

Long-term impact of haemorrhoidal artery ligation on anal function and continence

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Abstract

Aims

Haemorrhoidal artery ligation (HALO) and variants including Doppler-guided HAL (DG-HAL), HAL with rectoanal repair (HAL-RAR), and transanal haemorrhoidal dearterialisation (THD) serve as minimally invasive alternatives to excisional haemorrhoidectomy, reducing pain while preserving sphincter function. Long-term faecal incontinence remains a concern due to its quality-of-life impact. This systematic review assessed prevalence, severity, and patterns of incontinence beyond six months post-procedure across HAL techniques.

Methods

PRISMA 2020 guidelines directed searches of PROSPERO, MEDLINE, PubMed, Scopus, Cochrane Library, and ScienceDirect for 2015–2024 studies reporting continence >6 months after HAL-based procedures. Six studies (3 RCTs, 1 prospective, 2 retrospective cohorts; total n=671 patients) met PICOS criteria, with Wexner Incontinence Scores reported or retrospectively mapped. Quality appraisal used CASP Cohort Checklist.

Results

Seventeen (2.5%) of 671 patients developed postoperative faecal incontinence. Of these, 14 (82%) cases were mild (Wexner 1–4) and transient, resolving within 3–6 months; 3 (18%) were moderate (Wexner 5–8), primarily in HAL-RAR (9/158 [5.7%]). Standard HAL showed 0/76 (0%) cases; THD had 1/104 (1.0%); DG-HAL had 7/293 (2.4%). No severe incontinence occurred.

Discussion

HALO techniques demonstrate excellent long-term continence safety (overall 2.5% low-grade incontinence). HAL-RAR's higher risk (5.7%) warrants counselling. Standardised scoring and multicentre trials are recommended.

Introduction

Haemorrhoidal disease affects up to 39% of adults in Western populations, making it one of the most common anorectal conditions.¹ Symptoms such as bleeding, prolapse, and pain can markedly impair quality of life. The Doppler-guided Haemorrhoidal Artery Ligation Operation (HALO) has emerged as a minimally invasive alternative to traditional excisional haemorrhoidectomy, and when combined with rectoanal repair (HAL-RAR), it is increasingly favoured in clinical practice.^{2,3}

HALO offers reduced postoperative pain, preservation of sphincter function, and faster recovery compared with open surgery.⁴ Despite these advantages, uncertainties remain regarding its long-term functional outcomes, particularly faecal incontinence. Although early postoperative incontinence rates are low, evidence beyond the recovery period is limited. Studies vary in follow-up duration, definitions, and outcome measures, hindering meaningful comparison.

Currently, no systematic review or meta-analysis has comprehensively evaluated the long-term prevalence of faecal incontinence after HALO. This review therefore aims to determine the prevalence of faecal incontinence occurring more than six months after the procedure, with or without mucopexy. It also seeks to evaluate whether procedural variations influence continence outcomes, explore patient-related risk factors that may contribute to incontinence, and inform surgical decision-making to improve postoperative results.

A clear understanding of these long-term outcomes is essential for optimising treatment selection, enhancing patient counselling, and improving the overall quality of care in haemorrhoidal surgery.

Methods

This systematic review and meta-analysis followed the PRISMA 2020 guidelines⁵ and was developed using the PICO framework.

The population comprised post-surgical patients following haemorrhoid interventions. The intervention focused on the HALO procedure and its variants, including Doppler-guided HAL (DG-HAL), HAL with rectoanal repair (HAL-RAR), and transanal haemorrhoidal dearterialisation (THD). No specific comparison was designated, as the review evaluated absolute outcomes across techniques. The primary outcome was the long-term pattern and prevalence of faecal incontinence, assessed beyond six months post-procedure using standardised Wexner Incontinence Scores.

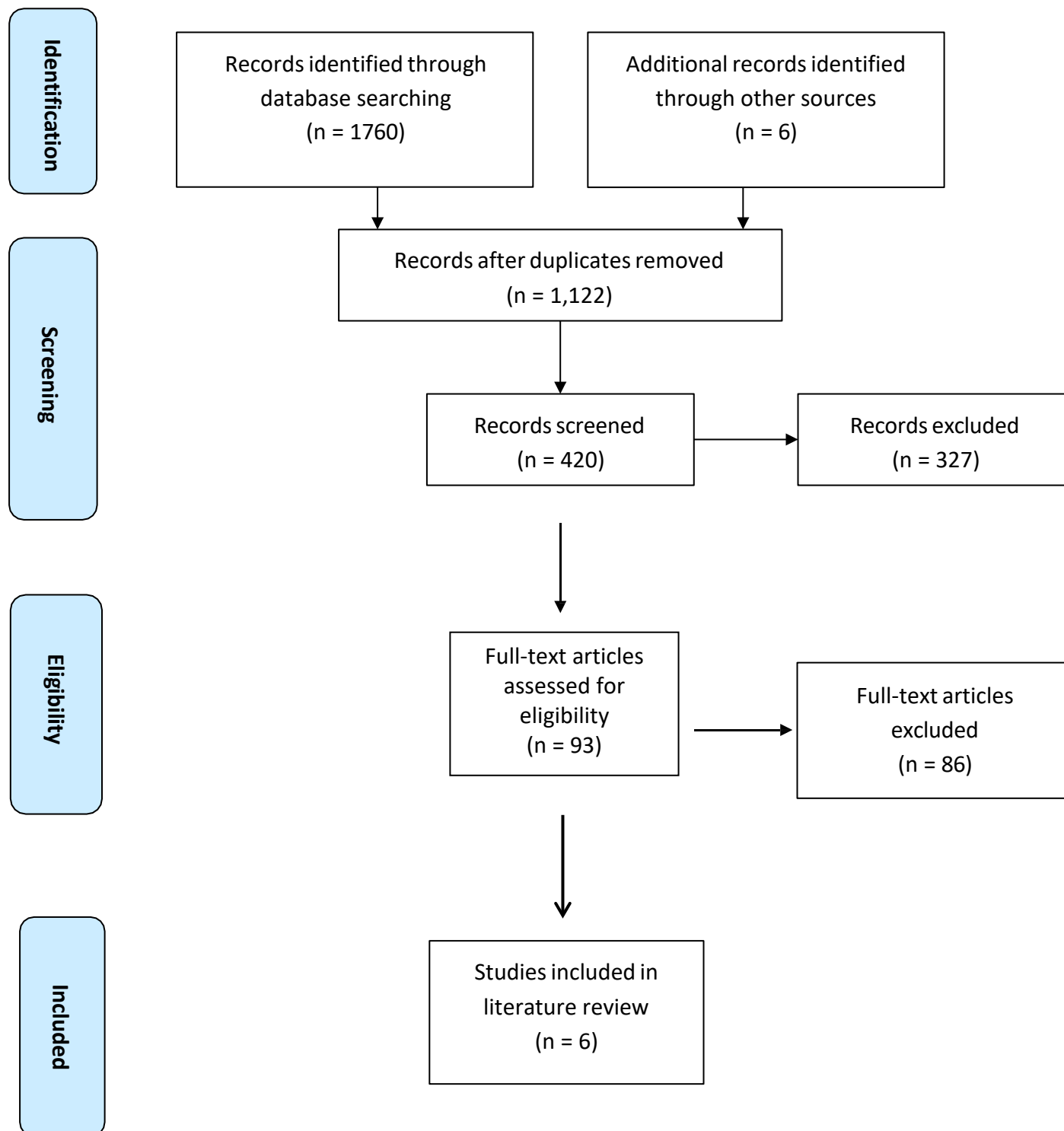
A comprehensive literature search was conducted between May and July 2025 using PROSPERO, MEDLINE, PubMed, Scopus, Cochrane Library, and ScienceDirect. Additional relevant studies were identified through a preliminary Google Scholar search.

Keywords included “haemorrhoidal artery ligation,” “HALO procedure,” “Doppler-guided haemorrhoidal artery ligation,” “HAL-RAR,” “faecal incontinence,” “anal incontinence,” and “long-term.” Boolean operators AND and OR were applied to refine and maximise retrieval of studies reporting follow-up periods longer than six months.

All studies were assessed for quality and relevance using the Critical Appraisal Skills Programme (CASP) Cohort Study Checklist. This ensured consistent evaluation of study design, data accuracy, confounding control, and follow-up adequacy, allowing inclusion of only high-quality evidence relevant to the research question.

Inclusion criteria encompassed studies published in English within the past 10 years (2015–2024) to reflect contemporary HALO techniques and care standards; those employing primary research methodology for high-quality empirical data suitable for analysis; and studies explicitly reporting faecal incontinence outcomes with follow-up exceeding six months after HALO procedures (with or without mucopexy). These ensured relevance to long-term functional outcomes. Exclusion criteria comprised studies predating 2015, as they may not represent current practices; non-English publications to avoid translation errors; secondary research such as discussion papers or case reports to minimise bias; and studies lacking faecal incontinence data or with follow-up ≤ 6 months, as they failed to address the primary outcome.

Figure 1: The PRISMA flow diagram



Result

Summary of Data Related to HALO Procedure and Incidence of Long-term Faecal Incontinence (Table 1)

Author	Year	Type of Study	Cases	Type of Halo Procedure	Grade of Haemorrhoids	Length of Follow up (Range)	Incontinence Reported
Bonomo, L ⁽⁶⁾	2023	Prospective	122	Hemorrhoidal artery ligation (HAL)=76 Doppler guide (DG) HAL= 46	ii-iii	46 months (6–86)	0
Carvajal López, F ⁽⁷⁾	2019	RCT	20	Haemorrhoid artery ligation with recto-anal repair (HAL-RAR)	iii=iv	6 months	1
Lauricella, S ⁽⁸⁾	2024	Retrospective cohort	89	Doppler-guided (DG) hemorrhoidal artery ligation and recto anal repair (HAL-RAR)	ii-iii	24 months	5
Lehur, P ⁽⁹⁾	2016	RCT	197	Doppler-guided hemorrhoidal artery ligation	ii-iii	12 months	0
Venara, A ⁽¹⁰⁾	2018	RCT	193	Trans anal hemorrhoidal dearterialization (THD)=104 HAL-RAR= 89	ii-iii	12MONTHS	THD=1 HAL-RAR=3
Zhai, M ⁽¹¹⁾	2016	RCT	50	Doppler guide (DG) HAL	iii	24 months however only look at 3 months for continence	7

Results (Articles and Study Design)

A total of six studies met the inclusion criteria for analysis of postoperative faecal incontinence following haemorrhoidal artery ligation (HAL) techniques. The selection process is summarised in Figure 1 (PRISMA flow diagram).

These studies, published between 2016 and 2024, included a combined total of 671 patients. Study designs comprised three randomised controlled trials (RCTs), one prospective observational study, and two retrospective cohort studies, with follow-up durations ranging from 6 to 86 months.

The surgical approaches analysed included standard HAL, Doppler-guided HAL (DG-HAL), HAL with rectoanal repair (HAL-RAR), and transanal haemorrhoidal dearterialisation (THD). Two studies compared multiple HAL variants within the same cohort, while the remaining studies focused on a single intervention type.^{6–11}

Surgical Technique and Follow-up Duration

Standard HAL was performed in 76 patients, DG-HAL in 293 patients, HAL-RAR in 158 patients, and THD in 104 patients. Follow-up duration varied significantly, with three studies assessing outcomes at 12 months or less, and three studies extending follow-up to 24 months or longer. The longest study reported a mean follow-up of 46 months (range 6–86 months) with no cases of incontinence in patients undergoing standard HAL⁽⁶⁾. In contrast, one study followed patients for 24 months and reported the highest incontinence rate (5.6%), all in the HAL-RAR group⁽⁸⁾.

Incontinence Patterns and Prevalence

Across all included studies, 17 postoperative incontinence cases were identified, giving an overall pooled prevalence of 2.5%. HAL-RAR showed the highest rate (5.7%), followed by DG-HAL (2.4%), THD (1.0%), and standard HAL (0%).^{6–11}

The Wexner Incontinence Grading System was applied to standardise outcomes. Only one study reported Wexner scores directly,⁹ while others were retrospectively mapped to this scale for comparison.

Most cases were mild (Wexner 1–4) and transient, resolving within 3–6 months. Moderate symptoms (Wexner 5–8) were uncommon and mainly occurred in HAL-RAR patients. No severe incontinence (Wexner ≥ 9) was reported.

Effect of Follow-up Duration

Follow-up duration influenced the detection of persistent faecal incontinence symptoms. Studies with short-term follow-up (≤ 12 months) reported a combined incontinence rate of 2.2% (7/313 patients), with all cases resolving within three months.^{6–11} In contrast, longer follow-up studies (>12 months) showed a slightly higher rate of 2.8% (10/358 patients), mainly in the HAL-RAR group.⁸

Extended follow-up improved identification of persistent symptoms; however, the overall incidence remained low, and severe cases were rare across all study durations.

Discussion

This systematic review investigated the long-term prevalence of faecal incontinence following the haemorrhoidal artery ligation operation (HALO) and its procedural variations. The pooled analysis of six studies involving 671 patients revealed an overall prevalence of 2.5%, with most cases being mild, transient, and resolving within three to six months. Persistent moderate symptoms were uncommon, and no severe cases were reported.^{6–11}

The findings of this review confirm that HALO remains a safe and effective minimally invasive treatment for haemorrhoidal disease. The inclusion of multiple randomised controlled trials strengthens the reliability of this review, given their ability to minimise selection bias and confounding. The results contrast with earlier haemorrhoid surgery reviews, which often relied on small observational studies with inconsistent methodologies and limited follow-up. By including studies published after 2015 and applying strict eligibility criteria, this review provides contemporary evidence that better reflects current surgical techniques and perioperative management.

HAL-RAR demonstrated the highest prevalence of incontinence (5.7%) compared with DG-HAL (2.4%), THD (1.0%), and standard HAL (0%).^{6–11} This suggests that the additional rectoanal repair component, which involves deeper tissue dissection, may temporarily affect sphincter function.⁸ Conversely, standard HAL showed no incontinence cases, consistent with its sphincter-preserving principle.

When compared with other haemorrhoid procedures such as stapled haemorrhoidopexy, which can result in incontinence rates up to 8%, HALO appears to provide a more favourable continence profile.¹² Extended follow-up improved detection of persistent symptoms, particularly in HAL-RAR patients, indicating that short-term studies may underestimate long-term complications.^{6–8}

From a clinical perspective, these results offer reassurance to both surgeons and patients. The low overall incidence of faecal incontinence supports HALO as a suitable alternative to

excisional haemorrhoidectomy, especially where sphincter preservation is prioritised. Nonetheless, the higher risk observed with HAL-RAR warrants emphasis during preoperative counselling. Avoiding HAL-RAR in patients with pre-existing continence issues or sphincter damage may further reduce risk.

Despite the strengths of this review, several limitations must be acknowledged. Heterogeneity in outcome assessment was notable—only one study used the Wexner score directly, while others applied non-standardised tools, requiring retrospective mapping for comparison.⁹ The small number of eligible studies and limited sample sizes reduce generalisability. The author acknowledges that the retrospective application of the Wexner Incontinence Grading System may result in minor inconsistencies in standardization.

Additionally, patient-related factors such as age, sex, obstetric history, and baseline continence were inconsistently reported, preventing stratified risk analysis. Future research should include larger multicentre trials using validated scoring systems and standardised reporting methods to ensure more accurate and comparable results.

Overall, HALO demonstrates excellent long-term functional safety, with very low rates of incontinence. These findings reinforce its role as a sphincter-preserving, patient-friendly option for managing haemorrhoidal disease.

This systematic review found that long-term faecal incontinence following the haemorrhoidal artery ligation operation (HALO) and its variations is uncommon, with an overall prevalence of 2.5%.^{6–11} Most cases were mild and transient, resolving within a few months. HAL-RAR demonstrated a slightly higher rate of persistent symptoms compared with other techniques, suggesting that the additional rectoanal repair component may temporarily affect continence.

Overall, HALO remains a safe, effective, and sphincter-preserving treatment for haemorrhoidal disease. Extended follow-up enhances detection of minor or delayed symptoms, but severe incontinence remains rare. Standardised reporting and use of validated scoring systems such as the Wexner scale are recommended for future studies to strengthen comparability and evidence quality.

Declarations of Conflicts of Interest:

None declared.

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Appendix:

Appendix 1: CASP Checklist for Cohort Study Review

1. Did the study address a clearly focused issue?
2. Was the cohort recruited in an acceptable way?
- *Is it worth continuing? *
3. Was the exposure accurately measured to minimise bias?
4. Was the outcome accurately measured to minimise bias?
5. (a) Have the authors identified all important confounding factors?
(b) Have they taken account of the confounding factors in the design and/or analysis?
6. (a) Was the follow up of subjects complete enough?
(b) Was the follow up of subjects long enough?
7. What are the results of this study?
8. How precise are the results?
9. Do you believe the results?
10. Can the results be applied to the local population?
11. Do the results of this study fit with other available evidence?
12. What are the implications of this study for practice?