

Original Research Article

Efficacy of local anaesthetic cocktail infiltration in a total knee replacement: a prospective, randomized study

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ABSTRACT

Background: The aim of this study is to assess the efficacy of local anaesthetic cocktail infiltration in pain management during a total knee arthroplasty.

Methods: In this study we had 25 patients each in study and control group. The study group was infiltrated with the local anesthetic cocktail just before final implantation. Pain was documented by a visual analogue scale in a double blinded manner. Statistical significance was calculated using an unpaired “t” test.

Results: In study group, pain levels were significantly lower as compared to control group for the first 48 hours after surgery with a ‘p’ value of 0.0224 (<0.05). The need of intravenous tramadol for breakthrough pain on the second day was significantly lower in study group as compared to control group with a ‘p’ value of 0.033(<0.05).

Conclusions: This study shows that the local high volume anaesthetic infiltration is effective in reducing immediate postoperative pain and the need of IV opioids for the first 48 hours after surgery.

Keywords: Arthroplasty, Total knee replacement, Pain management, Visual analogue scale

INTRODUCTION

Pain after a total knee replacement can be quite severe and debilitating factor, hindering with the rehabilitation and recovery of the patient. Pain management is thus an integral part of knee arthroplasty. Pain after a total knee replacement is an ill-understood and poorly managed even today.¹

Acute Post- surgical pain is not just inflammatory but also has a neurogenic component.² Pain management should thus be multimodal and adequate. Conventional methods like intravenous opioids are effective but cause side effects like nausea, vomiting and sedation.³ Local infiltration containing a local anesthetic like sensorcaine and a steroid like depomedrol have the potential to reduce the immediate post-surgical pain by reducing depolarization

of local nerve endings and reducing the early post-surgical inflammation respectively.

The aim of this study was to determine the efficacy of a local high volume anesthetic infiltration in reducing the pain and the requirement of intravenous opioids in postoperative management of total knee replacement.

MATERIALS AND METHODS

A prospective study was conducted at Sanjivan hospital, Nashik over a period of 1 year from March 2019 to December 2019 which included a total of 50 patients undergoing unilateral total knee arthroplasty for primary osteoarthritis of the knee. Patients with inflammatory arthritis uncontrolled diabetes were excluded from the study. There were randomized into a study and control

group having 25 patients each using simple randomization technique. A proper written informed consent was taken.

All the surgeries were done by a single senior arthroplasty surgeon. All patients received a combined spinal epidural anesthesia. A midline para patellar approach was taken in all patients; a cemented DePuy (PS 150) was used for all patients; the patella was resurfaced in just 2 of the cases due to grade 4 patellofemoral arthritis. The cocktail was infiltrated after giving a thorough wash before cementing and final implantation. One third of the total infiltrate was infiltrated in the posterior capsule (mainly the posterior-medial capsule) and the rest two third was infiltrated in the peri-articular tissues (infrapatellar fat-pad, quadriceps tendon, patellar tendon, pre-patellar and infra-patellar bursa, medial collateral ligament and other medial structures, and the sub-cutaneous tissue). The anesthetic cocktail consisted of: 0.5% sensorcaine 20 ml, inj. fentanyl 100 mcg, inj. ketorolac 1 amp, inj. clonidine 0.5ml (if no bradycardia), inj. depomedrol 40mg and normal saline. Total volume of the cocktail was diluted to 100 ml with normal saline.

The pain management protocol other than the local intra-operative anesthetic injection including: epidural infusion consisting of bupivacaine 3.6 mg/ml and fentanyl 4 mcg/ml at the rate of 2-3 mg/hour for first 24 hours, IV tramadol 8 hourly for the first 24 hours SOS (if necessary) after that; oral non-steroidal anti-inflammatory medications like etoricoxib 90 mg for 2 weeks post-operatively; cryotherapy, oral paracetamol 650 mg three times a day for 2 weeks post-operative remained the same in both study and control group.

Pain levels of patient was documented every 6 hourly using a visual analog scale ranging from 0 to 10 (0 indicating no pain and 10 indicating intolerable pain) for the first 3 days after which the patient was discharged. The next reading was taken on suture removal i.e. day 15 post surgery, and the final reading was taken 4 weeks after surgery on follow-up. The use of intravenous tramadol for breakthrough pain was also documented (number of vials). All the documentation was done in a double blinded

manner such that neither the person collecting the data nor the patient knew whether they were infiltrated with the cocktail or not.

Statistical analysis of the data was done using the unpaired t test with help of a statistician. Significance was defined as p value <0.05 at 95% confidence intervals.

RESULTS

The mean age of the patients was 69.4 years (ranging from 60 to 80 years). 59% of total patients were females and 41% were males. Patients were graded using Ahlback radiological classification for osteoarthritis of knee (Table 1).

In study group, pain levels were significantly lower as compared to control group for the first 48 hours after surgery (Figure 1) with a ‘p’ value of 0.0224 (<0.05) which is statistically significant at 95% confidence interval. The need of intravenous tramadol for breakthrough pain on the second day was significantly lower in study group as compared to control group with a ‘p’ value of 0.033 (<0.05). There was no statistical difference in the pain levels or the need of intravenous tramadol for breakthrough pain after the first 48 hours of surgery.

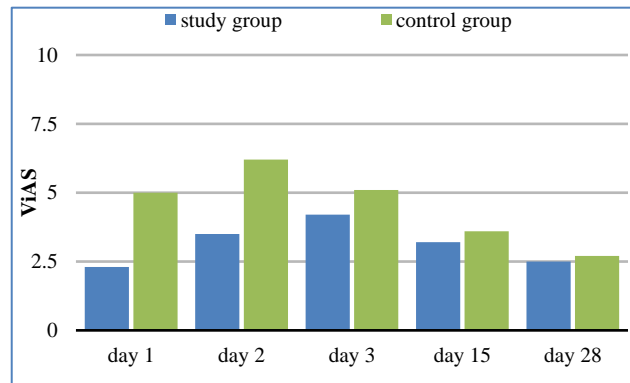


Figure 1: The mean visual analog scores of study (infiltrated) and control (non-infiltrated) groups.

Table 1: Representation of the demographic distribution and radiological (Ahlback classification) grading of patients included in the study.

Age Group (in years)	Sex	Grade 1 OA	Grade 2 OA	Grade 3 OA	Grade 4 OA	Grade 5 OA
60-65	4 Male/ 6 Female	1	5	3	1	Nil
65-70	5 Male/ 8 Female	Nil	7	4	2	Nil
70-75	6 Male/ 8 Female	Nil	5	4	4	1
75-80	6 Male/ 7 Female	Nil	1	5	5	2
Total patients (n=50)	21 Male/ 29 Female	1	18	16	12	3

DISCUSSION

The optimal pain management after a total knee arthroplasty is a continuously evolving subject. We also know that post-operative pain is one of the most important factor considered by a patient before going ahead with a total knee arthroplasty. Hence it is essential to manage the post-operative pain effectively to ensure optimal recovery of the patient. What we know as a fact is that the pain management should be pre-emptive and multimodal via peri-operative pharmacological and non-pharmacological modalities to provide optimal relief.^{4,5} This study shows lower post-operative pain in patients receiving local high volume infiltration. The benefits of the local infiltration seem to be extending to the first 48 hours after surgery as shown by a lower pain score and lower need of intravenous tramadol for breakthrough pain.

Pain control after a surgical procedure can be achieved at 3 levels: local tissue level, peripheral nervous system and central nervous system. Pain after a major surgical procedure like a total knee arthroplasty can be excruciating and hence it should be blocked at all 3 levels to produce significant pain relief. Local infiltration helps significantly in this regard. The sensorcaine in the local infiltrate binds to the voltage gated sodium channels, blocking sodium influx and thus inhibiting depolarization of the peripheral nervous system (A delta and C fibers), blocking the pain pathway. The depomedrol in the local infiltrate reduces the local inflammation and halts the inflammatory mediators thus reducing the inflammatory pain.

Local analgesic infiltration enhances the local analgesic effect in immediate post-operative phase thus aiding in pain control.^{6,7} It has been shown in animal studies that peripherally or locally administered opioids plays a significant role in reducing the post-surgical inflammatory pain, similarly local administration of bupivacaine is also effective in reducing post-operative pain.⁸⁻¹⁰ Long lasting pain relief can be achieved with local opioids although its onset of action is slower, as against bupivacaine which is faster and shorter acting. Thus a combination of opioids with bupivacaine for local infiltration gives optimal post-operative analgesia.¹¹ Various studies have shown that the action of local infiltration last for about first 24 to 48 hours from surgery.^{12,13} Some studies have shown that the infiltrated knee have a better range of motion as compared to non-infiltrated knee at time of discharge, whereas some other studies show that there is no difference in the range of motion.^{6,14}

As an adverse effect there can be a rebound increase in pain on the first and second day of the surgery.¹⁵ Although no cases of rebound pain were documented in our study. Local anesthetic infiltration containing methylprednisolone has not shown to have complications like delayed wound healing or increase chances of infection.^{16,17}

CONCLUSION

This study shows that the local high volume infiltration is effective in reducing the immediate post-operative pain and the need of i.v opioids in the post-operative phase. It does not have any significant adverse effects and the benefits definitely outweigh them. Its effect of improving the range of motion is debatable and needs further studies.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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