



evaluated RA using perineural catheters within the last decade, with the second building on the first.^{7,8} However, the primary focus of the prior reviews was to evaluate the immediate postoperative effects of RA, with the long-term effects being a secondary outcome measure. This review has modified the inclusion criteria from previous reviews to focus on the long-term effects of RA on post-amputation pain and will focus on evaluating RA's impact on the transition of acute surgical pain to chronic postoperative pain in limb amputation and its role in treating existing PLP and CSP.

This review aims to identify available evidence and evaluate the current literature findings to determine the effects of regional anesthesia in the perioperative period on the development and treatment of PLP. The PICO question guiding the framework of this review was: In patients with acute limb amputation and established PLP (P), does regional anesthesia (I) reduce the development or improve the treatment of phantom limb pain (O)?

Methodology

A search was performed using PubMed, CINAHL, Google Scholar, and Cochrane Library databases. The articles were appraised for level and quality of evidence utilizing the Johns Hopkins Evidence-Based Practice for Nurses and Healthcare Professionals Appraisal Tool.⁹ The literature was restricted to articles in English, and the language limitation could have excluded articles with important information on different techniques to reduce PLP. The search was limited to publications within the last ten years; using a more comprehensive time range could have given more information, but we wanted to ensure the information was current.

Results

Eleven articles met inclusion criteria; two systematic reviews with meta-analysis^{7,8}, three randomized controlled trials¹¹⁻¹³ two narrative reviews^{5,14}, one quasi-experimental evaluation¹⁵

anesthetic techniques was lowest with peripheral nerve blocks (1,781 subjects) followed by neuraxial (2,840 subjects) and general anesthesia (2,992 subjects).¹⁷

RA for the treatment of PLP and CSP was studied both as a single injection and as long-term PNCs from 6-30 days from the time of injection. McCormick et. al¹³ found decreased PLP three months after administering a single injection PNB. A six-day catheter decreased PLP at one month, with median pain scores decreasing from 5.0 to 3.0 in the treatment group. At 12 months, the average pain scores remained reduced by a median of 2.0 for the treatment group and 0.0 for the control group.^{12,16} Borghi et. al¹⁴ reported a case study using a thirty-day continuous PNB that resulted in a patient with no recurrence of PLP at 6, 12, 24, and 36-month follow-ups.

Perioperative peripheral nerve catheter placement has mixed results for the prevention of PLP. Three reviews found inconclusive results or no appreciable effect on PLP and CSP with perioperative nerve catheter placement, mainly used short-term.^{5,7,8} Others demonstrated effectiveness in reducing PLP with various techniques.^{5,7,14,16,17} Successful strategies included long-term or prolonged catheter use of greater than 30 days, simultaneous use of two catheters at different locations, such as femoral and sciatic catheters for lower limb amputations, and utilization of continuous nerve catheters as a critical component of an ERAS protocol.^{5,7,14,17}

Further research needs to be conducted to develop protocols that optimize treatment for this patient population.

This review included nine studies that provided evidence that RA, particularly PNCs, could help reduce PLP and CSP development and treat existing PLP and CSP. Only one study looked at PLP beyond one year, while the others covered shorter time frames of one year or less.¹⁸ Designing research with long-term endpoints would enhance the prevention and treatment of chronic amputation pain.

Conclusion

PLP and CSP are complex chronic pain conditions highly prevalent among amputation patients. RA with or without catheters can potentially decrease PLP and CSP, but more research is needed to determine their clinical effectiveness. Though the literature demonstrates a decrease in the incidence of PLP with RA over neuraxial or general anesthesia¹⁸, there is no consensus on the most effective regional anesthetic technique or the time frame in which it should be employed. Larger randomized control trials are needed to evaluate which techniques are most effective. Further studies evaluating the double catheter technique should be evaluated as these demonstrated the most promising results in decreasing the development of PLP in retrospective studies.

References:

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