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Review

# The efficacy and safety of dexamethasone for pain management after total knee arthroplasty: A systematic review and meta-analysis

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ABSTRACT

*Objective:* To evaluate the clinical outcomes of dexamethasone versus placebo for pain control in patients undergoing total knee arthroplasty (TKA).

*Methods:* The electronic databases include PubMed, Medline, Embase, Web of Science and the Cochrane Library from inception to February, 2018. Two reviewers abstracted visual analogue scale (VAS), total narcotic use, length of stay, and adverse effects. Data were using fixed-effects or random-effects models with weighted mean differences and odds ratio for continuous and dichotomous variables, respectively. STATA 14.0 was used to perform the meta-analysis.

*Results:* Four studies encompassing 496 participants were retrieved for this meta-analysis. The present meta-analysis revealed that use of dexamethasone was associated with a significant reduction of pain score and total narcotic use. There were significant differences between groups in terms of adverse effects between groups.

*Conclusion:* Dexamethasone decreases pain scores within 48 h postoperatively and is associated with significantly reduced narcotic consumption. Dexamethasone as an analgesic therapy appears to be a safe in patients undergoing TKA.

## 1. Introduction

Total knee arthroplasty (TKA) is an efficacious surgical treatment for advanced knee arthritis which could reduce pain and maintain motor function [1,2]. The number of TKAs performed has increased substantially, and future demand is projected to rise rapidly. However, the surgical procedure is associated with moderate to severe pain postoperatively [3]. Various analgesic method techniques have been used to reduce postoperative pain after TKA including adductor canal block, local infiltration analgesia and intravenous opioids [4–6]. However, it is still insufficient to achieve satisfactory results and many patients require concomitant pain management which are highly associated with patient's dissatisfaction. Guideline recommends that a multimodal regimen should be applied to minimize postoperative pain, nausea, and vomiting after TKA.

Surgical stress response may increase the expression of inflammatory components. Dexamethasone is a type of corticosteroid medication which has a powerful effect of anti-inflammatory due to the inhibition of prostaglandin and aggregation of inflammatory corpuscle [7,8]. Moreover, it decreases the release of lysosomal enzyme and synthesis of inflammatory factors. The biologic half-life of dexamethasone is 36–54 h [9], thus dexamethasone seems to play an important role in early period following operation. Dexamethasone has been widely used in gynecology and general surgery. Kassim et al. [10] reported that dexamethasone was effective in improving pain by reducing the requirements for rescue analgesia. However, potential risk of infection may be the major concern which limits the clinical application. Although no increased risk of infection was reported, the evidence level was low because of the small sample size.

Currently, the use of dexamethasone in management of postoperative pain was seldom reported. Therefore, a systematic review and meta-analysis is conducted to evaluate the overall benefits and harms of perioperative systemic dexamethasone in patients undergoing TKA. We hypothesize that the use of dexamethasone could reduce pain and total narcotic use.

## 2. Materials and methods

### 2.1. Search strategy

Two reviewers performed an electronic literature search for RCTs evaluating the dexamethasone in the management of postoperative

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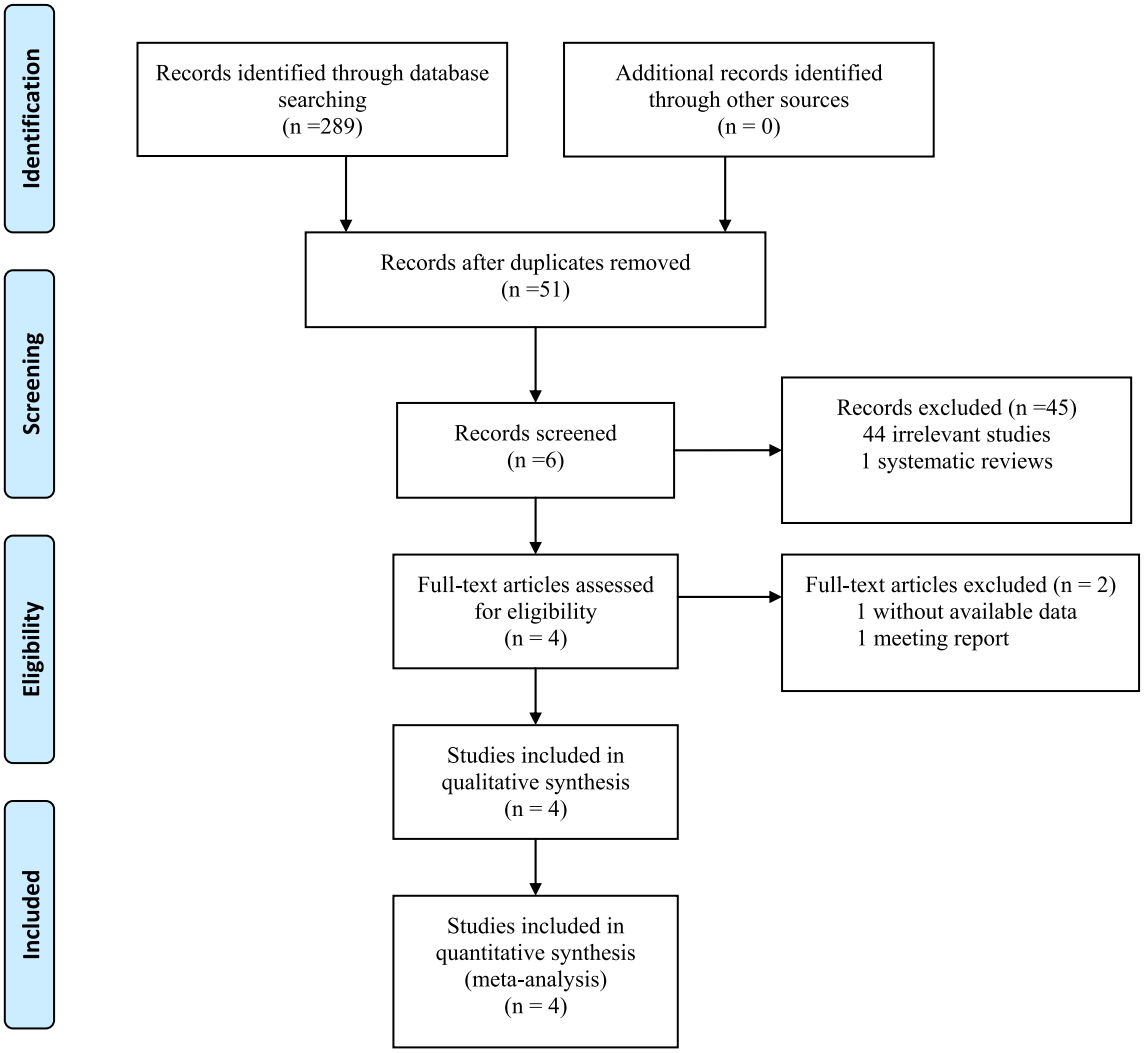
**Table 1**
PRISMA flow diagram.




pain after primary TKA. The electronic databases include PubMed, Medline, Embase, Web of Science and the Cochrane Library from inception to February, 2018. The following terms were used as key words: "dexamethasone", "total knee arthroplasty", and "pain". No restrictions were placed on the publication language. In addition, further articles were obtained by reviewing references of the selected articles. The detail retrieval process was shown in Table 1. Disagreement was resolved by consulting an additional reviewer.

### 2.2. Eligibility criteria

All RCTs comparing the clinical efficacy between dexamethasone with placebo among adults of any sex undergoing primary TKA were included in our study. The outcomes were visual analogue scale (VAS), total narcotic use, length of stay, and adverse effects.

### 2.3. Data extraction

Information was carefully extracted from all the eligible publications independently by two independent reviewers, and disagreements were resolved through discussion or by seeking an independent third author. A standard data extraction form was created using Microsoft Excel 2016 to collect data of interest. The major categories of variables to be coded were: (1) study characteristics; (2) participant characteristics; (3) type of intervention; and (4) outcome characteristics. When the original data were not available, we calculated the data through the available coefficients or consulted the corresponding author.

### 2.4. Risk of bias assessment

Two authors independently assessed the risk of bias using the Cochrane risk-of-bias tool. Bias was assessed across the following seven domains: (1) random-sequence generation (selection bias); (2) allocation concealment (selection bias); (3) blinding of participants and personnel (performance bias); (4) blinding of outcome assessment (detection bias); (5) incomplete outcome data (attrition bias); (6) selective reporting (reporting bias); (7) other bias. Each aspect could further be classified as a low, high or unclear risk. Any disagreements were resolved through discussion, and sometimes with another reviewer if necessary. The evidence grade was determined using the guidelines of the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) working group [11].

STATA 14.0 was used to perform the meta-analysis. Statistical heterogeneity was tested depending on the value of P and $I^2$ using the standard chi square test. When there was no statistical evidence of heterogeneity ($I^2 < 50\%$, $P > 0.05$), a fixed effects model was adopted; Otherwise, a random-effect model was used. Weighted mean difference