2 (6.7)	3 (10.0)	4 (13.3)	1 (3.3)	0.518

The above table no. 5 shows that, Laser hemorrhoidoplasty achieved the highest patient satisfaction and overall clinical success, followed closely by the glue procedure. Conventional hemorrhoidectomy demonstrated the lowest recurrence rate, although the difference was not statistically significant.

DISCUSSION

The present prospective comparative study evaluated the clinical outcomes of five commonly performed surgical procedures for hemorrhoidal disease, namely suture mucopexy, stapled hemorrhoidopexy, laser hemorrhoidoplasty, hemorrhoidal glue procedure, and conventional open hemorrhoidectomy, in 150 patients equally distributed among five treatment groups. The study compared perioperative outcomes, postoperative recovery, complications, recurrence, patient satisfaction, and overall surgical success over a 12-month follow-up period.

The demographic characteristics of the study population were comparable among all treatment groups, thereby minimizing selection bias. The mean age ranged from 42.9 to 44.8 years, with most patients belonging to the fourth and fifth decades of life. These findings are consistent with epidemiological studies demonstrating that symptomatic hemorrhoidal disease predominantly affects individuals between 40 and 60 years of age due to progressive weakening of the supporting connective tissue, repeated straining during defecation, and age-

related degeneration of the anal cushions. Male patients constituted approximately 71% of the study population, reflecting the male predominance reported in several previous studies by Johanson and Sonnenberg,³ Watson et al.⁹ and Brown et al.¹³

In the present study, the hemorrhoidal glue procedure required the shortest operative time (21.8 ± 2.7 minutes), followed by laser hemorrhoidoplasty (24.6 ± 3.1 minutes), stapled hemorrhoidopexy (27.9 ± 3.8 minutes), suture mucopexy (30.8 ± 4.2 minutes), and conventional hemorrhoidectomy (39.5 ± 5.3 minutes). The longer operative duration observed with conventional hemorrhoidectomy is attributable to careful dissection, ligation of vascular pedicles, excision of hemorrhoidal tissue, and meticulous hemostasis. In contrast, minimally invasive procedures preserve normal anatomy and avoid extensive tissue dissection, resulting in shorter operative times. Brown et al.¹³ reported significantly reduced operative duration with stapled hemorrhoidopexy compared with conventional hemorrhoidectomy, while studies by Giamundo et al.¹⁴ demonstrated similarly short operative times for laser hemorrhoidoplasty.

Intraoperative blood loss also showed statistically significant differences among the treatment groups. Conventional hemorrhoidectomy was associated with the greatest blood loss, whereas laser hemorrhoidoplasty and the glue procedure demonstrated minimal bleeding. The reduced blood loss observed with laser hemorrhoidoplasty can be attributed to the excellent coagulative effect of laser energy, which seals blood vessels during tissue shrinkage. Likewise, tissue adhesive used in the glue procedure promotes rapid vascular occlusion without tissue excision. Stapled hemorrhoidopexy and suture mucopexy also produced considerably less bleeding than conventional hemorrhoidectomy because these procedures preserve the anoderm and avoid excision of vascular hemorrhoidal cushions. Similar findings have been reported by Giamundo et al.¹⁴ and Ratto et al.¹⁵ who demonstrated significantly lower blood loss with tissue-preserving procedures than with excisional surgery.

In the present study, conventional hemorrhoidectomy produced significantly higher Visual Analog Scale (VAS) scores at every postoperative assessment, whereas laser hemorrhoidoplasty and the glue procedure resulted in the least postoperative pain. Pain progressively declined in all groups during follow-up; however, minimally invasive procedures consistently maintained significantly lower pain scores.

The anatomical basis for these findings is well established. Conventional hemorrhoidectomy involves excision of the highly innervated anoderm below the dentate line, resulting in considerable postoperative discomfort. In contrast, stapled hemorrhoidopexy, laser hemorrhoidoplasty, glue procedure, and suture mucopexy are performed above the dentate line or preserve the anoderm, thereby minimizing nociceptive stimulation. Longo et al.⁸ first demonstrated the advantages of stapled hemorrhoidopexy in reducing postoperative pain, and subsequent systematic reviews

by Shanmugam et al.¹⁶ and Nisar et al.¹⁷ confirmed significantly lower pain scores with tissue-preserving procedures. Similarly, Giamundo et al.¹⁴ reported excellent postoperative comfort following laser hemorrhoidoplasty with minimal analgesic requirements.

Patients undergoing laser hemorrhoidoplasty and the glue procedure were discharged after approximately one day, whereas those treated with conventional hemorrhoidectomy required more than three days of hospitalization. Early discharge reflects reduced postoperative pain, minimal wound care, earlier mobilization, and lower incidence of postoperative complications. Enhanced recovery protocols have increasingly supported the use of minimally invasive hemorrhoidal procedures as day-care or overnight surgical interventions, thereby reducing healthcare costs and improving utilization of hospital resources.^{18,19}

In the present study, patients who underwent the glue procedure returned to normal activities earliest, followed closely by those treated with laser hemorrhoidoplasty. Patients undergoing stapled hemorrhoidopexy and suture mucopexy also resumed work considerably earlier than those treated with conventional hemorrhoidectomy. The faster recovery associated with minimally invasive procedures is explained by preservation of the anoderm, reduced tissue trauma, minimal postoperative edema, and lower pain scores. Brown et al.¹³ Giamundo et al.¹⁴ and Giordano et al.¹⁸ similarly reported earlier return to work following stapled hemorrhoidopexy, laser hemorrhoidoplasty, and Doppler-guided hemorrhoidal artery ligation when compared with conventional hemorrhoidectomy.

Early postoperative complications were infrequent across all study groups. Reactionary bleeding occurred in only a small proportion of patients and was generally managed conservatively. Conventional hemorrhoidectomy demonstrated a slightly higher incidence of postoperative bleeding because of tissue excision and open wounds, whereas laser hemorrhoidoplasty and the glue procedure benefited from superior intraoperative hemostasis. Urinary retention occurred most frequently after conventional hemorrhoidectomy, likely owing to increased postoperative pain, prolonged immobilization, and reflex bladder inhibition. Similar findings have been reported in randomized controlled trials comparing excisional and non-excisional hemorrhoidal procedures.²⁰

Postoperative wound infection was uncommon in the present study but occurred predominantly after conventional hemorrhoidectomy. Open wounds in the anorectal region remain susceptible to bacterial contamination despite meticulous surgical technique. Tissue-preserving procedures, including stapled hemorrhoidopexy, laser hemorrhoidoplasty, glue procedure, and suture mucopexy, involve minimal external wounds and therefore demonstrate lower infection rates. The low overall incidence of wound infection observed in this study is consistent with published literature and reflects the benefits of

prophylactic antibiotics, careful surgical technique, and appropriate postoperative care.^{21,22}

Late postoperative complications were also uncommon during the 12-month follow-up. Anal stenosis occurred only in two patients who underwent conventional hemorrhoidectomy and was not observed following any tissue-preserving procedure. Excessive tissue excision and subsequent fibrosis remain the principal causes of anal stenosis after conventional hemorrhoidectomy. Preservation of adequate mucocutaneous bridges is therefore essential during excisional surgery. These findings are consistent with previous reports demonstrating a lower incidence of anal stenosis following stapled hemorrhoidopexy, laser hemorrhoidoplasty, and Doppler-guided hemorrhoidal artery ligation.²²

Patient satisfaction provides a comprehensive assessment of treatment success because it reflects postoperative pain, cosmetic outcome, symptom relief, recovery time, and recurrence. In the present study, laser hemorrhoidoplasty achieved the highest patient satisfaction, followed closely by the glue procedure, stapled hemorrhoidopexy, and suture mucopexy. Conventional hemorrhoidectomy demonstrated the lowest satisfaction despite excellent symptom control. These findings emphasize that early postoperative recovery and comfort strongly influence patient perception of surgical success. Similar trends have been reported in studies evaluating laser hemorrhoidoplasty and stapled hemorrhoidopexy, where reduced postoperative pain translated into higher patient-reported satisfaction scores.^{16,22}

Recurrence remains an important consideration when selecting the optimal surgical technique. Conventional hemorrhoidectomy demonstrated the lowest recurrence rate, whereas the glue procedure showed the highest recurrence during the 12-month follow-up. However, the differences among the treatment groups were not statistically significant. Complete excision of hemorrhoidal tissue during conventional hemorrhoidectomy offers superior long-term disease control, whereas minimally invasive procedures rely primarily on mucosal fixation, vascular interruption, or tissue shrinkage. Consequently, a modest increase in recurrence is expected with tissue-preserving procedures over longer follow-up periods. These findings correspond with systematic reviews by Nisar et al.¹⁷ and Giordano et al.¹⁸ which reported lower postoperative pain but slightly higher long-term recurrence following stapled hemorrhoidopexy and Doppler-guided hemorrhoidal artery ligation compared with conventional hemorrhoidectomy. Published studies on laser hemorrhoidoplasty and suture mucopexy have also demonstrated satisfactory short-term outcomes with acceptable recurrence rates.

An important observation of the present study was the economic advantage of suture mucopexy. Although laser hemorrhoidoplasty and the glue procedure produced the best early postoperative outcomes, both require specialized equipment and disposable materials,

increasing procedural costs. In contrast, suture mucopexy requires only standard absorbable sutures and conventional surgical instruments while providing favorable clinical outcomes with low postoperative morbidity. Consequently, suture mucopexy represents an effective and affordable alternative, particularly in low- and middle-income countries where healthcare expenditure remains a major determinant of treatment selection.^{16,22}

Overall, the findings of the present study demonstrate that laser hemorrhoidoplasty and the hemorrhoidal glue procedure provide superior early postoperative outcomes characterized by shorter operative time, minimal blood loss, reduced postoperative pain, shorter hospital stay, faster recovery, and greater patient satisfaction. Suture mucopexy provides comparable functional outcomes at substantially lower cost, making it an attractive option in resource-limited settings. Conventional hemorrhoidectomy continues to provide excellent long-term disease control with the lowest recurrence rate but is associated with greater postoperative pain, delayed recovery, and lower patient satisfaction.

The results of the present study support an individualized approach to the surgical management of hemorrhoidal disease. Selection of the operative technique should consider hemorrhoid grade, patient expectations, surgeon expertise, institutional resources, and treatment cost rather than adopting a single universal procedure. Larger multicenter randomized controlled trials with longer follow-up are warranted to further evaluate long-term recurrence, quality of life, functional outcomes, and cost-effectiveness of these procedures, thereby strengthening the evidence base for future clinical practice guidelines.

CONCLUSION

The findings suggest that laser hemorrhoidoplasty offers the best overall early postoperative recovery, whereas conventional hemorrhoidectomy provides the most durable long-term disease control. Suture mucopexy represents the most cost-effective balance between efficacy, safety, postoperative recovery, and affordability, making it particularly suitable for hospitals where advanced technology is not readily available.

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