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# Local infiltration anesthesia with steroids in total knee arthroplasty: A systematic review of randomized control trials

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## ABSTRACT

Local infiltration anesthesia (LIA) with anesthetics, steroids, NSAIDs, and epinephrine has been shown to be effective in reducing total knee arthroplasty (TKA) postoperative pain. This systematic review explores the functional outcomes of randomized control trials that have compared the use of LIA with and without steroids during TKA. Five studies with 412 patients met the inclusion criteria, 228 received local infiltration anesthesia with steroids (LIAS) and 184 received local infiltration anesthesia without steroids (LIAWS). The use of LIAS in management of postoperative TKA pain has been shown to decrease the length of hospital stay, time required to achieve straight leg raise, and pro-inflammatory signals in patients. Although there is no overwhelming data to suggest LIAS improves postoperative TKA pain, current literature does support its effectiveness in producing other favorable surgical outcomes.

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## 1. Introduction

Total knee arthroplasty (TKA) is a beneficial procedure to treat patients presenting with knee joint degeneration, but can be associated with postoperative pain hindering patient rehabilitation.<sup>1,2</sup> Recent studies demonstrate the number of knee revision procedures is expected to increase from 37,544 in 2005 to 56,918 in 2030, a 51% total increase in volume.<sup>3</sup> Local infiltration anesthesia (LIA) is widely accepted as a means to manage pain during the post-operative period after TKA and provides relief with a decrease incidence of nausea, vomiting,

urinary retention, constipation, drowsiness, and urinary catheter problems often associated with opioid use.<sup>4,5</sup>

Studies and systematic reviews of LIA to relieve postoperative TKA pain have found it to be effective in reducing pain, increasing range of motion, and lessening opioid consumption post surgery.<sup>6–10</sup> Although LIA for TKA has demonstrated positive results in reducing patient pain post-operatively, there is still very high variability in what medications are included in an LIA and in what dosages.<sup>9</sup>

Steroids are inconsistently included in LIA formulas.<sup>9,10</sup> Corticosteroids have been shown to decrease post-surgical pain by reducing production of prostaglandins and

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increasing vasodilation when injected directly into the surgical wound.<sup>11,12</sup> Although there are numerous studies that claim local infiltration anesthesia with steroids (LIAS) is effective in reducing post-surgical pain, there are few studies comparing LIAS and local infiltration anesthesia without steroids (LIAWS). In addition, no studies were found comparing the effect of different types of steroids in LIAS on patient pain relief. This systematic review provides a collective summary of existing TKA LIA studies that evaluate whether or not LIAS decreases pain and increases functional outcomes for patients versus LIAWS. To our knowledge, there are currently no published reviews examining LIAS and its role exclusively in TKA recovery.

## 2. Methods

### 2.1. Search methods

Relevant articles were found via the search methodology outlined in Fig. 1. A comprehensive search was conducted

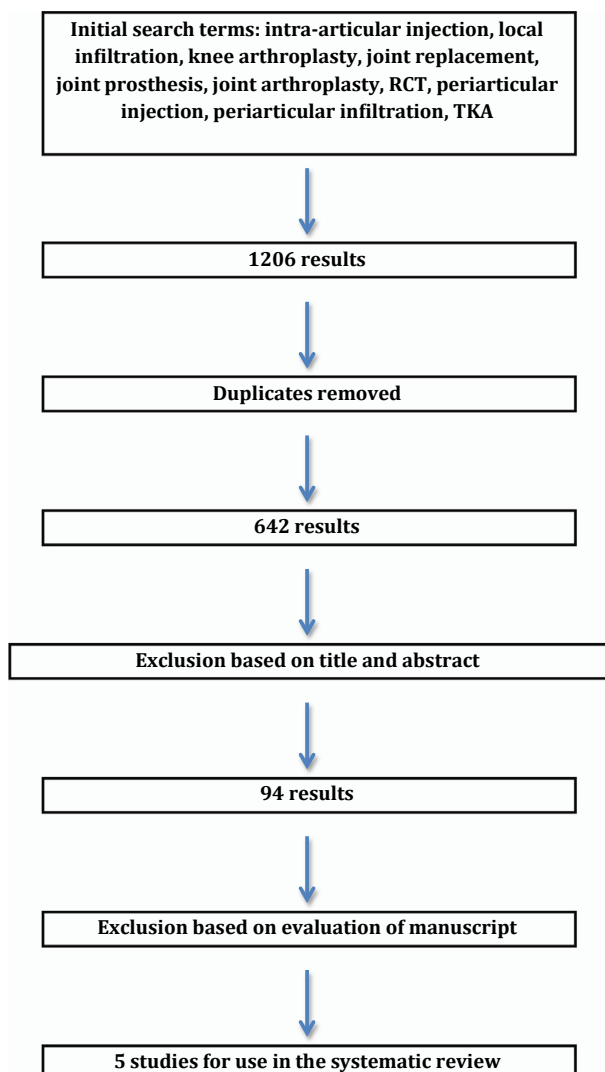


Fig. 1 – Flow diagram showing details of literature search.

using PubMed, EMBASE, and the Cochrane Library for any study that involved the use of LIAS to relieve pain after TKA up until May 1, 2014. The initial search utilized the following key terms: intra-articular injection, local infiltration, knee arthroplasty, joint replacement, joint prosthesis, joint arthroplasty, RCT, periarticular injection, periarticular infiltration, and TKA. Using various combinations of these key terms, 1206 studies were determined relevant for further analysis. Removal of duplicates then yielded 642 results. Exclusion based on title and abstract reduced the studies for analysis to 94. After full evaluation of the 94 manuscripts, 5 studies were deemed appropriate for inclusion in this systematic review and detailed analysis (Fig. 1).<sup>13–17</sup> Any studies that utilized LIAS during unicompartmental knee arthroplasty were not included. Evaluation and inclusion of selected studies was performed in accordance with the Cochrane Handbook for Systematic Reviews.

### 2.2. Data extraction

Data from the following fields were extracted from each study for further analysis: contents of LIA, pain visual analog scores (VAS), daily consumption of morphine post surgery, days to achieve straight leg raise (SLR), knee society score, range of motion (ROM), length of stay (LOS), C-reactive protein (CRP), and IL-6. In order to properly compare between studies, all steroids included in LIAS were converted into equivalents of dexamethasone (Table 1).

### 2.3. Statistical analysis

Review Manager 5.3 was used to analyze extracted data and produce meta-analyses when possible. The overall effect for continuous data was evaluated using mean difference with a 95% confidence interval (CI). The  $I^2$  statistic was used to evaluate heterogeneity. If the  $I^2$  statistic was less than 50%, heterogeneity was considered to be insignificant and a random effect model was used. If the  $I^2$  statistic was greater than 50% a fixed-effect model was applied for the meta-analysis.<sup>18,19</sup>

### 2.4. Functional outcome

The results produced by the 5 chosen studies in the following categories were used to evaluate the efficacy of LIAS: VAS scores, daily consumption of morphine post surgery, days to achieve straight leg raise, knee society score (KSS), range of motion score, length of hospital stay, and CRP.<sup>13–17</sup>

Of all of the evaluated categories, 4 were significant and not conflicting with the data of other studies: LOS, CRP, IL-6, and SLR. LOS represents hospital length of stay after surgery. CRP is an acute-phase protein synthesized by the liver in response to inflammation.<sup>20</sup> IL-6 is a pro-inflammatory cytokine released into the bloodstream by neutrophil granulocytes and macrophages during inflammation and trauma.<sup>21</sup> SLR is a test-conducted post TKA to gauge how high a patient is able to elevate his/her leg off of an exam table and it reflects pain control as well as muscle strength recovery.

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