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Review

Comparison of peri-articular liposomal bupivacaine and standard bupivacaine for postsurgical analgesia in total knee arthroplasty: A systematic review and meta-analysis

Xi Wang, Lin Xiao, Zhiyuan Wang, Guanghui Zhao, Jianbing Ma*

Joint Surgery, Hong-Hui Hospital, Xi'an Jiaotong University College of Medicine, Xi'an, 710054, China

HIGHLIGHTS

- To investigate the efficacy and safety between liposomal bupivacaine and standard bupivacaine in patients undergoing total knee arthroplasty.
- Only high quality studies were selected.
- Liposomal bupivacaine infiltration provides superior pain relief and less morphine consumption.

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ABSTRACT

Objective: This meta-analysis aimed to compare the efficacy and safety of intraoperative peri-articular liposomal bupivacaine and standard bupivacaine in patients undergoing total knee arthroplasty.
Methods: A systematic search was performed in Medline (1966–2016.9), PubMed (1966–2016.9), Embase (1980–2016.9), ScienceDirect (1985–2016.9) and the Cochrane Library. Only high-quality studies were selected. Meta-analysis was performed using Stata 11.0 software.
Results: Three randomized controlled trials (RCTs) and two non-randomized controlled trials (Non-RCTs), including 1214 patients met the inclusion criteria. The present meta-analysis indicated that there were significant differences between groups in terms of visual analogue scale (VAS) score at 24 h (SMD = −0.241, 95% CI: −0.374 to −0.108, P = 0.000), VAS score at 48 h (SMD = −0.124, 95% CI: −0.256 to 0.009, P = 0.0068), morphine equivalent consumption on POD 1 (SMD = −0.275, 95% CI: −0.398 to −0.153, P = 0.000) and incidence of nausea (RD = 0.038, 95% CI: 0.001 to 0.074, P = 0.042) and vomiting (RD = 0.38, 95% CI: 0.003 to 0.072, P = 0.032).
Conclusion: Compared to standard bupivacaine, intraoperative peri-articular liposomal bupivacaine infiltration promotes superior pain relief and less morphine consumption after total knee arthroplasty. In addition, there were fewer side effects associated with liposomal bupivacaine infiltration.

1. Introduction

Total knee arthroplasty (TKA) is a popular surgical procedure for treating end-stage osteoarthritis of the knee joint. It has been estimated that more than 700,000 of these procedures are performed in the United States annually [1]. However, TKA usually results in moderate to severe postoperative pain. Inadequate pain management is associated with delayed recovery, poor functional outcome and higher medical costs [2–4]. Moreover, additional opioids are required, which may cause adverse effects such as nausea, vomiting, respiratory depression and urinary retention [5,6]. Postoperative pain control remains an interesting topic for surgeons. Many strategies have been used to control pain, including femoral nerve block, local infiltration, epidural morphine and adductor canal block [7,8]. The optimal analgesia method remains controversial. Local infiltration analgesia has been considered the most common method due to its effectiveness and safety.

Bupivacaine, a local anaesthetic, is frequently used in TKA. However, even when multimodal analgesia is performed, the efficiency of bupivacaine is still limited due to the short duration of analgesia. Liposomal bupivacaine (LB) is a long-acting, local anaesthetic that is administered via single-dose infiltration to

* Corresponding author.
E-mail address: 3483245892@qq.com (J. Ma).

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produce postsurgical analgesia. Bupivacaine is encapsulated into multivesicular liposomes, resulting in a slow and controlled release. To extend its analgesic effects, LB uses DepoFoam® as its mechanism of delivery; thus, bupivacaine can be released over 72 h [9]. Previously published studies have shown that LB infiltration can relieve postoperative pain and reduce morphine consumption [10,11] Marcet assessed the effect of an opioid-sparing multimodal analgesia regimen with liposomal bupivacaine and compared these findings with the effects of standard of care on postsurgical opioid use They found that a liposome bupivacaine-based multimodal analgesic regimen resulted in statistically significant and clinically meaningful reductions in opioid consumption (mean, 20 mg versus 112 mg, $P < 0.01$). Gorfine indicated that bupivacaine extended-release demonstrated a statistically significant reduction in pain through 72 h (141.8 vs 202.5, $P < 0.0001$), and it decreased opioid requirements (22.3 mg and 29.1 mg, $P < 0.0006$) and improved patient satisfaction compared with placebo after haemorrhoidectomy.

However, some studies have reported that LB did not show analgesic effects that were superior to traditional local anaesthetics. Thus, we performed a systematic review and meta-analysis to compare the efficiency and safety of intraoperative peri-articular liposomal bupivacaine infiltration with that of standard bupivacaine for pain control in total knee arthroplasty.

2. Methods

2.1. Search strategy

We systematically searched electronic databases including Embase (1980–2016.9), MEDLINE (1966–2016.9), PubMed (1966–2016.9), ScienceDirect (1985–2016.9), Web of Science (1950–2016.9) and the Cochrane Library for potentially relevant articles. Grey academic studies were also identified from the references of the identified studies. There was no language restriction. The following terms were used as key words in combination with the Boolean operators AND or OR: “Total knee replacement OR arthroplasty”, “Liposomal bupivacaine”, “bupivacaine” and “pain control”. The retrieval process is presented in Fig. 1.

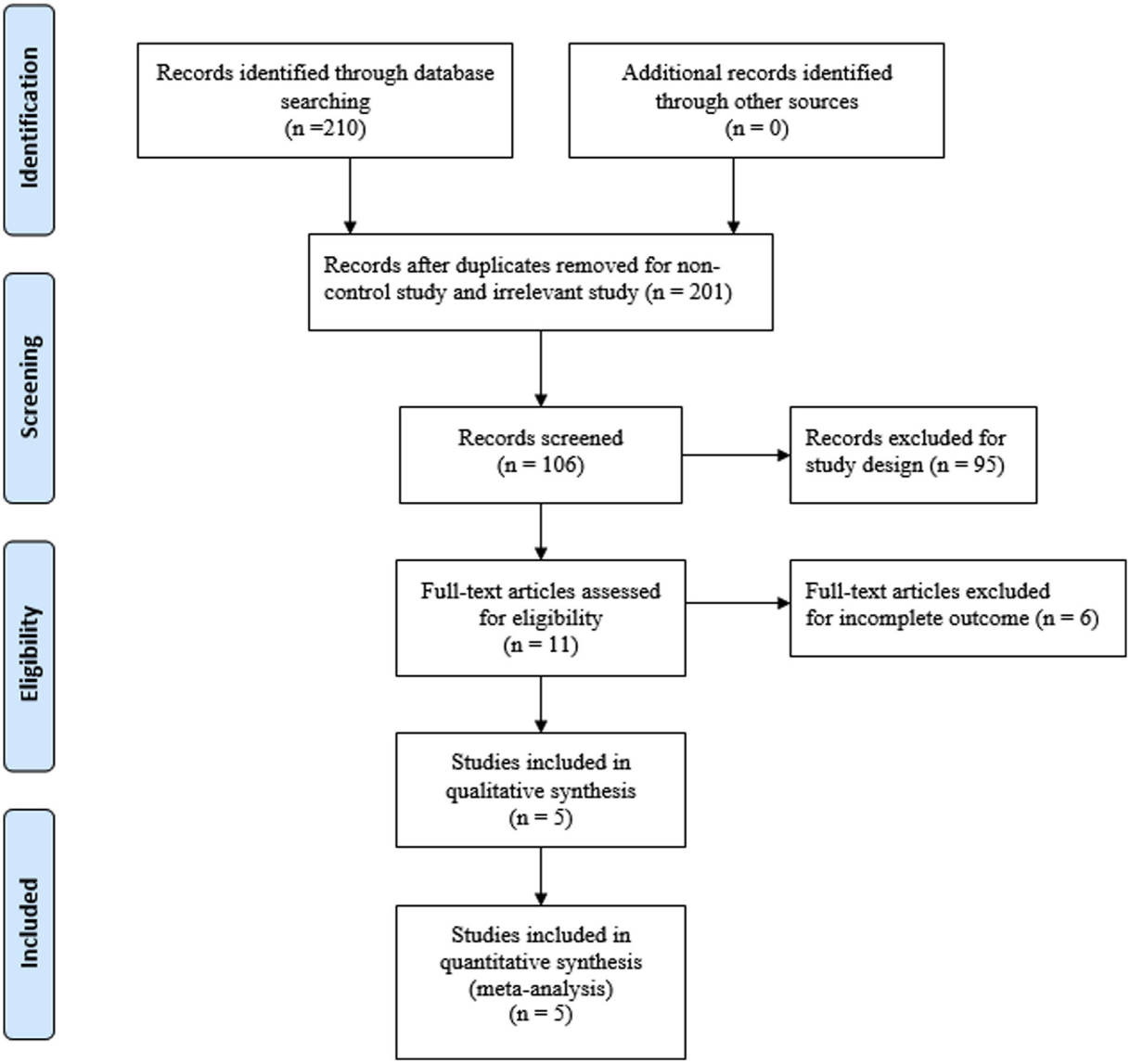

Fig. 1. Search results and the selection procedure.