

ORIGINAL RESEARCH

To evaluate the impact of clonidine and ropivacaine local infiltration in the treatment of post-operative pain of total knee arthroplasty

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ABSTRACT

Background: Significant postoperative discomfort is a side effect of total knee arthroplasty (TKA), which restricts postoperative movement, which is essential for restoring joint function. Pain is possibly the most dreaded thing in the world. It warns the body of illness. The intensity and length have an effect on quality of life. In orthopaedics, pain following total knee arthroplasty (TKA) is a major concern. Although continuous epidural analgesia and opioids continue to be the main options for postoperative pain treatment following TKA, they have negative side effects include drowsiness, nausea, and hypotension. An intricate and technically challenging technique requiring close monitoring is epidural catheterization. Local anaesthetic solution infiltration significantly reduces pain at the site. The learning curve is minimal, there are no long-term negative effects, no infections, no motor block at all, early mobilisation, and cost effective. An intricate and technically challenging technique requiring close monitoring is epidural catheterization. Local anaesthetic solution infiltration significantly reduces pain at the site. It has a minimal learning curve, no infection, no systemic side effects, no motor block at any level, early mobilisation, and is cost-effective. The use of ropivacaine and clonidine together as a LIA has not been extensively studied.

Methodology: At a tertiary care facility, a prospective study was conducted on 40 patients having total knee replacement surgery. A thorough evaluation of the airway, respiratory system, and cardiovascular system was done during the pre-anesthesia check-up. The simplest laboratory data were examined. The VAS was explained to

patients, and it was assessed before surgery while the operated-on knee was at rest and while it was moving.

Results & Conclusion: The average age was 63.45 + 8.6 years, as we saw. Thirteen (32.5%) of the 40 patients were male, and 27 (67.5%) were female. In the first 24 hours following total knee replacement surgery, ropivacaine and clonidine have proven to be particularly efficient painkillers. We came to the conclusion that the need for opioid has diminished with the use of local infiltrative anaesthetic, or the combination of ropivacaine and clonidine. Tachycardia and hypertension effects on the cardiovascular system have also diminished. Early mobilisation also helped the patient, who benefited.

Keywords: Total knee arthroplasty, Ropivacaine, Clonidine, Postoperative pain

INTRODUCTION

Injuries to the meniscal and ligaments of the knee joint are prevalent among athletes and sportspersons. Meniscal injuries can also happen to those who are involved in car accidents or mine employees who have knee joint rotational injuries. The most frequent knee injury is a meniscal tear, which results in 66 meniscectomy procedures for every 100,000 people annually. The normal operation of the knee joint depends on the meniscal.[1,2] An amino amide local anaesthetic is ropivacaine. Larger doses of it can be administered because it has a similar duration of effect to bupivacaine but less systemic toxicity. Moreover, it naturally has a vasoconstrictor effect that may help it last longer locally. In comparison to Bupivacaine, all these qualities make it a more suitable local anaesthetic for intra-articular injection.[3] Multimodal pain management is another advancement in post-arthroscopy analgesia. (Equilibrated analgesia) The goal of this therapy is to generate enough analgesia by the additive or synergistic effects of many analgesics, while concurrently reducing the negative effects of each medication due to its lower dosage. [4] Drugs like morphine, ketorolac, and other commonly used combinations with local anaesthetics have been explored with positive results. In this study, we provide a patient who has a total knee replacement surgery 0.75% ropivacaine and clonidine via injection. The long-acting local anaesthetic ropivacaine, which is less likely to cause motor block and has a lower risk of CNS and cardiotoxicity, appears to be a significant option to regional anaesthesia in the management of postoperative pain. [5,6] Clonidine, an alpha-2 adrenergic receptor agonist, is frequently used to manage acute perioperative pain.

The main objective of the study is to ascertain the effects of local infiltration of ropivacaine and clonidine on post-operative pain management after total knee arthroplasty.

METHODOLOGY

At a tertiary care facility, a prospective study was conducted on 40 patients having total knee replacement surgery. A thorough evaluation of the airway, respiratory system, and cardiovascular system was done during the pre-anesthesia check-up. The simplest laboratory data were examined. Written consent was obtained. All patients received oral premedication with Tab Ranitidine 150mg and Tab Diazepam 5mg 12 hours before to surgery while being maintained nil by mouth for 8 hours. The visual analogue pain scale (VAS) was taught to patients, and it was measured before surgery while the patient was at rest and while moving the knee that would be operated on.

A patient receiving unilateral TKA had been selected in accordance with ASA I and ASA II criteria, taking into account inclusion and exclusion criteria. The day before surgery, the patient was told of the entire procedure and given their consent to participate in the study. As the patient was sitting and under rigorous aseptic control, a midline route was used to administer a sub arachnoid block with bupivacaine 0.5% (hyperbaric) 0.6ml/10kg.

A 25 ml solution containing ropivacaine 0.75% (2 mg/kg), clonidine 75 mcg, and normal saline was prepared for local infiltrative anaesthesia. The supra-patellar pouch, the synovium surrounding the quadriceps tendon, the patellar fat pad, the medial meniscus capsular attachment, the posterior-medial capsule, the posterolateral capsule, the medial retinaculum, and the lateral retinaculum were all locally penetrated by this solution.

Every four hours for the first 24 hours, a visual analogue scale pain assessment was performed. This is the VAS grading scale:

NO PAIN

0

SLIGHT PAIN

1-3

MODERATE PAIN

4-6

VERY PAINFUL

7-9

WORST PAIN IMAGINABLE

10

RESULTS

In the demographic data of patients involved in total knee arthroplasty, we observed the mean age of the patients involved was 63.45 ± 8.6 years. Of the total number of 40 patients, the male was 13 (32.5%) and the female was 27 (67.5%) as shown in table 1.

Table 1: The demography Data od patients

Demographics	No of patients (n)
Age	
<50 years	3
51-60 years	20
61 years and above	17
Sex	
Male	13
Female	27

Table 2: Mean value of Visual Analogue scale

Visual Analog Scale (hours)	Mean	SD
0	0.07	0.20
4	0.08	0.21
8	0.2	0.5
12	0.6	0.65
16	1.3	0.81
20	1.8	0.78
24	2.5	1.01

The VAS score showed the significance results by increasing trends as the time duration increases as $p < 0.0001^*$

Table3: The rescue analgesia needed in 24hrs

Variables	Mean dose	P value
Rescue analgesia needed in 24 hours	1.48 ± 1.032	<0.001

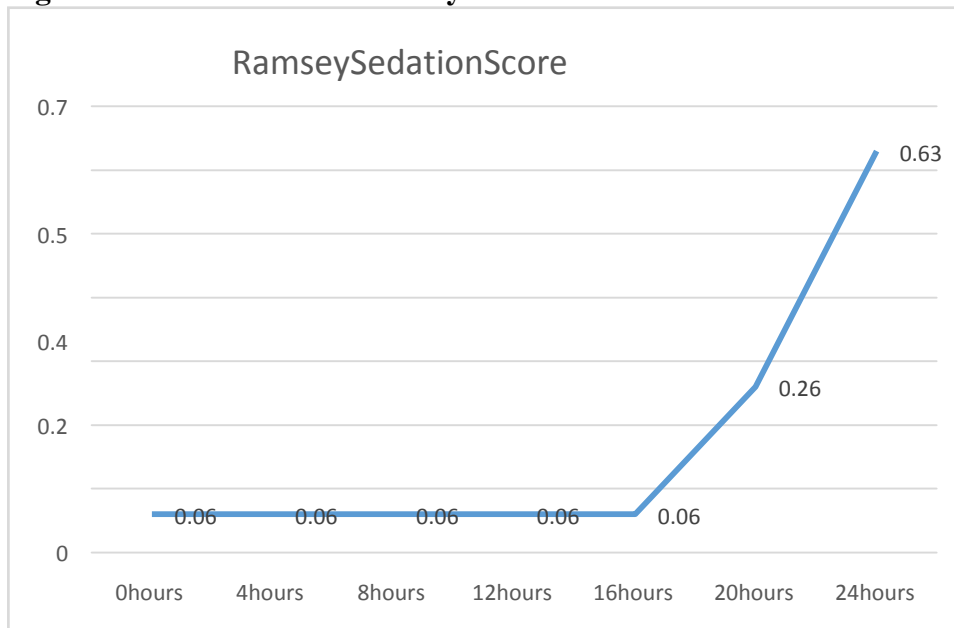
The rescue analgesia for the starting 8hours its was not needed, as the time increase, rescue analgesia was also increased till 24hrs

Table 4: The Mean Respiratory Rate

Respiratory rate (hours)	Mean ± SD
0	14.5 ± 0.4
4	14.2 ± 0.5
8	14 ± 0.7
12	13.6 ± 1.2
16	13.9 ± 1.1
20	14.2 ± 0.8
24	14.4 ± 0.78

The respiratory rate starting till 12 hours shows decreaseswhile after 16hours its shows increases trends shows statistical significance results $p < 0.0004$

In the Ramsey sedation score, there is an increase in trends after 16 hours.

Figure 1: Score trends of Ramsey sedation score

DISCUSSION

We found that the average age was 63.45 + 8.6 years. Males made up 13 (32.5%) of the total 40, while females made up 27 (67.5%). Using repeated ANOVA, the statistical significance is $p < 0.0001^*$. The VAS score indicated an upward trend. Rescue analgesia was not initially required, but as time passed, it became necessary. According to Suresh, A. et al. in statistical analysis, rescue analgesia was required after 24 hours. After 16 hours, the respiratory rate began to increase after showing a trend towards decline.[7] Similar respiratory rates were shown by Suresh, A., et al. Using repeated ANOVA, the statistical significance is indicated by $p < 0.004^*$. After 16 hours, Ramsey's score started to rise.

According to Chan et al. meta-analysis which was published in 2014, FNB was just as efficacious as opioid analgesics and comparable to epidural analgesics with less PONV.[8] It has been demonstrated that US-guided adductor canal blocks can stop the quadriceps

weakening that follows a FNB, allowing for early mobilisation. Yet, although quadriceps power is conserved following adductor canal blocks, the analgesic efficacy is comparable, according to the systematic review and meta-analysis by Kuang et al.[9]

In the first 24 hours following total knee replacement surgery, ropivacaine and clonidine have proven to be particularly efficient painkillers. According to Suresh, A et al examination of the data, the use of dexmedetomidine at levels of 2 g/kg in femoral nerve block is superior to 1 g/kg for producing analgesia after TKA. Karlsen APH et al. meta-analyses revealed statistically significant reductions in pain ratings at rest of 6 mg (95% CI: 3.2 to 8.7; P0.0001), rest of 5 mm (3 to 8; P0.001), and movement of 3 mm (-4 to 10; P = 0.41) at 24 hours following surgery.

According to a study by Kirkham KR et al., which was based on 11 randomised controlled trials involving a total of 628 participants, femoral nerve block lowered pain scores at rest at all time periods evaluated.[10] The trial sequence analysis provided additional evidence that the standard for credible evidence had been reached.[11] Patients who had a femoral nerve block experienced considerably decreased pain scores in the early, middle, and late postoperative phases.

CONCLUSION

We came to the conclusion from our study that the use of local infiltrative anaesthesia, or the mixture of ropivacaine and clonidine, has reduced the requirement for opioids. The cardiovascular system's impacts of tachycardia and hypertension have also decreased. Moreover, the patient benefited from early mobilisation.

REFERENCES

1. Koh IJ, Choi YJ, Kim MS, Koh HJ, Kang MS, In Y (2017) Femoral nerve block versus adductor canal block for analgesia after total knee arthroplasty. *Knee SurgRelat Res* 29:87–95.
2. Hede A, Jensen DB, Blyme P, Sonne-Holm S. Epidemiology of meniscal lesions in theknee:1,215openoperationsinCopenhagen1982-84.*ActaOrthopScand*.1990;61(5):435-437.
3. KurosawaH,FukubayashiT,NakajimaH.Load-bearingmodeofthekneejoint:physical behaviour of the knee joint with or without menisci. *Clinical Orthopedics*. 1980;149:283–90.
4. RobertStoelting,Simon Miller.Local Anaesthetics.In: RobertK Stoelting Editors.*Pharmacology And Physiology In Anaesthesia Practice*. 4th Edition. Lippincott – RavenPublishers(UnitedStates OfAmerica):1999
5. Hussain N, Grzywacz VP, Ferreri CA, Atrey A, Banfield L, Shaparin N, Vydyanathan A (2017) Investigating the efficacy of dexmedetomidine as an adjuvant to local anesthesia in brachial plexus block: a systematic review and meta-analysis of 18 randomized controlled trials. *RegAnesth Pain Med* 42:184–196
6. Jaureguito JW, Wilcox J, Cohn SJ, Thisted RA, Reider B. A Comparison of IntraarticularMorphine and Bupivacaine for pain control after outpatient arthroscopy. *Am J of SportsMedicine* 1995;23:350–353.
7. Suresh, A., Fultambkar, G., Vijayanand, B. et al. A prospective, randomized controlled,double-blindedstudycomparingdexmedetomidineandclonidineasanadjuvanttoropivacaineinfemoral nerveblockfor postoperative analgesia in patients undergoingtotalknee arthroplasty.*Ain-ShamsJAnesthesiol*.2021; 13,44.
8. Karlsen APH, Wetterslev M, Hansen SE, Hansen MS, Mathiesen O, Dahl JB (2017)Postoperative pain treatment after total knee arthroplasty: A systematic review.

PLoS ONE 12(3):e0173107.

9. Helal SM, Eskandr AM, Gaballah KM, Gaarour IS (2016) Effects of perineural administration of dexmedetomidine in combination with bupivacaine in a femoral-sciatic nerve block. *Saudi J Anaesth* 10:18–24
10. K. R. Kirkham, S. Grape, R. Martin, E. Albrecht. Analgesic efficacy of local infiltration analgesia vs. femoral nerve block after anterior cruciate ligament reconstruction: a systematic review and meta-analysis. *Anaesthesia*. 2017; Volume 72, Issue 12 p. 1542-1553.
11. Chaudhary SK, Verma RK, Rana S, Singh J, Gupta B, Singh Y (2016) Ultrasound-guided femorosciatic nerve block for post-operative analgesia after below knee orthopaedic surgeries under subarachnoid block: comparison between clonidine and dexmedetomidine as adjuvants to levobupivacaine. *Indian J Anaesth* 60:484–490.