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REVIEW ARTICLE

Does regional anaesthesia improve outcome after total hip arthroplasty? A systematic review

A. J. R. Macfarlane[1 2], G. A. Prasad[1], V. W. S. Chan[1] and R. Brull[1]*

[1]*Department of Anaesthesia and Pain Management, Toronto Western Hospital, University Health Network, 399 Bathurst Street, Toronto, ON, Canada M5T 2S8*
[2]*Present address: Department of Anaesthesia, Glasgow Royal Infirmary, 84 Castle Street, Glasgow G4 0SF, UK*
**Corresponding author. E-mail: richard.brull@uhn.on.ca*

Total hip arthroplasty (THA) is amenable to a variety of regional anaesthesia (RA) techniques that may improve patient outcome. We sought to answer whether RA decreased mortality, cardiovascular morbidity, deep venous thrombosis (DVT) and pulmonary embolism (PE), blood loss, duration of surgery, pain, opioid-related adverse effects, cognitive defects, and length of stay. We also questioned whether RA improved rehabilitation. To do so, we performed a systematic review of the contemporary literature to compare general anaesthesia (GA) and RA and also systemic and regional analgesia for THA. To reflect contemporary surgical and anaesthetic practice, only randomized controlled trials (RCTs) from 1990 onward were included. We identified 18 studies involving 1239 patients. Only two of the 18 trials were of Level I quality. There is insufficient evidence from RCTs alone to conclude if anaesthetic technique influenced mortality, cardiovascular morbidity, or the incidence of DVT and PE when using thromboprophylaxis. Blood loss may be reduced in patients receiving RA rather than GA for THA. Our review suggests that there is no difference in duration of surgery in patients who receive GA or RA. Compared with systemic analgesia, regional analgesia can reduce postoperative pain, morphine consumption, and nausea and vomiting. Length of stay is not reduced and rehabilitation does not appear to be facilitated by RA or analgesia for THA.

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Total hip arthroplasty (THA) is amenable to a variety of regional anaesthesia (RA) techniques. Central neuraxial blockade (CNB) can provide excellent intraoperative anaesthesia and prolonged postoperative analgesia. Peripheral nerve blockade (PNB) avoids some of the unwanted adverse effects of CNB and allows for targeted analgesia of the operative limb.[6 64 65] The use of continuous PNB has increased as it has the advantage of longer postoperative analgesia compared with a single-injection technique.[8 31 53]

Despite a low rate of complications and apparent benefits in certain orthopaedic procedures, including better postoperative analgesia, improved rehabilitation, and a reduced length of hospital stay, there are disadvantages of RA.[2–4 10 14 15 22 49 60 72 76] There is an inherent block failure rate, even in expert hands.[51] Operating theatre delays and a perceived risk of increased liability are criticisms also often directed at RA.[38 52] Other limiting factors include the training required to develop the necessary technical skills for successful RA and, more recently, the expense of ultrasound equipment as this method of nerve localization increases in popularity. Finally, many patients are fearful of RA and may have misconceptions about the technique involved.[43]

Although RA is increasingly used, the results of large meta-analyses and randomized controlled trials (RCTs) comparing general anaesthesia (GA) and RA for major lower limb orthopaedic surgery often conflict.[7 18 44 56 69 77] It is not uncommon for the results of large RCTs to disagree with those of meta-analyses.[30] This can be due to the inclusion of small studies, publication bias, and sample heterogeneity between different trial populations and meta-analysis bias.[32 40 46] More importantly, many trials included in recent meta-analyses were originally published more than 30 yr ago and do not reflect modern anaesthetic or surgical practice. Landmark articles which

compared GA and RA for hip surgery used drugs that are no longer available.[47 48] In the past two decades, surgical techniques and postoperative patient care have improved considerably, new thromboembolic prophylaxis regimes have been introduced, and RA has advanced as a result of enhanced needle technology, block placement techniques, catheter design, and infusion pumps.[25 27 33 58 63] We have re-examined existing data[66] for relevance and application to modern anaesthetic practice.

We have performed a systematic review of the literature, published from 1990 onwards, to ascertain if either RA was superior to GA or regional analgesia was superior to systemic analgesia for THA. The specific questions we sought to answer were whether, when compared with GA or systemic analgesia, RA or regional analgesia for THA decreased: (i) mortality, (ii) cardiovascular morbidity, (iii) deep venous thrombosis (DVT) and pulmonary embolism (PE), (iv) blood loss, (v) duration of surgery, (vi) pain, (vii) opioid-related adverse effects, (viii) cognitive defects, and (ix) length of stay. We also examined whether or not RA or regional analgesia improved rehabilitation.

Methods

Two of the authors (G.A.P. and R.B.) searched the electronic databases MEDLINE, EMBASE, and the Cochrane Central Register of Controlled Clinical Trials (from January 1990 to October 2008) using the following population search terms: 'total hip replacement' OR 'total hip arthroplasty' OR 'hip operation'. These search results were combined with 'anaesthesia' OR 'analgesia' using the Boolean search operator AND. The references of retrieved articles were hand searched for any relevant articles not identified in the original search.

The study selection criteria were limited to include only RCTs, English language, and human adults. Each abstract was screened to identify studies that had randomized patients to compare GA or RA for surgery. RCTs comparing systemic or regional techniques for postoperative analgesia were also included. Studies were excluded if surgery other than a joint arthroplasty was performed, or if both hip and knee arthroplasty were treated as one single study population and data on the patients undergoing knee surgery were not presented separately in the results.[9 26 29 35 73] Studies using opioid-only neuraxial techniques were excluded.[24 71] Finally, studies were excluded if the primary outcome was not included in the list described above.[13 57]

The data were extracted onto a templated evidence-based medicine literature review form to assist in the systematic review of full-text articles and data collection. Data extracted for comparison included year of publication, author, total number of subjects, mean patient age, per cent male, and co-morbidity. The intervention (specific RA, regional analgesia technique, or both) and comparator (GA, specific systemic analgesia technique, or both) were recorded. The specific outcomes sought in each article were: (i) mortality, (ii) cardiovascular morbidity (myocardial infarction, arrhythmia, and hypotension), (iii) DVT, (iv) PE, (v) blood loss, (vi) duration of surgery, (vii) pain (pain scores and morphine consumption), (viii) opioid-related adverse effects (nausea, vomiting, pruritis, sedation, urinary retention, and respiratory depression), (ix) cognitive defects, (x) length of stay, and (xi) rehabilitation (range of motion and ambulation). It was noted whether each outcome was primary or secondary. Each outcome was then evaluated qualitatively for each intervention and comparator and the data were recorded in tables. Because there were a limited number of studies with homogenous design for each outcome, meta-analysis was not performed.

The methodological quality of each trial was assessed using several criteria. The likelihood of methodological bias of each RCT was assessed using the Jadad score,[34] which assigns points based on three factors. One point was given to randomized studies, an additional point was given if the method of randomization was described and appropriate, and one point was deducted if randomization was inappropriate. One point was given if a study was double-blind, and an additional point was given if the blinding procedure was described and appropriate. One point was deducted if blinding was inappropriate. One point was given if the numbers and reasons for withdrawals were described. The maximum score is 5; trials scoring 3 or more are generally regarded as having satisfactory methodologic quality. Allocation concealment, which helps eliminate selection bias, was assessed and defined as adequate, unclear, or inadequate. Finally, whether patient follow-up rates were $<80\%$ was recorded.

After abstraction of information, a level of evidence was assigned to the outcomes of each RCT (Level I is a high-quality RCT; Level II is a lesser quality RCT, e.g. $<80\%$ follow-up, no blinding, or improper randomization). Two authors (A.J.R.M. and R.B.) independently reviewed and scored each RCT using this methodology.

Results

In total, 18 RCTs were identified that compared either GA *vs* RA, systemic *vs* regional analgesia, or both for THA (Fig. 1). Ten of these had a Jadad score of 2 or less. Allocation concealment was unclear in 13 trials and inadequate in one. Follow-up was adequate in all trials (Table 1). Two RCTs were considered to provide Level I evidence.[37 65] In total, the studies included 1239 patients. A summary of the outcomes reported in each trial is provided in Table 2.

Mortality

There were no trials primarily designed to assess differences in mortality after GA or RA for THA. Only two