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Topical magnesium sulfate administration for analgesia in total knee arthroplasty: systematic review and meta-analyses of randomized control trials

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ADMINISTRATIVE INFORMATION

Support - Traditional Chinese Medicine Inheritance and Innovative Talent Project (Zhongjing Project) Top-notch Chinese Medicine Talents Training Project (Yuwei Chinese Medicine Letter [2021] No. 15).

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 August 2023 and was last updated on 15 August 2023.

INTRODUCTION

Review question / Objective The purpose of this study was to investigate the analgesic effect of topical magnesium sulfate on total knee arthroplasty.

Condition being studied Total knee arthroplasty (TKA) is the most effective way to alleviate knee pain and enhance knee function in patients suffering from end-stage knee joint disorders. However, previous investigations have shown that over 60% of patients who undergo TKA experience moderate-to-severe postoperative pain. Long-term influences of poor pain management include the transition to chronic pain and prolonged narcotic consumption, which can result in opioid dependence, an epidemic in the United States. Effective postoperative pain management is crucial for early recovery and enhanced patient satisfaction. Periarticular infiltration of analgesics, such as magnesium sulfate, has emerged as a potential technique to improve pain control after TKA. Therefore, a systematic review and meta-analysis are warranted to clarify the overall effectiveness of this intervention.

METHODS

Participant or population Patients undergoing total knee arthroplasty.

Intervention Topical magnesium sulfate.

Comparator No magnesium sulfate is added.

Study designs to be included RCT.

Eligibility criteria Total knee arthroplasty for the first time for osteoarthritis of the knee.

Information sources PubMed, EMBASE, Web of Science, and the Cochrane Library.

Main outcome(s) Visual analogue scale (VAS) pain scores at rest or during motion within 72h after surgery, postoperative morphine consumption for rescue analgesia, and time to first rescue analgesia. Length of stay, knee functional recovery (assessed by knee range of motion, daily mobilization distance, and time to first straight leg raising), and major surgical complications (nausea or vomiting, wound complications, deep vein thrombosis, rash, chronic pain, urine retention, respiratory depression, pruritus, sedation).

Quality assessment / Risk of bias analysis The Cochrane risk of bias tool was used to assess the quality and risk of bias in RCTs. We systematically evaluated various aspects of methodological rigor, including random sequence generation, allocation concealment, blinding of participants and personnel, blind outcome assessment, handling of incomplete outcome data, selective reporting, and potential sources of bias. The overall quality of the included studies was categorized as low, unclear, or high risk of bias. The quality assessment was conducted independently by two reviewers, and any discrepancies were resolved through thorough discussions.
The quality of evidence for the outcomes in the current meta-analysis was assessed using the Recommendations Assessment, Development and Evaluation (GRADE) system, which takes into consideration the following elements: risk of bias, inconsistency, indirectness, imprecision, and publication bias. The levels of evidence recommendation are categorized as high, moderate, low, and very low.

Strategy of data synthesis The statistical analysis was performed using the Review Manager (RevMan) software, version 5.4, provided by Cochrane Collaboration. Dichotomous data were analyzed using risk ratios (RRs), while continuous data were presented as mean differences (MDs) with corresponding 95% confidence intervals (CIs). The results, originally presented as median and interquartile range (IQR), were transformed into mean and standard deviation (SD) following the guidelines outlined in The Cochrane Handbook 7.7.3.5 when applicable. Statistical significance was set at $P<0.05$, indicating a statistically significant result. Statistical heterogeneity among studies was assessed using the I2 statistic and P value. When the I20.1, it indicated that there was no significant heterogeneity among the included studies. However, $I2 \geq 50\%$, $P \leq 0.1$, it suggested the presence of statistical heterogeneity among the studies.

Subgroup analysis None.

Sensitivity analysis The sensitivity analysis was carried out using state software, and the sensitivity was reflected by the change in effect size after deleting one of the literature.

Country(ies) involved China.

Keywords total knee arthroplasty, magnesium sulfate, analgesia.

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