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SYSTEMATIC REVIEW & META-ANALYSIS

Laser Haemorrhoidoplasty versus Stapled Haemorrhoidopexy for Grade II–III Haemorrhoidal Disease: A Systematic Review and Meta-Analysis of Postoperative Pain and Perioperative Outcomes

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ABSTRACT

Background: Postoperative pain and delayed recovery are the principal drawbacks of excisional haemorrhoid surgery, and two minimally invasive alternatives — laser haemorrhoidoplasty (LH) and stapled haemorrhoidopexy (SH) — are increasingly used to overcome them. Although each has repeatedly been compared with conventional haemorrhoidectomy, the direct head-to-head evidence comparing LH with SH has never been pooled quantitatively.

Objective: This systematic review and meta-analysis compared the perioperative, early postoperative pain and safety outcomes of LH and SH in adults with symptomatic haemorrhoidal disease.

Methods: PubMed, Scopus-indexed journals, Crossref and Google Scholar were searched systematically for randomised and comparative studies directly comparing LH with SH. Ten studies were included and seven contributed poolable data. Random-effects models (DerSimonian–Laird, with Hartung–Knapp–Sidik–Jonkman intervals for inference on continuous outcomes) generated risk ratios (RR) for dichotomous outcomes and standardised mean differences (SMD, Hedges g) for continuous outcomes; raw mean differences were reported for interpretability. Risk of bias was appraised with RoB 2 and ROBINS-I, and the certainty of evidence was rated for each outcome.

Results: Laser haemorrhoidoplasty was associated with a significantly shorter operative time (SMD −1.65, 95% CI −2.47 to −0.84; p<0.001; approximately 8 minutes shorter on average), a shorter hospital stay (SMD −3.07, 95% CI −5.58 to −0.55; p=0.017) and a non-significant trend toward less intraoperative blood loss (SMD −2.30, 95% CI −4.74 to 0.13; p=0.064). Early postoperative pain (≤24 h) did not differ significantly on pooling (SMD −0.66, 95% CI −1.95 to 0.63; p=0.32; I^2 98%); this reflected a time-dependent crossover in which LH was less painful in the first hours but SH became less painful from 24 hours onward. Overall complications favoured LH numerically but not significantly (RR 0.58, 95% CI 0.25 to 1.30; p=0.18), an advantage confined to short-follow-up studies and reversed in the single 24-month trial. Recurrence, bleeding, anal stenosis and urinary retention were comparable. The certainty of evidence was low to very low for all outcomes.

Conclusion: Laser haemorrhoidoplasty offered consistent intraoperative advantages over stapled haemorrhoidopexy, whereas early pain and safety were comparable and duration of follow-up was the dominant effect-modifier. Both are reasonable minimally invasive options; technique selection should be individualised pending adequately powered long-term trials.

1. Introduction

Haemorrhoidal disease is among the most prevalent benign anorectal disorders worldwide, with population-based estimates of symptomatic disease ranging from roughly 3% to 28% and a peak incidence between the fourth and sixth decades of life.[1,2] Affected patients typically present with rectal bleeding, prolapse, perianal discomfort, pruritus and soiling, and the condition imposes a substantial burden on quality of life and productivity. Conservative measures control symptoms in most patients with lower-grade disease, but surgical intervention remained the treatment of choice for advanced grade III and IV haemorrhoids and for disease refractory to non-operative management.

Conventional excisional haemorrhoidectomy, exemplified by the Milligan–Morgan and Ferguson techniques, has long been the surgical gold standard because of its durable disease control and low recurrence. Its principal disadvantage is considerable postoperative pain arising from the open perianal wound, exposed somatic nerve endings, sphincter spasm and healing by secondary intention, which prolongs recovery and delays return to work.[3,4] This has motivated the development of less traumatic alternatives, of which stapled haemorrhoidopexy and laser haemorrhoidoplasty are now the most widely adopted.

Stapled haemorrhoidopexy repositions the prolapsed anal cushions and interrupts their arterial supply by excising a circumferential ring of rectal mucosa above the dentate line, avoiding an anoderm wound and reducing early pain relative to excisional surgery.[5] Laser haemorrhoidoplasty is a non-excisional technique in which a diode laser fibre delivers controlled photothermal energy into the submucosal plexus, producing coagulation and fibrotic shrinkage while preserving the anoderm and mucosa.[1] Both were designed to reduce pain and accelerate recovery, and both have been compared extensively with excisional surgery.

The comparative literature, however, has developed asymmetrically. Numerous syntheses have established that laser haemorrhoidoplasty reduces early pain, operative time and blood loss relative to excisional haemorrhoidectomy,[3,4] and dedicated reviews have addressed laser versus LigaSure and non-excisional laser dearterialisation.[2,6] By contrast, the direct comparison of the two dominant minimally invasive techniques against each other has never been pooled quantitatively, even though several primary comparative studies now exist, and these have reached discordant conclusions — some reporting clear early advantages for laser treatment,[7,8] and at least one randomised trial with prolonged follow-up favouring stapled haemorrhoidopexy for pain beyond the first postoperative day and for two-year recurrence.[9] This leaves clinicians without pooled evidence to guide the choice between them.

The novelty of this study lies in its being, to our knowledge, the first systematic review and meta-analysis to pool the direct head-to-head evidence comparing laser haemorrhoidoplasty with stapled haemorrhoidopexy for symptomatic grade II–III haemorrhoidal disease, quantitatively integrating perioperative, early pain and safety outcomes that have previously only been described narratively. The aim of this study was to determine whether the two techniques differ in postoperative pain, operative time, intraoperative blood loss, hospital stay, complications and recurrence, and to identify the clinical factors that modify any observed differences.

2. Methods

This systematic review and meta-analysis was conducted and reported in accordance with the PRISMA 2020 statement.[10] A review protocol defining the research question, eligibility criteria and outcomes was prepared a priori using the Population–Intervention–Comparison–Outcome (PICO) framework: the population comprised adults with symptomatic haemorrhoidal disease, the intervention was laser haemorrhoidoplasty, the comparator was stapled or stapler haemorrhoidopexy, and the outcomes were postoperative pain and perioperative recovery measures.

Search strategy

PubMed/MEDLINE, Scopus-indexed journals, the Crossref database and Google Scholar were searched systematically from inception, supplemented by hand-searching the reference lists of retrieved articles and relevant reviews. The core Boolean string was: (“haemorrhoids” OR “haemorrhoids” OR “haemorrhoidal disease” OR “piles”) AND (“laser haemorrhoidoplasty” OR “laser haemorrhoidoplasty” OR “LHP” OR “laser haemorrhoidopexy” OR “diode laser”) AND (“stapled haemorrhoidopexy” OR “stapler haemorrhoidopexy” OR “procedure for prolapse and haemorrhoids” OR “PPH” OR “circumferential stapler”). No date or language limit was applied within the database interfaces; only studies with an accessible English full text were ultimately eligible.

Eligibility criteria

Studies were eligible if they were randomised controlled trials or prospective or retrospective comparative cohort studies (including propensity-score-matched analyses) that directly compared laser haemorrhoidoplasty with stapled or stapler haemorrhoidopexy in adults with symptomatic haemorrhoidal disease and reported at least one outcome of interest (postoperative pain on the Visual Analogue Scale (VAS) or Numeric Rating Scale, operative time, intraoperative blood loss, length of hospital stay, postoperative complications, recurrence). Studies were excluded if they were single-arm series, reviews, editorials, conference abstracts or case reports, if the comparator was a technique other than stapled haemorrhoidopexy, or if no extractable outcome data were available.

Study selection and data extraction

Records from all sources were collated and de-duplicated, after which titles and abstracts were screened and potentially relevant articles were assessed in full text. Data were extracted onto a standardised form comprising first author, country, design, sample size per arm, haemorrhoid grade, laser specifications, follow-up, pain scale and time points, and the numeric values (mean, standard deviation and event counts) for every outcome, and were checked against the source full text for transcription accuracy. Where a study reported a mean without a standard deviation and provided only a directional p-value, the value was retained descriptively but was not used for continuous pooling, because reliable reconstruction of the dispersion was not possible from a directional p-value alone. Two such studies reported pain and perioperative means without standard deviations and therefore contributed only to dichotomous pooling; their exclusion reduced the pain and blood-loss analyses to three studies each, a limitation intrinsic to the primary literature rather than an analytical choice.

Risk-of-bias assessment

Randomised trials were appraised with the Cochrane RoB 2 tool across the domains of randomisation, deviations from intended interventions, missing outcome data, outcome measurement and selective reporting.[11] Non-randomised comparative and propensity-score-matched studies were appraised with the ROBINS-I tool across its seven domains. For each study the overall judgement was derived by taking the least favourable domain rating as the overall rating, following the standard algorithm for each tool, such that a single domain at high or serious risk determined an overall high or serious judgement.

Statistical analysis

All analyses used random-effects models with the DerSimonian–Laird estimator of between-study variance. For continuous outcomes the effect measure was the standardised mean difference expressed as Hedges g, which corrects for small-sample bias; because standardised effects are difficult to interpret clinically, the corresponding raw mean differences in natural units (minutes, millilitres, days) were also summarised from the study-level data. A value below zero favoured laser haemorrhoidoplasty. For dichotomous outcomes the effect measure was the Mantel–Haenszel risk ratio, with a 0.5 continuity correction applied to zero-cell studies; a value below one favoured laser haemorrhoidoplasty. Because the DerSimonian–Laird interval can be anticonservative when studies are few and heterogeneity high, the Hartung–Knapp–Sidik–Jonkman adjustment was pre-specified as the primary basis for inference on the continuous outcomes, and results were additionally re-estimated with restricted maximum likelihood. Heterogeneity was quantified with the I^2 statistic and Cochran Q. Because no outcome was informed by ten or more studies, formal small-study/publication-bias testing by Egger regression was not performed, and a funnel plot was inspected only descriptively for the primary outcome. Robustness was examined by leave-one-out analysis and by subgroup analyses stratified by study design and by follow-up duration. The certainty of evidence for each outcome was rated using a structured approach considering risk of bias, inconsistency, indirectness, imprecision and study number. Given the number of outcomes examined, individual significant subgroup findings were regarded as hypothesis-generating rather than confirmatory. Analyses were performed in R (packages meta and metafor) with figures prepared in Python (matplotlib); all pooled estimates were independently recomputed for verification.

3. Results

Study selection

The database and supplementary searches returned 220 records (94 from PubMed and 126 from Google Scholar and regional-journal hand-searching). After 41 duplicates were removed, 179 records were screened by title and abstract, of which 141 were excluded. Thirty-eight full-text articles were assessed and 28 were excluded, most commonly because they did not compare laser haemorrhoidoplasty with stapled haemorrhoidopexy (n=15), lacked extractable outcome data (n=7), reported duplicate cohorts (n=4) or had no accessible English full text (n=2). Ten studies met all criteria and were included in the qualitative synthesis, and seven contributed poolable data to the quantitative synthesis, as illustrated in the PRISMA flow diagram in Figure 1.

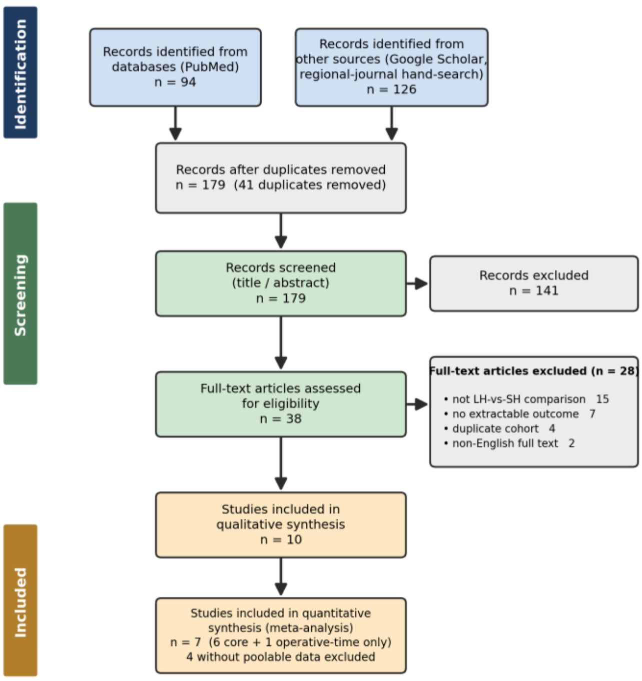

Figure 1. PRISMA 2020 flow diagram of study identification, screening and inclusion.

Study characteristics

The ten included studies were published between 2020 and 2025 and originated from Egypt, India, Bangladesh and Vietnam, reflecting the concentration of this literature in regional surgical practice.[7-9,12-18] They comprised randomised comparative trials and prospective or propensity-score-matched studies, and together enrolled more than nine hundred patients with predominantly grade II–III and grade III–IV disease. Pain was assessed predominantly with the VAS at time points from 12 hours to three months, and follow-up ranged from three months to two years. The full characteristics of the included studies, including reported age, laser settings where available and the pooled outcomes to which each study contributed, are detailed in Table 1.

Table 1. Characteristics of the included studies.

Study	Country	Design	LH / SH (n)	Grade	Age (yr, LH/SH)	Laser	Follow-up	Contributed to
Eskandaros & Darwish 2020	Egypt	RCT (3-arm)	40 / 40	III	NR	Diode	12 mo	Complications, recurrence
Kaushal 2020	India	Prospective comparative	25 / 25	II–III	NR	Diode	3 mo	Complications (pain means only)
Majumder 2021	Bangladesh	Prospective comparative	42 / 42	III–IV	NR	Diode	4 mo	Complications (pain means only)
Elhefny 2021	Egypt	Comparative	NR / NR	II–III	NR	Diode	NR	Qualitative only
Viswanath 2022	India	Prospective cohort	NR / NR	II–III	NR	Diode	NR	Qualitative only
Sabry 2023	Egypt	RCT	60 / 60	III	NR	Diode	24 mo	Pain, op time, blood loss, complications, recurrence
Tran & Duong 2024	Vietnam	Comparative (PSM)	115 / 115	III–IV	NR	Diode	12 mo	Pain, op time, complications, recurrence
Sinha 2025	India	RCT	50 / 50	III–IV	45.2 / 46.8	Diode (Lasotronix)	3 mo	Pain, op time, hospital stay, complications
Bhanarkar 2025	India	Comparative	30 / 30	II–III	52.6 / 49.3	Diode	short	Op time, complications
Reny 2024	India	Prospective comparative	20 / 20	III–IV	~47	Diode 980 nm	2–6 mo	Op time

Notes: LH, laser haemorrhoidoplasty; SH, stapled haemorrhoidopexy; RCT, randomised controlled trial; PSM, propensity-score matched; NR, not reported.

Risk of bias

Among the randomised trials, most raised some concerns, chiefly because of incomplete reporting of allocation concealment, sequence generation and assessor blinding; the two-year randomised trial by Sabry and colleagues was the most rigorously reported.[9] The non-randomised comparative studies carried moderate to serious risk of bias, driven principally by confounding and by allocation based on patient preference, and one study with inconsistent reporting of sample size was rated at serious risk across most domains. The domain-level judgements for every study are presented in the traffic-light plot in Figure 2.

Primary outcome: overall postoperative complications

Six studies reported overall postoperative complications. The pooled risk ratio favoured laser haemorrhoidoplasty numerically but was not statistically significant (RR 0.58, 95% CI 0.25 to 1.30; p=0.18; I^2 57%). Leave-one-out analysis identified the two-year randomised trial by Sabry and colleagues as the sole driver of both the non-significance and the heterogeneity: omitting it produced a significant estimate favouring laser haemorrhoidoplasty (RR 0.43, 95% CI 0.27 to 0.69; p=0.0004) with heterogeneity abolished (I^2 0%).[9] That trial uniquely reported greater late flatus incontinence, anal stenosis and two-year recurrence after laser treatment. Because this single trial exerts such leverage on the pooled result, the primary estimate should be regarded as fragile and interpreted with corresponding caution. The forest plot of this outcome, subgrouped by study design, is shown in Figure 3.

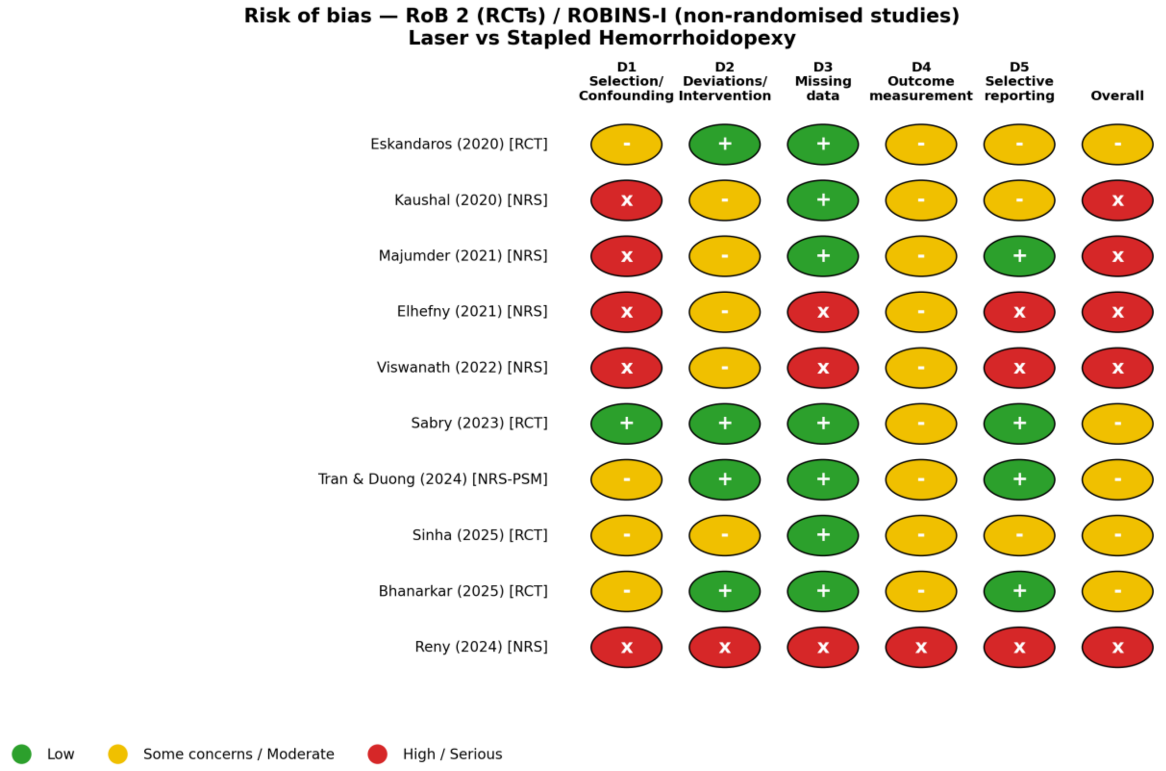

Figure 2. Risk-of-bias summary (RoB 2 for randomised trials; ROBINS-I for non-randomised studies).

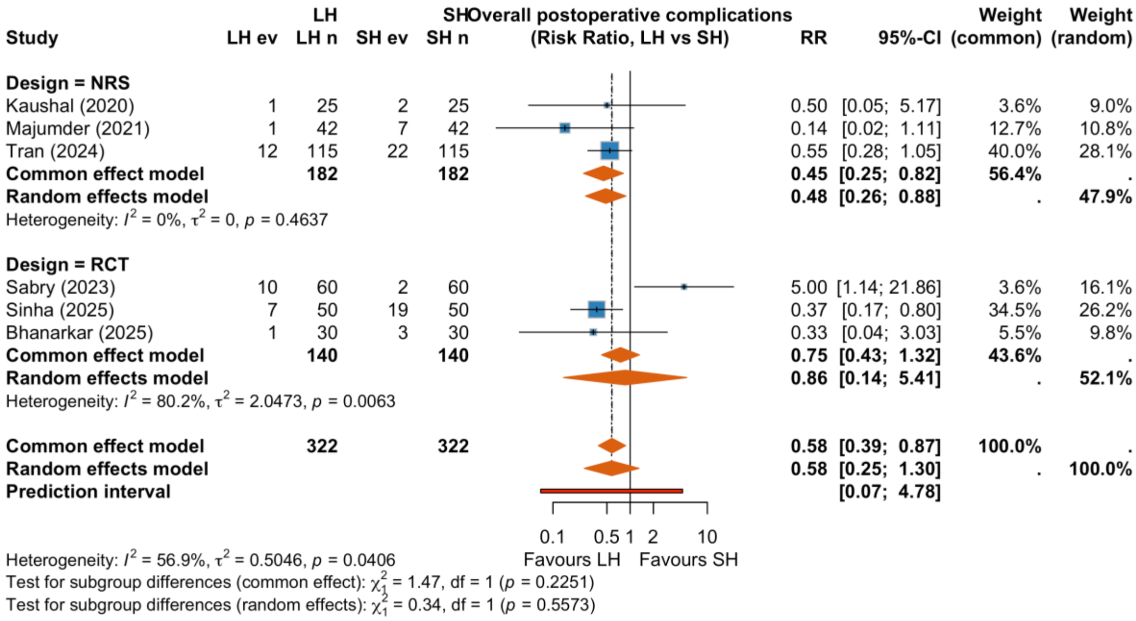

Figure 3. Forest plot of overall postoperative complications (random-effects risk ratio), subgrouped by study design.

Continuous secondary outcomes and their clinical magnitude

Five studies provided poolable operative-time data, and the pooled estimate demonstrated a clear and statistically significant advantage for laser haemorrhoidoplasty (SMD −1.65, 95% CI −2.47 to −0.84; p<0.001).[8,9,16-18] Although statistical heterogeneity was high (I^2 94%), it reflected variation in the magnitude rather than the direction of effect — every contributing study favoured laser treatment — and the effect persisted under the conservative Hartung–Knapp–Sidik–Jonkman interval (p=0.011), which is the basis for our inference. Translated into natural units, the raw operative-time difference across studies ranged from approximately 4 to 11 minutes shorter for laser treatment, averaging around 8 minutes. Length of hospital stay, informed by two studies and therefore exploratory, was significantly shorter after laser haemorrhoidoplasty (SMD −3.07, 95% CI −5.58 to −0.55; p=0.017), corresponding to roughly ten hours to one and a half days less in the raw data. Intraoperative blood loss showed a strong trend favouring laser treatment that narrowly missed significance (SMD −2.30, 95% CI −4.74 to 0.13; p=0.064), amounting to approximately 3 to 6 millilitres less in absolute terms — a difference of limited clinical consequence. These standardised effects are large but imprecise, and are best read as consistently favouring laser treatment in direction while remaining uncertain in magnitude.

Early postoperative pain within 24 hours could be pooled from three studies with usable dispersion data. The pooled standardised mean difference did not demonstrate a significant difference (SMD −0.66, 95% CI −1.95 to 0.63; p=0.32), and heterogeneity was extreme (I^2 98%). This inconsistency was clinically interpretable rather than random, and is best understood through the time course of pain rather than through a single pooled figure. As detailed in Table 2, laser haemorrhoidoplasty was consistently less painful in the first 12 hours, but by 24 hours and one week the advantage narrowed and, in the two-year randomised trial, reversed in favour of stapled haemorrhoidopexy, while by late follow-up both techniques converged to near-painless scores.[9,16] The pooled early-pain estimate should therefore be interpreted as evidence that neither technique holds a uniform pain advantage across the whole early window, rather than as evidence of equivalence at any single time point. Leave-one-out analysis confirmed that removal of the propensity-matched study, which reported higher day-one pain after laser treatment, yielded a significant pooled advantage for laser treatment, underscoring the instability of this estimate.

Table 2. Mean VAS pain scores by time point (lower value = less pain).

Study	12 h / POD1 (LH vs SH)	24 h (LH vs SH)	1 week (LH vs SH)	Late (≈3 mo)
Kaushal 2020	2.64 vs 4.76	1.88 vs 3.60	0.36 vs 0.88	0.04 vs 0.12
Majumder 2021	3.80 vs 6.81	2.60 vs 4.60	0.46 vs 0.88	0.04 vs 0.10
Sabry 2023	5.02 vs 5.83	3.86 vs 3.39*	1.59 vs 1.01*	—
Sinha 2025	4.80 vs 6.70	—	3.50 vs 5.80	0.30 vs 1.20

Notes: Values favouring stapled haemorrhoidopexy are marked with an asterisk (*), illustrating the crossover in the pain trajectory. Studies reporting means without standard deviations are shown descriptively and were not pooled for pain.

Dichotomous secondary outcomes

Recurrence (four studies) did not differ significantly (RR 0.88, 95% CI 0.15 to 4.96; p=0.88), nor did postoperative bleeding (RR 0.61, 95% CI 0.26 to 1.39; p=0.24; I^2 0%), anal stenosis or stricture (RR 0.44, 95% CI 0.04 to 4.89; p=0.50) or urinary retention (RR 0.63, 95% CI 0.29 to 1.36; p=0.24; I^2 0%). The point estimates for bleeding, stenosis and retention consistently favoured laser haemorrhoidoplasty, but none reached significance in this modest evidence base, and given the number of comparisons these should be viewed as hypothesis-generating.

Recovery-focused outcomes

Because time to return to normal activity, analgesic consumption and patient satisfaction are central to the rationale for minimally invasive surgery, these were sought from every study but were reported too inconsistently for meta-analysis. Narratively, earlier return to daily activity and lower early analgesic requirement after laser haemorrhoidoplasty were described by Kaushal and Bhanarkar and colleagues,[7,8] whereas the two-year randomised trial reported faster return to activity after stapled haemorrhoidopexy over the longer term, mirroring the crossover seen for pain.[9] Patient-satisfaction data were sparse and heterogeneously measured. These outcomes are therefore reported qualitatively, and their inconsistent measurement is flagged as a priority for standardisation in future studies.

Sensitivity, subgroup, robustness and certainty

The direction and significance of the operative-time and hospital-stay findings were stable across every leave-one-out iteration and across the DerSimonian–Laird, restricted maximum likelihood and Hartung–Knapp–Sidik–Jonkman estimators, indicating that these results were not artefacts of the variance-estimation method. For the primary complications outcome, subgroup analysis by design showed a significant advantage for laser treatment among non-randomised studies (RR 0.48, 95% CI 0.26 to 0.88) that was attenuated among randomised trials (RR 0.86, 95% CI 0.14 to 5.41; between-subgroup p=0.56); the fact that the advantage weakens in the higher-quality randomised subset reinforces the need for caution. The most informative stratification was by follow-up: among short-follow-up studies laser haemorrhoidoplasty conferred significantly fewer complications (RR 0.34, 95% CI 0.18 to 0.66; I^2 0%), whereas among studies with follow-up of at least twelve months the point estimate reversed toward stapled haemorrhoidopexy (RR 1.50, 95% CI 0.17 to 13.5), so that follow-up duration behaved as the dominant effect-modifier, albeit on the basis of very few studies. The funnel plot for the primary outcome, presented in Figure 4, showed no gross asymmetry, but with only six studies visual inspection is of very limited value and provides no reliable evidence for or against small-study effects. The certainty of the evidence, appraised across risk of bias, inconsistency, imprecision and study number, was low for operative time and overall complications and very low for the remaining outcomes, as summarised in Table 3.

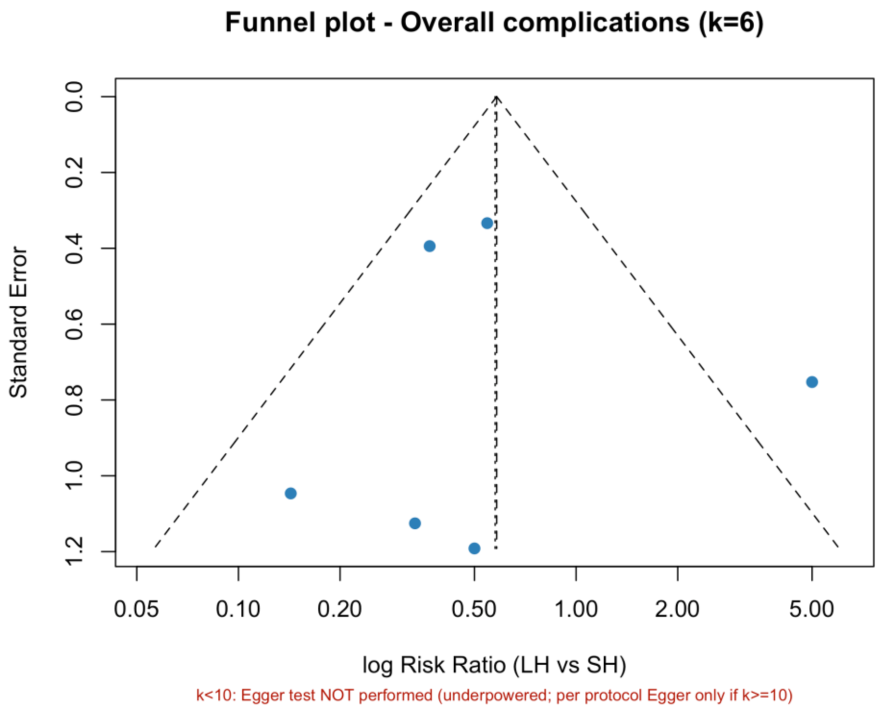

Figure 4. *Funnel plot for the primary outcome (overall complications). Formal small-study testing was not performed because fewer than ten studies contributed.*

Table 3. Summary of findings and certainty of evidence.

Outcome	k	Pooled effect (95% CI)	Direction	Certainty
Operative time	5	SMD −1.65 (−2.47, −0.84)	Favours LH (significant)	Low
Hospital stay	2	SMD −3.07 (−5.58, −0.55)	Favours LH (exploratory)	Very low
Intraoperative blood loss	3	SMD −2.30 (−4.74, 0.13)	Trend favours LH	Very low
Early pain (≤24 h)	3	SMD −0.66 (−1.95, 0.63)	No significant difference	Very low
Overall complications	6	RR 0.58 (0.25, 1.30)	No significant difference	Low
Recurrence	4	RR 0.88 (0.15, 4.96)	No significant difference	Very low
Postoperative bleeding	4	RR 0.61 (0.26, 1.39)	No significant difference	Low

Notes: LH, laser haemorrhoidoplasty; k, number of studies; SMD, standardised mean difference (Hedges g); RR, risk ratio. RR<1 or SMD<0 favours LH.

4. Discussion

This meta-analysis provides the first quantitative synthesis of the direct comparison between laser haemorrhoidoplasty and stapled haemorrhoidopexy for symptomatic haemorrhoidal disease. The pooled evidence indicated that laser haemorrhoidoplasty conferred consistent intraoperative advantages — a shorter operative time and hospital stay and a strong trend toward reduced blood loss, as summarised in Table 3 — whereas early postoperative pain and the principal safety endpoints did not differ significantly. The most clinically important observation was that the apparent complication advantage of laser treatment was confined to studies with short follow-up and reversed in the only trial that followed patients for two years, so that duration of follow-up emerged as the central effect-modifier.

The intraoperative superiority of laser haemorrhoidoplasty is mechanistically coherent. Because the technique delivers energy through a fine fibre without excising tissue or fashioning a purse-string and firing a circular stapler, it is inherently faster and produces less bleeding than the multi-step stapled procedure, and preservation of the anoderm and mucosa plausibly underlies the shorter hospital stay. These findings are directionally consistent with the larger body of evidence comparing laser haemorrhoidoplasty with conventional excisional haemorrhoidectomy,[3,4,19-22] suggesting that the perioperative benefits of the laser technique are robust across different comparators. Nonetheless, the raw differences — around eight minutes of operating time and a few millilitres of blood — are modest in absolute terms, and the very large standardised effects should be read as reflecting between-study measurement variation as much as uniformly large clinical benefit.

The absence of a significant pooled difference in early pain contrasts with the widespread clinical impression that laser haemorrhoidoplasty is the least painful option, and it merits careful interpretation. The extreme heterogeneity of this outcome was not statistical noise but reflected genuine clinical divergence, best captured by the time-point analysis in Table 2: laser treatment was less painful in the first twelve hours, but the advantage narrowed by 24 hours and, in the two-year randomised trial, reversed thereafter, while a propensity-matched cohort reported higher day-one pain after laser treatment.[9,16] Averaging across such crossing trajectories is misleading, and the finding should be read as evidence that neither technique holds a uniform pain advantage across the entire early window rather than as evidence of equivalence at any single time point. This time-dependence, rather than a single summary estimate, is arguably the most useful message for a surgeon counselling a patient.

A plausible biological explanation reconciles the crossover observed for pain. In the first hours after surgery, laser haemorrhoidoplasty produces less immediate nociceptive input because it avoids an open perianal wound and preserves the somatic sensory innervation of the anoderm, so pain is lowest while acute tissue trauma dominates. Over the subsequent days, however, the submucosal photothermal coagulation induced by the laser provokes an inflammatory and fibrotic remodelling response, and residual oedema and thrombosis of treated cushions may generate a second, later phase of discomfort, whereas the stapled wound, positioned in the relatively insensate rectal mucosa above the dentate line, settles more predictably once the initial staple-line irritation subsides. This mechanistic account is consistent with the pattern in Table 2 and reinforces the argument that pain after these procedures should be reported and compared at explicit, standardised time points rather than aggregated into a single early window that conceals opposing trajectories.

Our results also situate the two techniques within the broader therapeutic landscape. Existing meta-analyses have compared laser haemorrhoidoplasty with Milligan–Morgan and Ferguson haemorrhoidectomy and with LigaSure, and have compared stapled haemorrhoidopexy with excisional surgery, but the direct laser-versus-stapled comparison had not previously been pooled.[3-6] By demonstrating that the two minimally invasive techniques are broadly comparable for pain and safety while differing in intraoperative efficiency, the present synthesis fills a specific evidence gap. The signal that stapled haemorrhoidopexy may retain an advantage in long-term recurrence and continence, driven by the only two-year trial, echoes long-standing concerns that tissue-preserving laser techniques may trade early comfort for higher late recurrence;[1,2] this concern should temper enthusiasm for laser treatment in younger patients for whom durability is paramount, though it rests on limited data and cannot yet be regarded as established.

Several practical considerations bear on technique selection. Cost is prominent: laser systems and single-use fibres carry substantial capital and consumable expense, and although the shorter operating time and hospital stay associated with laser treatment may offset part of that expense, the balance varies between health systems and was not formally evaluated here; a dedicated health-economic analysis is warranted. The learning curve and reproducibility also differ, with stapled haemorrhoidopexy carrying well-described technical pitfalls and rare serious complications, and laser haemorrhoidoplasty being simpler to learn but sensitive to energy settings that were inconsistently reported across the included studies. Indeed, the frequent absence of reported wavelength, power and total energy is both a source of heterogeneity and a barrier to standardisation, and we echo calls for consistent reporting of these parameters. Relative performance may also vary by disease grade — stapled haemorrhoidopexy is traditionally favoured for circumferential prolapse and laser treatment for less advanced disease — but the available data did not permit reliable grade-stratified pooling, and this remains an important question for future work.

Heterogeneity was a defining feature of this evidence base. The very high I^2 values for the continuous outcomes arose from differences in pain-assessment time points, laser settings, disease grade, analgesic protocols and follow-up, as well as from the mixture of randomised and non-randomised designs. Rather than obscuring these differences with a single pooled figure, we used random-effects models, subgroup analysis, leave-one-out diagnostics and the conservative Hartung–Knapp–Sidik–Jonkman interval to characterise them, and we interpret the continuous estimates as indicative of direction and approximate magnitude rather than as precise summary effects. The stability of the operative-time result under these conservative methods nonetheless gives reasonable confidence that the intraoperative advantage of laser treatment is real, even if its magnitude is uncertain.

These findings carry several implications for practice. For patients in whom a short procedure, minimal bleeding and rapid discharge are priorities — for example those managed in day-case or resource-constrained settings, or those at higher bleeding risk — laser haemorrhoidoplasty offers tangible intraoperative benefits and a favourable very-early pain profile. For patients in whom durable long-term control is paramount, the possibility that stapled haemorrhoidopexy provides lower late recurrence and better late continence should be weighed, alongside the higher device cost of laser systems. Because neither technique demonstrated a decisive overall superiority and the certainty of evidence was low to very low throughout, individualised selection based on disease grade, patient priorities, expected follow-up, resource availability and local expertise appears the most defensible approach, and any recommendation should be offered as provisional guidance rather than a definitive standard.

This review has several limitations. First, the evidence base was small: only ten studies were eligible and no more than six contributed to any single pooled outcome, limiting power and precluding formal publication-bias testing. Second, the studies were methodologically heterogeneous, combining randomised trials with non-randomised and propensity-matched cohorts, and several carried moderate to serious risk of bias, particularly from allocation by patient preference and incomplete reporting; the attenuation of the complication advantage within the randomised subset illustrates the potential influence of this. Third, statistical heterogeneity for the continuous outcomes was very high, so those pooled estimates must be interpreted with caution. Fourth, most studies reported only short follow-up, constraining inference about recurrence and late complications, and two studies reported means without dispersion measures that could not be pooled for pain. Fifth, the evidence was concentrated in a small number of countries and centres, chiefly in Egypt and the Indian subcontinent, which may limit generalisability to other health systems and populations. Sixth, several included studies appeared in regional journals with limited international indexing, and the certainty of evidence was low to very low across all outcomes. These limitations collectively temper the strength of the conclusions and underline the provisional nature of the current evidence.

Future research should prioritise adequately powered, multicentre randomised controlled trials comparing the two techniques directly, employing standardised operative protocols and clearly reported laser settings, uniform and pre-defined pain-assessment time points, standardised reporting of recovery outcomes such as return to activity and analgesic use, and follow-up extended to at least two to three years to capture recurrence and continence reliably.[23,24] Consistent reporting of means with standard deviations and of complication definitions would materially improve poolability, grade-stratified analysis would clarify whether relative performance depends on disease severity, and health-economic evaluation would contextualise the trade-off between the intraoperative efficiency of laser treatment and its higher device cost. The field is also evolving, with newer-generation stapling devices and refined laser protocols combined with mucopexy, so the present conclusions apply to the techniques as practised in the included studies and should be revisited as new evidence accrues.[5]

5. Conclusion

This systematic review and meta-analysis represents the first quantitative synthesis of the direct comparison between laser haemorrhoidoplasty and stapled haemorrhoidopexy for symptomatic grade II–III haemorrhoidal disease. Pooling the available randomised and comparative evidence, laser haemorrhoidoplasty demonstrated consistent and statistically significant intraoperative advantages over stapled haemorrhoidopexy, including a substantially shorter operative time and a shorter hospital stay, together with a strong but non-significant trend toward reduced intraoperative blood loss. These benefits are biologically plausible, arising from the non-excisional nature of the laser technique and its preservation of the anoderm and mucosa, although in absolute terms the differences were modest and their standardised magnitude was imprecise.

For the outcomes that matter most to patients over the medium term, the two techniques were statistically comparable. Early postoperative pain did not differ significantly on pooling; this was an unstable estimate reflecting a genuine time-dependent crossover — laser treatment less painful in the first hours, stapled haemorrhoidopexy less painful thereafter — rather than true equivalence. Overall complications, recurrence, bleeding, anal stenosis and urinary retention showed no significant differences. The apparent early complication advantage of laser treatment was confined to short-follow-up studies and reversed in the single two-year trial, which favoured stapled haemorrhoidopexy for late continence and recurrence, establishing duration of follow-up as the dominant effect-modifier in this comparison.

Taken together, these findings indicate that laser haemorrhoidoplasty and stapled haemorrhoidopexy are both reasonable minimally invasive options for advanced haemorrhoidal disease, with laser treatment offering greater intraoperative efficiency and a favourable very-early pain profile, and stapled haemorrhoidopexy potentially offering more durable long-term control. In the absence of a decisive overall superiority and with the certainty of evidence rated low to very low, technique selection should be individualised according to disease grade, patient priorities, expected follow-up, resource availability and surgical expertise. The current evidence remains limited by small numbers, methodological heterogeneity, high statistical inconsistency and short follow-up, and adequately powered long-term randomised trials with standardised outcome reporting are needed before firmer recommendations can be made.

Declarations

Conflict of interests

The authors declare that they have no competing interests. In particular, the authors have no financial relationship with any manufacturer of laser or stapling devices relevant to this comparison.

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Author contributions

Both authors contributed to the conception and design of the review, the screening and data extraction, the interpretation of the analyses and the drafting and critical revision of the manuscript, and both approved the final version.

Data availability

The extracted dataset and analysis outputs supporting the findings of this study are available from the corresponding author on reasonable request.

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