



Peri-articular Steroid Injection in Total Knee Arthroplasty: A Prospective, Double Blinded, Randomized Controlled Trial

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ABSTRACT

Total knee arthroplasty is a painful operation. Peri-articular local anesthetic injections reduce post-operative pain and assist recovery. It is inconclusive whether intra-operative injections of peri-articular corticosteroids are of benefit. Therefore our clinical question was: in patients with osteoarthritis who are undergoing TKA, does the addition of high or low dose corticosteroid to peri-articular injections of local anesthetic and adrenaline improve post-operative pain and range of motion? We performed a prospective, double-blinded, randomized controlled trial of two different doses of triamcinolone acetate (N = 42 in each group) added to local anesthetic in TKA for osteoarthritis. There were no significant differences in pain scores or ROM between the control and corticosteroid groups. Differences in secondary outcomes were also non-significant. Peri-articular corticosteroids do not appear to be of benefit in TKA.

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Control of pain following total knee arthroplasty (TKA) improves early patient satisfaction, reduces hospital stay and accelerates recovery [1,2]. A multi-modal analgesic regime is important in achieving this. This approach may include blocking afferent pain receptors at different sites, thus reducing opiate requirements and avoiding side effects [3]. Blocking pain receptors locally with long acting anesthetics and analgesics is an effective way of reducing pain after orthopedic surgery [5,6].

The introduction of injectable corticosteroid, a potent inhibitor of the phospholipase A2 (PLA2) inflammatory pathway, to peri-articular tissue is suggested to benefit pain and early range of motion (ROM) in total hip replacements, unicondylar knee replacements (UKA) and TKA [7–9]. However, previous studies regarding corticosteroid infiltration have used single, fixed dosages and often used other varying modes of anesthesia, analgesia, and post-operative rehabilitation protocols. Furthermore there is a small body of evidence showing that injected steroids, both intra-articular and peri-articular, do not improve outcomes and can perhaps be detrimental due to infection risk [10,11].

Our clinical question was the following: In patients with osteoarthritis of the knee who are undergoing TKA, does the addition

of varying amounts of a corticosteroid to peri-articular injections of local anesthetic and adrenaline improve post-operative pain scores and ROM compared to local anesthetic and adrenaline alone?

Materials and Methods

A prospective, randomized, double-blinded study was undertaken to assess the efficacy of adding peri-articular corticosteroids to intra-operative, peri-articular high volume local anesthetic in post-operative pain management following TKA. Ethics board approval and patient consent were obtained. Inclusion criteria were patients undergoing primary TKA for osteoarthritis. Patients were excluded if there was a history of unstable diabetes mellitus, immunosuppression, chronic renal failure, or allergic reactions to any of the local infiltrate components. Workers compensation cases were also excluded.

A pre-study powers analysis suggested that to achieve a 20% reduction in inter-group pain scores, each group should be composed of at least 39 patients. A total of 204 patients undergoing TKA surgery by the two study surgeons in a private urban hospital setting were consecutively assessed for eligibility to enter the study. There were 40 patients who did not meet the inclusion criteria and a further 37 who declined to participate. This left 127 patients who were enrolled and subsequently randomized into 3 groups. Randomization was performed by opening sealed envelopes containing allocations that had been determined by a random number generator. The study flow-sheet is provided in Fig. 1. On the day of surgery the anesthetist

Investigation Performed at Sydney Knee Specialists, Sydney, Australia

The Conflict of Interest statement associated with this article can be found at <http://dx.doi.org/10.1016/j.arth.2012.07.034>.

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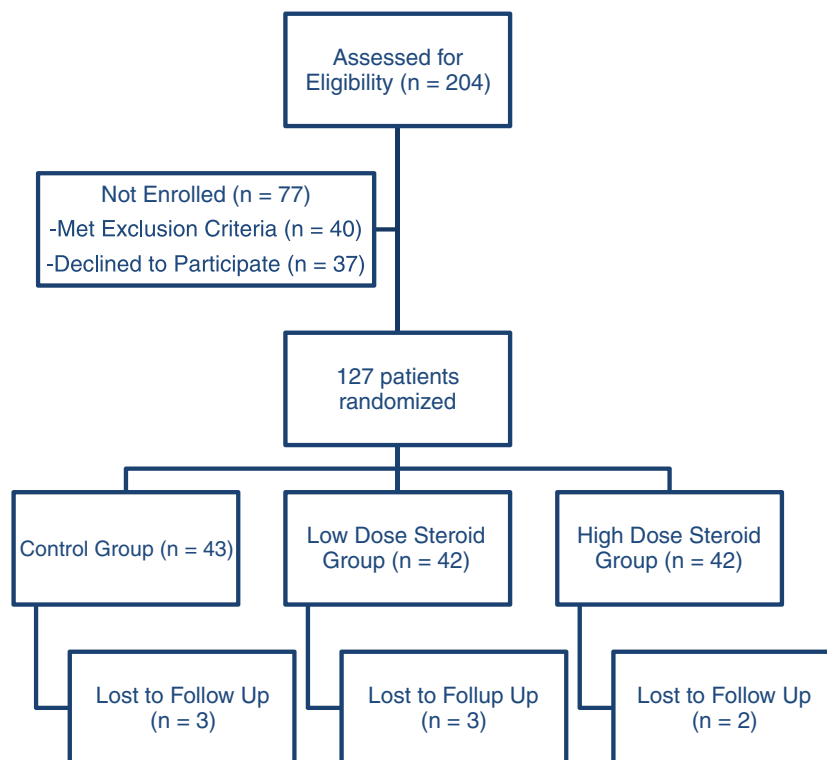


Fig. 1. The study flow-sheet demonstrates assessed, enrolled, completed and lost to follow-up patients.

prepared the injectable mixture after opening the sealed envelope. It was then handed off to the scrub nurse.

The control group received an intraoperative, peri-articular injection of local anesthetic (100 ml of ropivacaine 0.2%) and 1:1000 adrenaline. The low dose steroid group received the same amount of local anesthetic and adrenaline plus 40 mg of triamcinolone acetate. Finally, the high dose steroid group received the same amount of local anesthetic and adrenaline plus 80 mg of triamcinolone acetate. To prevent the surgeon from detecting the steroid containing solution, which is cloudy, the syringes were completely covered with a sterile adhesive tape. Only the anesthetist and scrub nurse who drew up and covered the syringe could identify which patient received which mixture. The operating surgeon, remaining operating staff, patients, physiotherapists, ward nursing staff and data collectors remained blinded for the duration of the study.

Surgical Technique

All surgeries were performed by two fellowship-trained knee arthroplasty surgeons. Each patient underwent spinal anesthesia with sedation. Intravenous cephalothin was given prior to inflation of the

tourniquet. A standard medial parapatellar approach was used in all operations. All patients received fully cemented, posterior stabilized knee replacements (Zimmer NexGen LPS Flex, Warsaw IN) with patellar resurfacing.

After the definitive bone cuts had been made, lamina spreaders were inserted to expose the posterior compartment of the knee at 90° of flexion. Posterior osteophytes were removed with a curved osteotome and the meniscal remnants were excised. At this stage, local tissues were injected with the trial mixture. The following tissues were sequentially injected using an 18 gauge spinal needle: medial and lateral posterior capsule, medial and lateral meniscal rims, the deep portion of medial ligament, the anterior synovial tissue and medial and lateral synovial recesses. The extensor mechanism (patellar ligament and quadriceps tendon) was not infiltrated with steroid due to the risk of delayed tendon rupture.

A second aliquot of local anesthetic and adrenaline without corticosteroid was injected in to the patellar and quadriceps tendon and the subcutaneous fat in all three groups after the definitive prosthetic components was implanted. The volume of the second injection varied with weight, with 60 ml if the patient was under 70 kg and 100 ml for patients heavier than this. The tourniquet was deflated during the case and hemostasis was achieved. No drains were used.

Table 1

The Primary and Secondary Outcomes of the Study are Shown Above.

Primary Outcomes	ROM (Range of Motion)
	RVAS (Resting Visual Analog Pain Score)
	AVAS (Active Visual Analog Pain Score)
Secondary Outcomes	LOS (Length of Stay)
	TME (Total Morphine Equivalents)
	KSS (Knee Society Score)
	KOOS (Knee Injury & Osteoarthritis Outcome Score)
	WOMAC (Western Ontario & MacMaster Universities Index)
	Adverse Outcomes

Table 2

The Baseline Characteristics with Standard Deviations of the Control and Two Trial Groups Shows No Significant Differences in Any Category.

	Control Group	Low Dose Group	High Dose Group	ANOVA P value
Age	65.09 ± 8.4	68.9 ± 8.0	66.81 ± 7.5	0.09
BMI	31.49 ± 4.7	30.85 ± 5.5	31.09 ± 5.4	0.85
ROM pre op	108.8 ± 12.0	105.7 ± 13.1	108.8 ± 13.2	0.44
RVAS pre op	5.62 ± 0.9	5.56 ± 1.6	5.6 ± 1.5	0.98
AVAS pre op	7.7 ± 1.1	7.62 ± 1.3	7.49 ± 1.2	0.74

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