

# Efficacy and Safety of Snap Needles in the Treatment of Postoperative Hemorrhoidal Pain: A Systematic Review and Meta-Analysis

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**Purpose:** The aim of this study is to evaluate the efficacy and safety of Snap Needles (SN) in the management of Postoperative Hemorrhoidal Pain (POHP).

**Patients and Methods:** A systematic search was conducted in various databases, including EMBASE, Web of Science, PubMed, WanFang database, China National Knowledge Infrastructure (CNKI), China Biomedical Literature Database (CBM), and China Science and Technology Journal Database (VIP), spanning from their inception to August 2023, to identify relevant randomized controlled trials (RCTs) on SN for POHP. The primary outcome measure was the Visual Analog Scale (VAS), while secondary outcomes encompassed the Total Effective Rate (TER), Wound Healing Time (WHT), Pain Relief Time (PRT), Pain Disappearance Time (PDT), and Adverse Events (AEs). The Cochrane Risk of Bias Tool was employed to assess the quality of individual studies. A meta-analysis was conducted using RevMan 5.4.1 software.

**Results:** The meta-analysis included 11 RCTs involving 1188 POHP patients, with an overall assessment of study quality ranging from very low to moderate. The findings revealed that the SN group exhibited significant improvements in treatment outcomes when compared to the control group (CG). These improvements were reflected in reduced VAS scores (mean difference [MD] = -1.10, 95% confidence interval [CI]: -1.31, -0.89,  $P < 0.05$ ), shorter WHT (MD = -2.55, 95% CI: -3.02, -2.09,  $P < 0.05$ ), quicker PRT (MD = -7.99, 95% CI: -8.48, -7.49,  $P < 0.05$ ), fewer AEs (risk ratio [RR] = 0.38, 95% CI: 0.22, 0.67,  $P < 0.05$ ), improved TER (RR = 1.18, 95% CI: 1.09, 1.27,  $P < 0.05$ ), and faster PDT (MD = 19.24, 95% CI: 14.17, 24.31,  $P < 0.05$ ).

**Conclusion:** The use of SN appears to yield favorable outcomes in the treatment of POHP, and is potentially an alternative therapy to western drug therapy.

**Keywords:** snap needles, SN, postoperative hemorrhoidal pain, POHP, auricular acupuncture, systematic review, meta-analysis

## Introduction

Hemorrhoids represent one of the most prevalent anorectal conditions, characterized by clinical symptoms including pain, bleeding, itching, and prolapse, and can manifest at any stage of life.<sup>1</sup> In China, the incidence of anal and intestinal disorders is estimated at approximately 51.14%, with hemorrhoids ranking as the foremost condition, affecting around 50.28% of individuals.<sup>2</sup> This high prevalence significantly impacts the quality of life for affected individuals,<sup>2</sup> and presents a substantial challenge in both the medical and socio-economic domains.<sup>3</sup>

The approach to treating hemorrhoids is contingent upon the symptoms and the stage of the condition. Hemorrhoidectomy is widely acknowledged as an effective intervention for conservative management, particularly in cases of refractory, grade III, and grade IV hemorrhoids.<sup>4</sup> However, a prevalent issue following hemorrhoidectomy is the occurrence of pain.<sup>5</sup> This pain is significant, with reports indicating that up to 65% of patients experience moderate to



**Figure 1** Specific structure of the SN.

severe discomfort, leading to analgesic requirements that include both opioids and nonsteroidal anti-inflammatory drugs (NSAIDs) for as many as 40% of patients.<sup>6</sup> Consequently, this pain can impede recovery and result in extended hospitalization. Presently, Western medicine predominantly employs oral or local analgesic medications for postoperative hemorrhoidectomy pain relief. However, these medications often come with significant side effects. Opioid analgesics, for instance, carry the risk of respiratory depression and the potential for addiction. On the other hand, NSAIDs, while offering pain relief, may induce adverse effects such as peptic ulcers or gastrointestinal hemorrhage.<sup>7</sup> In light of these concerns, there is a growing interest in exploring the use of effective and safe Traditional Chinese Medicine (TCM) as an alternative approach to analgesia.

Snap Needles (SN), which stands for snap-type intradermal needle, is a specialized form of intradermal needle characterized by its distinctive ring-shaped end, which extends straight from the needle body.<sup>8</sup> It is also referred to as a peg-type intradermal needle. The structure of SN is illustrated in [Figure 1](#). SN represents a unique fusion of skin theory and acupuncture point theory.<sup>9</sup> Its shorter needle is designed to puncture and securely anchor within the skin or subcutaneous tissue at specific acupuncture points on the body's surface. These needles remain in place for several hours to days, delivering gentle and sustained stimulation to the skin. This approach is employed to prevent and treat various diseases and promote overall health.<sup>10</sup> SN is prized for its simplicity, rapid action, minimal discomfort, and wide applicability. Since the establishment of the national standard code of practice for intradermal needling, SN has gained extensive recognition and appreciation within clinical settings.<sup>11</sup>

Two prior meta-analyses have delved into the realm of acupuncture therapy for Postoperative Hemorrhoidal Pain (POHP).<sup>12,13</sup> However, it's crucial to note that these analyses primarily focused on distinct acupuncture modalities, such as electroacupuncture,<sup>12</sup> which may introduce variations in convenience, pain management, and potential side effects compared to SN. Furthermore, there exists a network meta-analysis examining three therapeutic approaches: auricular acupressure, acupressure, and acupressure embedding for POHP treatment.<sup>13</sup> However, a significant disparity in the definitions and methodologies of these three approaches in relation to traditional acupuncture modalities complicates direct comparisons.<sup>14</sup> Notably, there has yet to be a dedicated meta-analysis investigating the efficacy of SN in managing POHP. Therefore, we conducted this meta-analysis to assess the efficacy and safety of SN in the treatment of POHP.

## Materials and Methods

No ethical approval or patient consent was required for this study, as all analyses were conducted using data from previously published studies. The present study was carried out according to the Preferred Reporting Items for

Systematic Reviews and Meta-Analysis (PRISMA) 2020<sup>15</sup> guidelines ([Supplementary Material](#)), ensuring a standardized and systematic approach to our review process. The study has been registered with the International Prospective Register of Systematic Reviews (PROSPERO) under registration number CRD42023402881.

## Search Strategies and Study Selection

We conducted a comprehensive search of multiple databases from their inception through August 2023 without imposing any language or publication date restrictions. The databases included in our search were EMBASE, PubMed, Web of Science, China National Knowledge Infrastructure (CNKI), WanFang database, Chinese Biomedical Literature Database (CBM), and Chinese Science and Technology Journal Database (VIP). Our retrieval strategy employed a combined approach of MeSH terms and free keywords to maximize the retrieval of relevant studies. The key terms used in our search included “postoperative pain”, “hemorrhoid”, “press needle”, “snap needle”, “auricular acupuncture”, and “randomized controlled trials”. These terms were adapted as needed to conform to the specific search syntax and requirements of each database. To ensure a comprehensive search, we also screened all references cited in the included trials, aiming to identify any additional eligible trials that may have been missed during the initial database search. Detailed and database-specific search strategies are provided in the [Supplementary Material for Reference](#).

All retrieved articles were imported into Endnote software (version X9), where we conducted a systematic screening to identify and eliminate duplicate records. Subsequently, potentially eligible studies underwent a thorough examination of their full texts. To maintain the integrity of the selection process, two independent researchers meticulously reviewed the chosen citations. In the event of any discrepancies or differences in the screening process, a third investigator was consulted to provide their judgment.

## Inclusion Criteria

Studies were eligible for inclusion in this meta-analysis if they met the following criteria: (a) Population: Patients who met the diagnostic criteria in the “Guidelines for the Diagnosis and Treatment of Hemorrhoids”<sup>16</sup> and experienced postoperative pain, irrespective of sex, age, or race. (b) Intervention: The experimental group received SN only in addition to the treatment associated with the control group (CG). (c) Comparison: The CG did not receive SN intervention and could include Western medical therapies, Chinese medical therapies, and routine nursing interventions. (d) Outcomes: The primary outcome measure was the Visual Analog Scale (VAS), while secondary outcomes included Total Effective Rate (TER), Wound Healing Time (WHT), Pain Relief Time (PRT), Pain Disappearance Time (PDT), and Adverse Events (AEs). (e) Study Type: Only randomized controlled trials (RCTs) were considered for inclusion.

## Outcome Measurement and Quality Assessment

In [Table 1](#), we conducted a systematic extraction of essential information from the included studies, comprising the following details: first author, publication year, duration of intervention, study design, outcome measures, and participant characteristics, including age, sample size, and gender ratio. In instances where certain essential data were not provided in the original study, we proactively reached out to the corresponding authors to obtain the necessary information.

The quality assessment of the RCTs for inclusion in the review was carried out independently by two reviewers. We utilized the Cochrane Risk of Bias Tool<sup>17</sup> to assess various aspects of trial quality, including generation of random sequences; allocation was hidden; blinding among study subjects and treatment protocol implementers; blinding to outcome assessment; complete results; selective publication; and other biases. For each of these domains, the RCTs were categorized as exhibiting “high risk”, “low risk” or “unclear risk”.

## Statistical Analyses

The meta-analysis was conducted with Review Manager 5.4.1, with the following statistical measures applied: Dichotomous variables were measured using risk ratio (RR); continuous variables were assessed using the mean difference (MD) when measured on the same scale. Otherwise, the standardized mean difference (SMD) was used.<sup>18</sup> Corresponding 95% confidence intervals (CI) were reported for all results. Heterogeneity was assessed using the

**Table 1** Demographic Characteristics of Included Studies

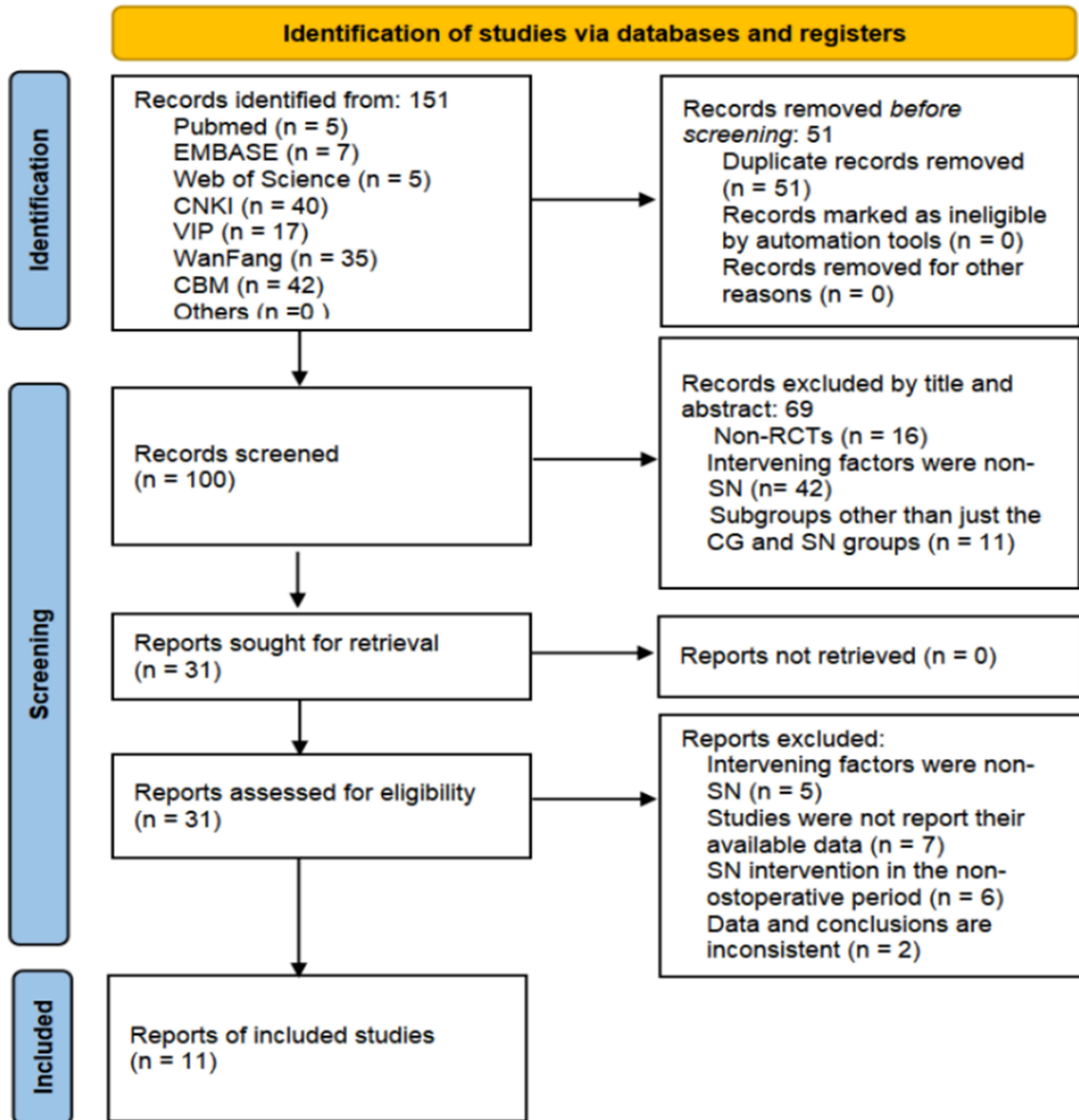
Sources	Number of Males/ Females		Participants Sample		Age (years), mean $\pm$ SD/ Range		Medication Regimen		Acupuncture Point	Duration of Intervention	Outcomes
	SN	CG	SN	CG	SN	CG	SN	CG			
LIU HM, 2023	23/22	25/20	45	45	43.00 $\pm$ 7.50	45.00 $\pm$ 2.00	SN + CG	Cefoxitin Sodium, Amylol Oxycodone Tablets	SM	Prn	VAS
Jia CL, 2021	21/12	19/14	33	33	47.87 $\pm$ 4.58	48.52 $\pm$ 4.74	SN + CG	Thunder and fire moxibustion therapy	EB	14days	VAS; WHT; AEs
Guo D, 2021	17/13	17/13	30	30	29.19 $\pm$ 2.84	29.40 $\pm$ 2.73	SN + CG	Clinical nursing interventions	CQ	14days	VAS; WHT
He YH, 2018	14/26	18/22	40	40	47.10 $\pm$ 10.00	46.10 $\pm$ 9.80	SN	Amylol Oxycodone Tablets	SM	Prn	VAS; TER; AEs; PRT; PDT
Ye XS, 2020	22/18	21/19	40	40	45.00 $\pm$ 2.12	45.25 $\pm$ 2.45	SN + CG	Tramadol hydrochloride extended-release tablets	SM	Prn	VAS; TER; PRT
Wang W, 2018	21/9	20/10	30	30	49.16 $\pm$ 10.53	49.11 $\pm$ 10.68	SN + CG	Thunder and fire moxibustion therapy	EB	5days	VAS; WHT; TER
Cui XX, 2022	110/110	115/105	220	220	45.87 $\pm$ 2.49	46.03 $\pm$ 2.51	SN + CG	Clinical nursing interventions	HG	Prn	VAS; PRT; PDT
Zeng Y, 2020	19/11	18/12	30	30	41.30 $\pm$ 13.00	46.90 $\pm$ 11.60	SN	Intravenous analgesic pumps	HG	Prn	VAS; AEs
Li HL, 2020	44/48		46	46	30–60		SN	Auricular acupressure	SM	Prn	TER
Zeng HM, 2019	20/20	22/18	40	40	44.95 $\pm$ 11.415	44.70 $\pm$ 12.054	SN + CG	Aminobutanetriol Ketoglobate Capsules	CS	Prn	VAS
Zhu Z, 2010	24/16	27/13	40	40	53.00	50.00	SN	Clinical nursing interventions	SM	5days	TER

**Abbreviations:** SN, Snap Needles; CG, control group; SM, Shenmen; Prn, prorenata; VAS, Visual Analog Scale; EB, Erbai; WHT, Wound Healing Time; AEs, Adverse Events; CQ, Changqiang; PRT, Pain Relief Time; PDT, Pain Disappearance Time; HG, Hegu; TER, Total Effective Rate; CS, Chengshan.

inconsistency (I<sup>2</sup>) values and chi-squared ( $\chi^2$ ) tests. When  $I^2 \leq 50\%$  and  $P \geq 0.10$ , it was considered homogeneous with fixed-effects modeling; alternatively, it was regarded as highly heterogeneous with random-effects modeling.

To assess the potential for publication bias in the VAS with over 10 selected studies, funnel plots were examined. Subgroup analyses were conducted based on diverse measurement timings post-treatment, various treatments in the CG, and different acupoints in the SN group.

The stability of the outcomes was verified through sensitivity analysis. The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach was applied for assessment, recommendation development, and evaluation. The strength of evidence was categorized as very low, low, moderate, or high based on five



**Figure 2** Flowchart of the study selection process.

dimensions: risk of bias, publication bias, indirectness, imprecision, and inconsistency.<sup>19</sup> Statistical significance was established with a threshold of a *P*-value less than 0.05 for all data, unless otherwise specified.

## Results

### Literature Search

The comprehensive search yielded an initial pool of 151 trials. After removing 51 duplicate studies, 100 unique studies remained for evaluation. Thorough scrutiny of titles, abstracts, and full-text articles led to the exclusion of 89 studies. Ultimately, our systematic review included 11 eligible RCTs.<sup>7,20–29</sup> A visual representation of the selection process can be found in [Figure 2](#).

### Study Characteristics

Our analysis encompassed a total of 11 RCTs<sup>7,20–29</sup> conducted by distinct research teams, collectively involving 1188 patients afflicted with POHP. Among these, 594 patients were assigned to the SN group, while the remaining 594 patients were allocated to the CG. The smallest sample size among all the RCTs was 60 cases,<sup>21,25,27</sup> while the largest sample size reached 440 cases.<sup>20</sup>

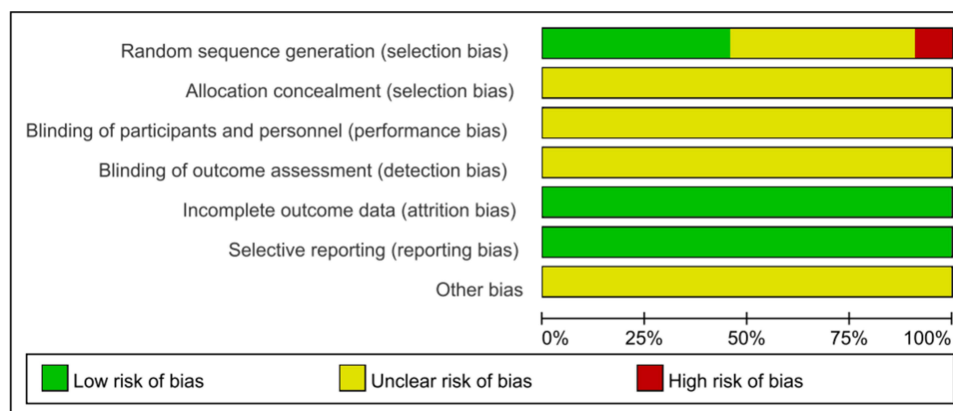
In terms of intervention duration, two studies extended treatment for a duration of 5 days,<sup>24,25</sup> two studies implemented a 14-day intervention period,<sup>21,22</sup> and the remaining studies adopted a pronata (prn) approach.<sup>7,20,23,26–29</sup> The acupuncture points targeted for intervention included Erbai (EB), Changqiang (CQ), Hegu (HG), Chengshan (CS), and Shenmen (SM). Importantly, all the RCTs examined in our analysis were carried out in China.

### Risk of Bias

We conducted an assessment of the methodological quality of the RCTs included in our analysis using the Cochrane Risk of Bias tool. The Results of this assessment are graphically presented in [Figures 3 and 4](#). In summary, the majority of the included studies were rated as having an unclear risk of bias, with one study<sup>28</sup> being classified as having a high risk of bias. Specifically, six of the studies<sup>7,20,22,25–27</sup> provided detailed information on random sequence generation and utilized the random number table method, while one study used semi-randomized grouping.<sup>28</sup> However, none of the studies reported sufficient information on allocation concealment or the blinding of participants, personnel, and outcome assessment. On a positive note, all the included studies reported complete outcome data, and we did not identify any selective reporting in any of the studies.

### Visual Analog Scale

A total of nine studies, encompassing 1016 participants, provided data on the VAS.<sup>7,20–27</sup> We conducted a meta-analysis using a random effects model due to the substantial heterogeneity observed among these studies. Our analysis revealed



**Figure 3** Risk of bias graph.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Cui XX, 2022	+	?	?	?	+	+	?
Guo D, 2021	?	?	?	?	+	+	?
He YH, 2018	+	?	?	?	+	+	?
Jia CL, 2021	+	?	?	?	+	+	?
Li HL, 2020	-	?	?	?	+	+	?
Liu HM, 2023	?	?	?	?	+	+	?
Wang W, 2018	+	?	?	?	+	+	?
Ye XS, 2020	?	?	?	?	+	+	?
Zeng HM, 2019	?	?	?	?	+	+	?
Zeng Y, 2020	+	?	?	?	+	+	?
Zhu Z, 2010	?	?	?	?	+	+	?

Figure 4 Risk of bias summary.

that the VAS scores were significantly lower in the SN group compared to the control group, with a MD of -1.10 (95% CI: -1.31, -0.89;  $P < 0.05$ ) (Table 2 and Figure 5A). The observed heterogeneity among the included studies was substantial ( $I^2 = 93\%$ ,  $P < 0.001$ ), indicating significant variability in the results across studies. Additionally, we assessed

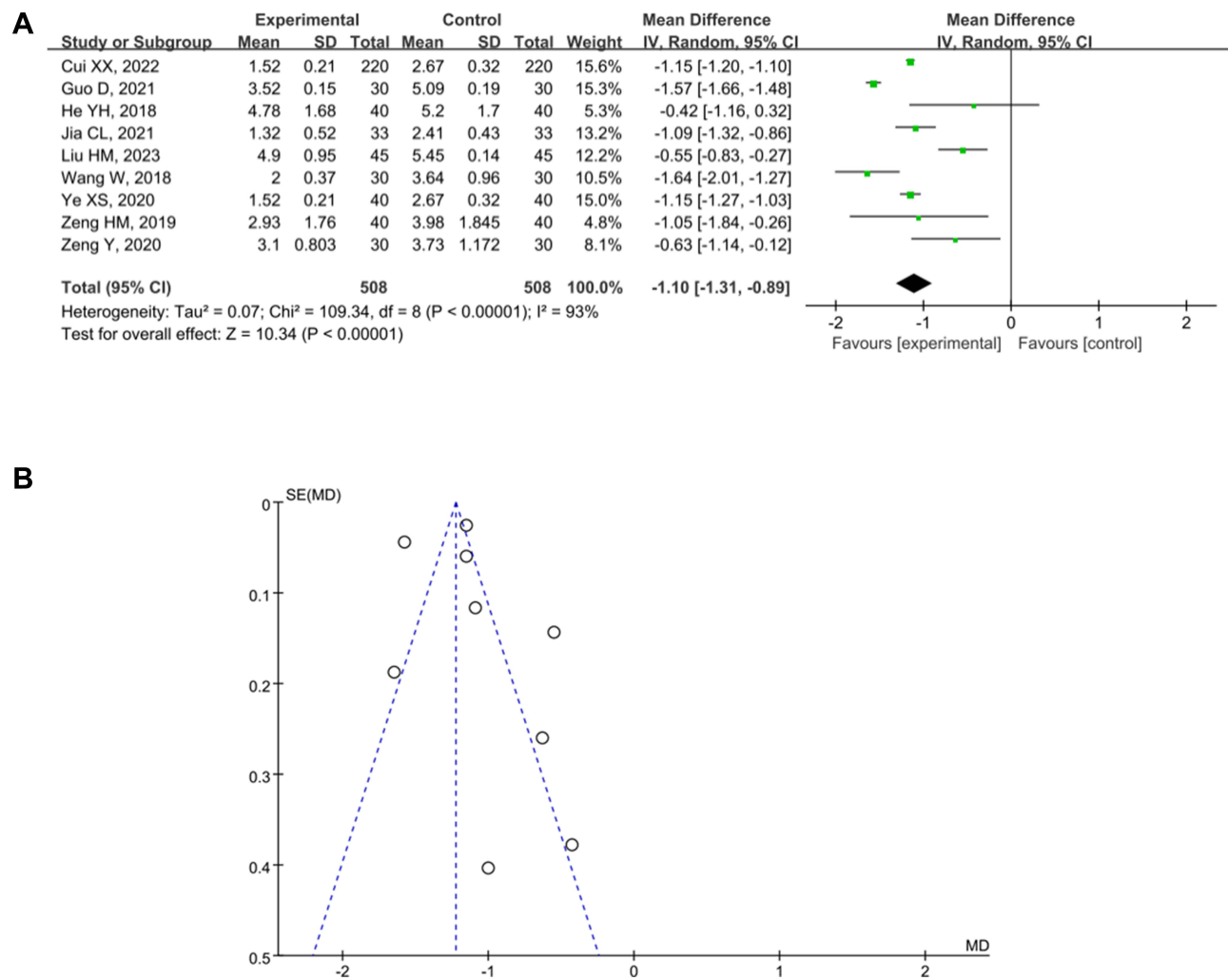
**Table 2** Primary Results Based on Various Outcomes and Subgroup Analyses

Meta-analyses Outcomes	Meta-analyses Variables	No. of Studies	No. of Patients		Pool Effect Size	Heterogeneity		P <sub>Statistical DIFFERENCE</sub>	P <sub>Egger's test</sub>
			SN	CG		I <sup>2</sup> (%)	P		
<b>Primary outcomes</b>									
VAS <sup>a</sup>		9	508	508	-1.10 (-1.31 to -0.89)	93.00	<0.001	<0.05	0.564
<b>Secondary outcomes</b>									
TER <sup>b</sup>		4	156	156	1.18 (1.09 to 1.27)	12.00	0.33	<0.05	
AEs <sup>b</sup>		3	103	103	0.38 (0.22 to 0.67)	0.00	0.80	<0.05	
WHT <sup>a</sup>		3	93	93	-2.55 (-3.02 to -2.09)	25.00	0.26	<0.05	
PRT <sup>a</sup>		3	300	300	-7.99 (-8.48 to -7.49)	0.00	1.00	<0.05	
PDT <sup>a</sup>		2	260	260	19.24 (14.17 to 24.31)	0.00	1.00	<0.05	
<b>Subgroup analysis of primary outcomes based on VAS<sup>a</sup></b>									
VAS <sup>a</sup> (different measurement times)	Overall	9	744	744	-1.25 (-1.28 to -1.21)	93.00	<0.001	<0.05	
	0–6 hours	3	300	300	-1.15 (-1.20 to -1.10)	0.00	0.90	<0.05	
	6–48 hours	3	108	108	-0.93 (-1.11 to -0.74)	93.00	<0.001	<0.05	
	3 days	3	103	103	-1.77 (-1.98 to -1.56)	98.00	<0.001	<0.05	
	4 days	3	103	103	-1.08 (-1.28 to -0.88)	0.00	0.97	<0.05	
	5 days	2	70	70	-1.19 (-1.60 to -0.79)	0.00	0.58	<0.05	
	7–14 days	2	60	60	-1.57 (-1.66 to -1.49)	0.00	0.72	<0.05	
VAS <sup>a</sup> (different treatments of CG)	Overall	9	508	508	-1.22 (-1.26 to -1.18)	92.00	<0.001	<0.05	
	Chinese medical therapies	2	63	63	-1.09 (-1.29 to -0.88)	0.00	0.97	<0.05	
	Western medical therapies	5	195	195	-1.05 (-1.15 to -0.94)	78.00	0.001	<0.05	
	Clinical nursing interventions	2	250	250	-1.26 (-1.30 to -1.21)	99.00	<0.001	<0.05	
VAS <sup>a</sup> (different acupoints)	Overall	7	438	438	-1.13 (-1.17 to -1.08)	73.00	<0.001	<0.05	
	EB	2	63	63	-1.09 (-1.29 to -0.88)	0.00	0.97	<0.05	
	HG	2	250	250	-1.14 (-1.20 to -1.09)	75.00	<0.001	<0.05	
	SM	3	125	125	-1.05 (-1.16 to -0.94)	87.00	<0.001	<0.05	

**Notes:** Pool effect size: <sup>a</sup>Pooled MDs (95% CI); <sup>b</sup>Pooled RRs (95% CI).

**Abbreviations:** SN, Snap Needles; CG, control group; CI, confidence interval; RR, risk ratio; MD, mean difference; VAS, Visual Analog Scale; EB, Erbai; WHT, Wound Healing Time; AEs, Adverse Events; PRT, Pain Relief Time; PDT, Pain Disappearance Time; HG, Hegu; TER, Total Effective Rate; SM, Shenmen.





**Figure 5 (A)** Effect of interventions in SN and CG on VAS forest plot. **(B)** Effect of interventions in SN and CG on VAS funnel plot.

potential publication bias using a funnel plot, which appeared relatively symmetrical, suggesting no significant publication bias (Egger’s test,  $P = 0.564$ ) (Figure 5B).

### Total Effective Rate

In the analysis of the data related to TER, four studies involving a pool of 312 participants were eligible for inclusion.<sup>23,25,28,29</sup> The analysis indicated homogeneity among these studies, so the effect sizes were pooled using a fixed-effects model ( $I^2 = 12\%$ ,  $P = 0.33$ ). The results suggested that TER was likely to be higher in the SN group than in the CG (RR = 1.18; 95% CI: 1.09, 1.27;  $P < 0.05$ ), indicating a favorable outcome associated with SN treatment (Table 2) (Supplementary Material and Figure S1A).

### Wound Healing Time

We analyzed data from three studies involving 186 participants to assess WHT.<sup>21,22,25</sup> Our analysis, characterized by homogeneity among the studies ( $I^2 = 25\%$ ,  $P = 0.26$ ), allowed us to pool the effect sizes using a fixed-effects model. The results indicate that WHT may be lower in the SN group relative to the CG (MD = -2.55; 95% CI: -3.02, -2.09;  $P < 0.05$ ) (Table 2) (Supplementary Material and Figure S1B).

## Pain Relief Time

Our analysis included data from three studies with a total of 600 participants, focusing on PRT.<sup>20,23,26</sup> The studies exhibited homogeneity ( $I^2 = 0\%$ ,  $P = 1.00$ ), allowing us to pool the effect sizes using a fixed-effects model. The results indicate that PRT may be lower in the SN group relative to the CG (MD = -7.99; 95% CI: -8.48, -7.49;  $P < 0.05$ ) (Table 2) ([Supplementary Material](#) and [Figure S1C](#)).

## Pain Disappearance Time

Our analysis included data from two studies involving 520 participants, focusing on PDT.<sup>20,26</sup> These studies exhibited homogeneity ( $I^2 = 0\%$ ,  $P = 1.00$ ), allowing us to pool the effect sizes using a fixed-effects model. The results suggest that PDT may be higher in the SN group relative to the CG (MD = 19.24; 95% CI: 14.17, 24.31;  $P < 0.05$ ) (Table 2) ([Supplementary Material](#) and [Figure S1D](#)).

## Adverse Events

Three studies involving 206 participants reported the data of AEs.<sup>22,26,27</sup> The analysis was conducted using a fixed-effects model due to the presence of homogeneity in the data ( $I^2 = 0\%$ ,  $P = 0.80$ ). The results suggest that AEs may be lower in the SN group relative to the CG (RR = 0.38; 95% CI: 0.22, 0.67;  $P < 0.05$ ) (Table 2) ([Supplementary Material](#) and [Figure S1E](#)).

## Subgroup Analysis of Visual Analog Scale

Subgroup analyses of the VAS were undertaken to investigate potential causes of heterogeneity. These evaluations were performed using different measurement times after treatment, different treatments in the CG, and different acupoints, aiming to identify factors contributing to the observed heterogeneity in VAS outcomes.

### Measurement Time Subgroup Analysis (TABLE 2) ([Supplementary Material](#) and [FIGURE S2A](#))

- VAS (0–6 hours): The subgroup analysis for VAS measurements taken within 0 to 6 hours after treatment showed a significant reduction in VAS scores in the SN group (MD = -1.15; 95% CI: -1.20, -1.10;  $P < 0.05$ ). There was no heterogeneity among the studies ( $I^2 = 0\%$ ,  $P = 0.90$ ).

- VAS (4 days): The subgroup analysis for VAS measurements taken at 4 days after treatment also demonstrated a significant reduction in VAS scores favoring SN treatment (MD = -1.08; 95% CI: -1.28, -0.88;  $P < 0.05$ ). No heterogeneity was observed among the studies ( $I^2 = 0\%$ ,  $P = 0.97$ ).

- VAS (5 days): In this subgroup analysis for VAS measurements taken at 5 days after treatment, a significant reduction in VAS scores was observed in the SN group (MD = -1.19; 95% CI: -1.60, -0.79;  $P < 0.05$ ). Minimal heterogeneity was observed among the studies conducted ( $I^2 = 0\%$ ,  $P = 0.58$ ).

- VAS (7–14 days): The subgroup analysis for VAS measurements taken between 7 and 14 days after treatment revealed a notable reduction in VAS scores favoring SN treatment (MD = -1.57; 95% CI: -1.66, -1.49;  $P < 0.05$ ). There was low heterogeneity among the studies ( $I^2 = 0\%$ ,  $P = 0.72$ ).

### Treatment of CG Subgroup Analysis (TABLE 2) ([Supplementary Material](#) and [FIGURE S2B](#))

- VAS (Chinese medical therapies): This subgroup analysis, focusing on VAS measurements in CG with Chinese medical therapies, showed a notable reduction in heterogeneity compared to the overall VAS analysis. VAS scores were lower in the SN group (MD = -1.09; 95% CI: -1.29, -0.88;  $P < 0.05$ ), and there was no heterogeneity among the studies ( $I^2 = 0\%$ ,  $P = 0.97$ ).

### Acupoints Subgroup Analysis (TABLE 2) ([Supplementary Material](#) and [FIGURE S2C](#))

- VAS (EB): In the subgroup analysis considering different acupoints with EB (Electroacupuncture), a reduction in heterogeneity was observed compared to the overall VAS analysis. VAS scores favored the SN group (MD = -1.09; 95% CI: -1.29, -0.88;  $P < 0.05$ ), and there was no significant heterogeneity among the studies ( $I^2 = 0\%$ ,  $P = 0.97$ ).

## Sensitivity Analyses

The sensitivity analyses conducted for various outcome measures, including VAS, TER, AEs, WHT, PRT, and PDT, aimed to evaluate the robustness and reliability of the combined findings by eliminating individual studies one at a time. The analyses found that none of the studies significantly interfered with the overall results when any of them were excluded. Therefore, the combined results for these outcome measures were deemed robust and reliable, providing confidence in the validity of the findings. (Table 2) ([Supplementary Material](#) and [Figure S3A-3F](#)).

## Assessment of Evidence Using GRADE

All the results were assessed using the recommended grading system methodology, and the evidence was determined to be moderate or very low. The reduced certainty of the evidence can be attributed to several factors, including the risk of bias (unclear blinding and allocation concealment), imprecision (small sample sizes and large confidence intervals), and inconsistency (high heterogeneity without a clear explanation) ([Supplementary Material](#)).

## Discussion

In this comprehensive meta-analysis, our objective was to assess the effectiveness and safety of SN in the treatment of POHP. Our analysis revealed compelling findings: SN led to a significant reduction in key parameters such as VAS scores, WHT, PRT, PDT, and the incidence of AEs compared to CG. These results collectively underscore the clinical superiority of SN over Chinese medical therapies, Western medical interventions, or routine nursing care for alleviating POHP while ensuring patient safety.

Hemorrhoids, characterized by high morbidity and a tendency for recurrence after treatment, have become a prevalent concern.<sup>30</sup> Hemorrhoidectomy, a common surgical intervention to prevent and treat complications, often leaves patients grappling with POHP.<sup>31</sup> Strategies to reduce postoperative pain rely on drug therapy, which including metronidazole, glyceryl trinitrate, flavonoids, cholestylamine ointment, lidocaine ointment, etc. Studies have found that the administration of mesoglycan after open transparent heat removal of hemorrhoids can reduce postoperative pain.<sup>32</sup> Previous research has focused on observing the advantages of surgical methods, surgical devices, and anesthesia methods in reducing postoperative pain.<sup>33–35</sup> As the number of available treatment methods has grown in recent years,<sup>36–38</sup> TCM has emerged as a particularly safe and effective option,<sup>39</sup> offering advantages over potential adverse effects associated with Western medicine.<sup>7</sup> Our study reinforces the notion that SN effectively alleviates POHP symptoms, consistent with findings from Zou's study<sup>12</sup> on electroacupuncture for POHP treatment.

Although our study reported statistically significant reductions in VAS scores, heterogeneity was observed. To elucidate potential sources of heterogeneity, we conducted subgroup analyses. We observed significantly less heterogeneity in VAS results when measurements were taken at various time points post-treatment, such as 0–6 hours,<sup>20,25,26</sup> 4 days,<sup>22,24,25</sup> 5 days,<sup>24,25</sup> and 7–14 days.<sup>21,25</sup> This variation in timing may contribute to the observed heterogeneity. Additionally, subgroup analyses focusing on different treatment modalities within the CG and various intervention points for both SN and CG revealed that specific combinations, like TCM<sup>22,25</sup> and EB,<sup>22,25</sup> exhibited significantly lower heterogeneity. This suggests that these combinations may influence result heterogeneity. Future research should delve into the differential effectiveness of distinct acupoints and various CG therapies for POHP.

Our study's secondary outcomes, including WHT,<sup>21,22,25</sup> TER,<sup>23,25,28,29</sup> PRT,<sup>20,23,26</sup> and PDT,<sup>20,26</sup> consistently support SN's efficacy in pain reduction. Furthermore, AEs data<sup>22,26,27</sup> indicate that SN is an extremely safe treatment for POHP, with a lower incidence of adverse reactions compared to Western drug treatment. However, since the majority of interventions in the SN group for AEs consisted of SN alone, we cannot definitively conclude that SN alleviates adverse effects following Western drug treatment. Additional research is warranted to explore this aspect further.

The prevailing “anatomical injury theory” has gained recognition among experts and scholars studying POHP mechanisms.<sup>40</sup> According to this theory, nerve fibers below the dentate line in the anal area are controlled by somatic nerves, which have sensitive pain receptors and low pain thresholds. During surgery, even relatively gentle procedures can induce severe pain, leading to local muscle spasms, lymphatic fluid reflux obstruction, blood flow disruption, and localized edema. These factors collectively exacerbate pain and discomfort in patients.<sup>41</sup> Additionally, localized

inflammatory reactions in the operative area contribute significantly to inducing postoperative pain in hemorrhoidectomy patients.<sup>42</sup>

Research on SN mechanisms provides valuable insights. Studies, including Zhang's research,<sup>43</sup> establish a neuroanatomical basis for the analgesic effects of SN. Others have shown that SN treatment enhances nerve endings' excitability and activates central nervous system regulation, consistent with our findings in the context of POHP treatment.<sup>44</sup> Multiple studies suggest that SN's biological mechanisms may involve reducing PGE2 in serum<sup>45</sup> and modulating endorphin secretion, further corroborating our analysis. Another study suggests that acupuncture may provide analgesia by modulating endorphin secretion.<sup>46</sup> Notably, acupuncture at the subsarcolemma point has been shown to improve postoperative pain after anorectal surgery, accompanied by a reduction in interleukin-1 $\beta$  levels, among other effects.<sup>47</sup>

## Strengths and Limitations

Our study boasts several strengths. It marks the first meta-analysis examining the efficacy and safety of SN for POHP treatment, providing a solid foundation for clinicians and future research. The sensitivity analysis conducted underscores the robustness of our findings, further enhancing the reliability of our conclusions. Additionally, our study incorporates a comprehensive set of outcome indicators.

Nonetheless, limitations must be acknowledged. The limited number and overall quality of included studies may introduce bias in interpreting the results. Since SN is a new acupuncture tool, which is widely used in China, the birthplace of acupuncture, all current included studies originated from China, raising questions about the generalizability of our findings. We believe that with the global promotion of SN, clinical literature from non Asian countries will be included in the evaluation. Furthermore, due to the limitations of the surgical knowledge of the included studies written by TCM clinicians, the descriptions of the surgical methods, anesthesia protocols, surgical devices and IDEAL guidelines for hemorrhoidectomy in the articles are not sufficient, resulting in our inability to conduct in-depth analysis. It is expected that these deficiencies will be improved with the enrichment of later research and the improvement of article quality.

## Conclusion

In summary, our meta-analysis confirms that SN represents an effective and safe approach for managing POHP. To substantiate our findings and address limitations, further high-quality multicenter trials are warranted.

## Abbreviations

SN, Snap Needles; CG, control group; SM, Shenmen; Prn, prorenata; VAS, Visual Analog Scale; EB, Erbai; WHT, Wound Healing Time; AEs, Adverse Events; CQ, Changqiang; PRT, Pain Relief Time; PDT, Pain Disappearance Time; HG, Hegu; TER, Total Effective Rate; CS, Chengshan; CI, confidence interval; RR, risk ratio; MD, mean difference.

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## Disclosure

The authors report no conflicts of interest in this work.

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