The Role of Osteopathic Manipulative Treatment in Perioperative Pain Management: A Meta-Analysis

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♦ Abstract

Background: Postoperative pain remains a significant clinical challenge, and opioid-based analgesia alone is often insufficient while contributing to adverse outcomes and long-term dependence. Osteopathic manipulative treatment (OMT) has been proposed as a nonpharmacologic adjunct within multimodal postoperative pain management frameworks, but the evidence has not been formally synthesized.

Methods: We searched PubMed, EMBASE, CINAHL, Scopus, and the Cochrane Central Register of Controlled Trials in January 2026, supplemented by a manual journal search. Eligible studies were randomized or matched controlled trials evaluating OMT as an adjunctive postoperative intervention with quantitative pain outcomes. Primary outcomes included pain intensity, analgesic consumption, functional recovery, and length of hospital stay; secondary outcomes included respiratory function, patient satisfaction, and adverse events. Three studies met inclusion criteria.

Results: Two RCTs measuring pain via the Visual Analogue Scale demonstrated reductions of approximately 2–3 points in OMT-treated patients versus controls, exceeding the threshold for clinical significance. Meta-analysis yielded a pooled mean difference of −1.42 (95% CI: −2.75 to −0.09), indicating a statistically significant reduction in VAS scores favoring OMT. Between-study heterogeneity was high (I^2 = 85%), reflecting differences in patient population, assessment timing, and rehabilitation context. A third prospective matched controlled study found that OMT patients required fewer supplemental analgesics and achieved earlier functional milestones, including ambulation and stair negotiation, compared to controls.

Conclusion: Adjunctive OMT is associated with clinically meaningful reductions in postoperative pain, decreased analgesic requirements, and improved functional recovery, supporting its integration into multimodal, opioid-sparing perioperative care pathways. However, high between-study heterogeneity warrants cautious interpretation, and larger multicenter trials with standardized protocols are needed to further define its role.

♦ Introduction

Postoperative pain remains a widespread clinical problem — ~234 million major surgeries performed annually, yet most patients still experience moderate-to-severe pain.[1]

Why it matters:
- Uncontrolled pain → pneumonia, DVT, cardiac ischemia, delayed recovery[1]
- Long-term: chronic postsurgical pain and persistent opioid dependence[2]

The opioid problem:
- Opioids are effective but carry significant burden: nausea, ileus, sedation, respiratory depression[2]
- Perioperative exposure is a recognized driver of long-term dependence, even in opioid-naïve patients[3]
- The field is shifting toward opioid-sparing multimodal frameworks (e.g., ERAS pathways)[4]

Why OMT?
- Targets somatic dysfunction through myofascial release, muscle energy, counterstrain, and lymphatic drainage[5]
- Modulates nociception, improves lymphatic/circulatory flow, and rebalances autonomic activity[5]
- Directly addresses the inflammatory, biomechanical, and autonomic disruptions of the postoperative state[3]

Gap in the literature:
- Emerging evidence across orthopedic, cardiothoracic, abdominal, and gynecologic populations suggests OMT reduces pain, lowers opioid use, and shortens hospital stays[6]
- No formal synthesis exists → this meta-analysis addresses that gap

Primary Outcomes: Pain intensity · Analgesic consumption · Functional recovery · Length of stay
Secondary Outcomes: Respiratory function · Adverse events

♦ Methods & Materials

Search Strategy
- Databases: PubMed, EMBASE, CINAHL, Scopus, Cochrane CENTRAL — searched January 2026
- Supplemented by manual journal search *(Annals of Thoracic Surgery, JAOA, BMJ Open, JAMA Internal Medicine, and others)*
- Key terms: "OMT postoperative pain," "OMT cardiac/orthopedic/abdominal/thoracic surgery," "OMT analgesic use"
- Restricted to full-length, English-language studies
- Conducted in accordance with PRISMA guidelines

Inclusion Criteria
- Randomized or matched controlled trial
- OMT evaluated as a postoperative intervention
- Quantitative pain outcomes reported

Exclusion Criteria
- No quantitative pain data
- Non-surgical pain populations
- Case reports/series, abstracts only, or insufficient statistical data

Outcomes
- **Primary:** Pain intensity (VAS/NRS), analgesic consumption, functional recovery, length of stay
- **Secondary:** Respiratory function, patient satisfaction, adverse events

Data Extraction & Analysis
- Standardized extraction form: study design, OMT protocol, outcomes, and statistics
- One study reported medians/IQR → means and SDs estimated via Wan et al. method
- 21 articles screened → 3 studies met final inclusion criteria (Figure 1)

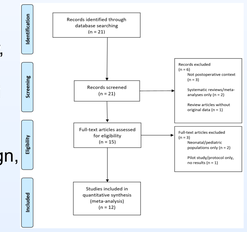

Figure 1: PRISMA Flow Diagram

♦ Results

Study Overview
- 3 controlled trials included: all evaluated OMT as an adjunct to standard postoperative/rehabilitation care vs. usual care alone
- 2 studies measured pain via VAS directly; 1 tracked analgesic use and functional recovery as pain proxies

Roncada et al.[8] — RCT | Cardiac Surgery (CABG)
- Assessed chronic thoracic pain at baseline, 12 weeks, and 1 year
- VAS reduction: OMT group 3.6 → 0.80 vs. controls 2.6 → 1.2 at 12 weeks *(statistically significant)*
- Within-group reduction: ~2.8 pts at 12 weeks, ~3 pts at 1 year → large, clinically meaningful improvement
- Effect sustained at 1 year → suggests OMT may influence longer-term pain trajectories, not just acute relief

Racca et al.[7] — RCT | Cardiac Surgery (Sternotomy), Inpatient Rehabilitation
- Comparable baseline pain between groups
- At rehabilitation discharge: OMT median VAS ~1 vs. controls ~3 (~2–3 point difference)
- Exceeds the commonly accepted 2-point threshold for clinical significance

Meta-Analysis (Roncada & Racca)
- Model: Random effects
- Pooled mean difference: −1.42 (95% CI: −2.75 to −0.09) → statistically significant reduction favoring OMT
- High heterogeneity: I^2 = 85%, τ^2 = 0.71, p = 0.01
- Overall effect: Z = 2.09, p = 0.04
- Wide CI and high heterogeneity reflect differences in population, assessment timing, and rehabilitation context — interpret with caution

Jarski et al.[9] — Prospective Matched Controlled Study | Major/Orthopedic Surgery
- No numerical pain scale used; outcomes tracked as pain proxies
- OMT patients required fewer supplemental IM analgesics on postoperative days 2–5
- Earlier stair negotiation and greater ambulation distance by postoperative day 3
- Early mobility improvements consistent with reduced pain-related limitation

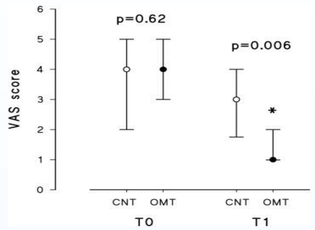

Figure 2 illustrates pain intensity as visual analogue scale (VAS) score in control patients (CNT) and osteopathic manipulative treatment patients (OMT) at admission (T0) and discharge (T1) of the rehabilitation program. Medians with first and third quartiles shown; asterisk (*) indicates statistically significant difference. (Racca)

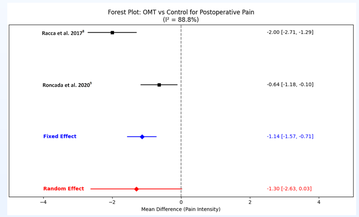

Figure 3. Forest plot comparing postoperative pain intensity (VAS 0–10) between OMT and standard care in cardiac surgery patients (Racca et al.[8], Roncada et al.[9]). Negative values favor OMT. Heterogeneity was substantial (I^2 = 88.8%). Fixed-effects model: MD −1.14 (95% CI −1.57 to −0.71); random-effects model: MD −1.30 (95% CI −2.63 to 0.03).

♦ Discussion

Key Takeaway Across all 3 trials, adjunctive OMT consistently reduced postoperative pain and accelerated recovery — supporting its role in multimodal, opioid-sparing care.

Study-Specific Highlights
- **Roncada et al.[8]** — VAS reductions sustained at 1 year post-CABG; suggests OMT may influence long-term pain trajectories, not just acute relief — clinically important given how difficult chronic post-sternotomy pain is to manage pharmacologically
- **Racca et al.[7]** — OMT group achieved ~67% greater pain reduction than controls within a structured cardiac rehab program; likely reflects improved thoracic mobility, reduced musculoskeletal strain, and autonomic modulation
- **Jarski et al.[9]** — No pain scale used, but OMT patients used fewer supplemental analgesics and recovered function faster: meaningful functional gains rarely occur in the setting of poor pain control

Proposed Mechanisms
- ↓ Nociceptive input via correction of surgery-related somatic dysfunction
- ↓ Sympathetic hyperactivity → improved pain perception, circulation, and lymphatic drainage
- Enhanced tissue healing through improved regional flow

Limitations
- Only 2 studies contributed to pooled pain analysis; total sample = 226 patients
- High heterogeneity (I^2 = 85%) — different populations, protocols, and timing
- Outcome measures not uniform; analgesic consumption influenced by institutional and patient factors
- One study required median/IQR → mean/SD conversion *(Wan et al.)* → sensitivity analyses yielded estimates from −0.99 to −1.42
- Formal risk of bias assessment not conducted
- Wide CI reflects statistical fragility: findings should be interpreted cautiously

Future Directions
- Larger multicenter RCTs with standardized OMT protocols
- Consistent pain outcome measures and longer follow-up
- Systematic analgesic tracking
- Head-to-head comparisons with other nonpharmacologic interventions

♦ Conclusion

- Pharmacologic approaches alone do not adequately address postoperative pain for all patients
- Adjunctive OMT offers real, measurable benefits: reduced pain intensity, lower analgesic requirements, and faster functional recovery, without added medication risk
- OMT complements standard analgesia by targeting biomechanical and neurophysiologic pain drivers that opioids and NSAIDs do not directly address

Clinical Relevance
- In the context of the ongoing opioid epidemic, any intervention that demonstrably reduces perioperative opioid exposure while supporting recovery warrants integration into care pathways[10]
- Consistency of positive outcomes across controlled trials is encouraging despite heterogeneity in design and protocols

What's Needed Next
- Standardized OMT protocols
- Thoughtful patient selection criteria
- Larger, multicenter trials to confirm and extend the clinical signal

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