

Knee Arthroplasty Surgery: Comparison of Intra-Articular Levobupivacaine and Dexmedetomidine with Ropivacaine and Dexmedetomidine for Post-Operative Pain Management.

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ABSTRACT

Background: Local anaesthetics in intra-articular route are commonly used for the management of pain after arthroscopic knee surgery. Dexmedetomidine prolongs the duration of commonly used local anesthetics. In this study, analgesic effect of intra-articular administration of levobupivacaine and dexmedetomidine was compared with ropivacaine and dexmedetomidine in arthroscopic knee surgery. **Methods:** 80 patients, aged between 20 to 60 years of ASA I and II posted for knee arthroscopy were divided into two equal groups (n = 40) in a randomized double blind study. Patients in Group LD received 10 ml of 0.5% levobupivacaine and 1 mcg/kg dexmedetomidine and Group RD received 10 ml of 0.75% ropivacaine and 1 mcg/kg of dexmedetomidine through intra-articular route at the end of the surgery. In the post-operative period, pain intensity was assessed by visual analogue scale (VAS) VAS score was recorded at 1st, 5th, 8th, 12th and 18th post-operative hours. Duration of analgesia, total rescue analgesic requirement in first 18 hours and any side effects were recorded. **Results:** Group LD showed significantly longer duration of postoperative analgesia and lesser rescue analgesic requirement compared to group RD. Group RD had higher mean VAS score at 5th and 12th post-operative hours compare to group LD. **Conclusion:** Intra-articular levobupivacaine and dexmedetomidine combine provides better post-operative pain relief by increasing duration of the analgesia, and decreasing the need of rescue analgesic compared to intra-articular ropivacaine and dexmedetomidine.

Keywords: Dexmedetomidine, levobupivacaine, ropivacaine

INTRODUCTION

Number of day care orthopaedic surgery is increasing day by day. Arthroscopic surgery is the one of the most common minimally invasive surgical procedure in modern orthopaedic setup. Better pain control in day care arthroscopy is more essential for patient comfort and early hospital discharge. Spinal anaesthesia is the most common anaesthetic technique used for arthroscopy surgery.

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Local anaesthetics with adjuvant in spinal route prolongs duration of analgesia but it may produce side effects like hypotension, bradycardia, nausea, vomiting and drowsiness which is not be ideal for day care procedures.^[1] In an effort to provide an effective, safe, and prolonged postoperative analgesia, several studies have been done using

intra-articular local anaesthetics.^[2] Levobupivacaine and ropivacaine are most commonly used local anaesthetics now. Intra-articular dexmedetomidine with bupivacaine have shown to reduce post-operative pain after arthroscopic knee surgery.^[3]

So, the purpose of this clinical study was to compare the analgesic efficacy of intra-articular levobupivacaine (0.75%) with dexmedetomidine 1 mcg/kg and ropivacaine (0.5%) with dexmedetomidine after arthroscopic surgery.

MATERIALS AND METHODS

A total of 80 adult patients were randomly divided into the two equal groups using computer-generated randomization. Patients of ASA status I and II, aged between 20 and 60 years of both sexes undergoing elective arthroscopic knee surgery (meniscectomy, chondral debridement, loose body removal, diagnostic arthroscopy, lavage, and synovectomy) under spinal anaesthesia were included in the present study. Patients having any spinal deformity with co morbidities such as hypertension, diabetes, ischemic

heart disease, any contraindication to regional anaesthesia, allergy to local anaesthetic, pre-existing neurological deficit and psychiatric illness were excluded from the study. Patients in group LD received 10 ml of 0.50% levobupivacaine and 1 mcg/kg dexmedetomidine, and group RD received 10 ml of 0.75% ropivacaine and 1 mcg/kg dexmedetomidine. All patients were clinically examined during pre anaesthetic check up. The laboratory investigations such as haemoglobin, total leucocyte count, differential count, erythrocyte sedimentation rate, serum urea, creatinine, and fasting blood sugar were analyzed during preanaesthetic check-up. Whole procedure was explained to all patients. Visual analogue scale (VAS) (0, no pain and 10, worst pain imaginable) were also explained during the preoperative visit. Routine monitoring in the form of non-invasive blood pressure, ECG, and pulse oximetry was done preoperatively. Lumbar puncture was done in a sitting position at L3 and L4 intervertebral space in midline approach with 26-gauge spinal needle. 2.5 ml of 0.5% (12.5 mg) hyperbaric bupivacaine was injected in the subarachnoid space and then the patient were placed in supine position immediately. After 5 min, sensory blockade at level T10 was confirmed and arthroscopic surgery was started. At the end of the surgery before the skin closure, study drug was administered through the port site in the intra-articular space. Intraoperative monitoring of NIBP, SPO2 and heart rate was done. The intensity of pain was assessed by VAS score in immediate postoperative period and thereafter at 1 h and 5th, 8th, 12th, and 18th hr in postoperative period. Rescue analgesia was given when VAS score ≥ 3 or on patient demand. Injection paracetamol (1gm iv) was used as rescue analgesic. First postoperative analgesia request time, total paracetamol used in first 18 h were recorded. All data were collected by an observer who was unaware of patients' group assignment. Statistical analysis was done using SPSS version 16 and $P < 0.05$ was considered to be significant.

RESULT

With regard to demographic data there was no statistically significant difference between the two groups.[Table 1] In our study, time for the request of first dose of rescue analgesia in Group RD was less (9.25 ± 2.52 hour) compared to Group LD (11.92 ± 2.05 hour) which was statistically significant ($P < 0.05$). [Table 2] Total amount of mean rescue analgesia requirement in first 18h in the postoperative period was 1.4 ± 0.2 gm in LD group and 2.8 ± 1.1 gm in RD group which was statistically significant. [Table 3] Group RD had higher mean VAS score at 5th, 12th postoperative hours in comparison to group LD.[Table 4] Both groups were hemodynamically stable in postoperative period and there was no statistically significant difference

regarding blood pressure and heart rate. Incidence of side effects like hypotension, bradycardia, nausea, vomiting was less and comparable in both groups.

Table 1: Demographic data

Parameter	Group LD Levobupivacaine and dexmedetomidine (n=40)	Group RD Levobupivacaine and dexmedetomidine (n=40)	P Value
Age (years)	38.54 \pm 10.83	37.73 \pm 6.89	0.758
Sex (male: female)	35:5	33:7	0.342
Height (cm)	166.10 \pm 8.35	164.55 \pm 7.45	0.156
Bodyweight (Kg)	59.22 \pm 6.69	61.52 \pm 8.25	0.321
ASA physical status (I:II)	28:12	34:6	0.168

ASA: American society of anaesthesiologists

Table 2: Duration of postoperative analgesia in hours

Parameter	Group	N	SD \pm Mean	P
Duration of analgesia /time of first analgesic request (h) postoperatively	LD	40	11.92 \pm 2.05	<0.01*
	RD	40	9.25 \pm 2.52	

SD : Standard deviation, *Significant

Table 3: Rescue analgesia required in 18 h postoperative (gm)

Parameter	Group	N	Mean \pm SD	P
Total amount of paracetamol(gm) as rescue analgesic	LD	40	1.4 \pm 0.2	<0.01*
	RD	40	2.8 \pm 1.1	

SD: Standard deviation, *Significant

Table 4: Visual analog scale score at 1st, 5th, 8th, 12th and 18th postoperative hours

VAS	Group LD	Group RD	P
VAS Score at 1 hr	0(0-0)	0(0-0)	1.000
VAS Score at 5 hr	0(1-3)	2(2-4)	0.021*
VAS Score at 8 hr	2(1-2)	2(2-2)	0.074
VAS score at 12 hr	3(2-3)	3(2-4)	0.09*
VAS score at 18 hr	5(4-5)	5(4-5)	0.653

VAS : Visual analog scale; *Significant

DISCUSSION

A variety of analgesic drugs and techniques have been used to manage postoperative pain after arthroscopic knee surgery. Lignocaine and bupivacaine have been used intra-articularly to provide postoperative analgesia but they have their own limitations. Dexmedetomidine has been shown to prolong the duration of action of local anaesthetics in different regional blocks. Studies using dexmedetomidine as

adjuvants to local anaesthetics has recently been shown to provide prolonged postoperative analgesia. Prolonged analgesia and reduced requirement of rescue analgesic may be due to a slower rate of absorption through poorly vascular intra-articular surface.^[4] Levobupivacaine is the S-enantiomer of bupivacaine with less cardiac and neural toxicity but equally potent as bupivacaine. Intra-articular administration of levobupivacaine is effective and safe for postoperative pain management as shown by different studies. Ropivacaine is a amino amide local anaesthetic which is prepared as the pure S-enantiomer. It blocks nerve fibres involved in pain transmission (A δ and C fibres) to a greater extent than those controlling motor functions (A β fibers).^[5] It is less cardiotoxic than bupivacaine. For better and prolonged analgesia we have compared dexmedetomidine with levobupivacaine and ropivacaine. Samoladas et al. studied intra-articular ropivacaine and concluded that it is effective in reducing postoperative pain.^[6] Reuben SS showed that clonidine, when administered along with intra-articular bupivacaine produced quality analgesia. There was an increased time to first analgesic request and a decreased need for postoperative analgesics.^[7] Rosen et al. found that intra-articular ropivacaine had not produced any significant change in VAS score when compared with placebo.^[8] In our study we found that levobupivacaine dexmedetomidine combine produced prolonged analgesia than ropivacaine dexmedetomidine combine when used intra-articularly. Al-Metwalli et al compared three groups using intra-articular dexmedetomidine, intravenous dexmedetomidine and placebo and concluded that intra-articular dexmedetomidine in a dose of 1 μ g /kg enhanced postoperative pain relief and also reduced the need for postoperative analgesia and prolonged the time to first analgesic request.^[9] These results are in agreement with our study. Our study was supported by the study by Das et al. Das et al found that intra-articular levobupivacaine increases the duration of analgesia and decreases the need for rescue analgesic in first postoperative 24 hrs.^[10] El-Hamamsy et al compared intra-articular dexmedetomidine and fentanyl with bupivacaine 0.25% in a volume of 30 ml. They concluded that both dexmedetomidine and fentanyl in combination with bupivacaine resulted in increased time to first analgesic request and decreased the need for postoperative analgesia as well as increased the duration of pain relief as compared with bupivacaine alone.^[11] Kazak Bengisun et al. found that use of levobupivacaine and bupivacaine intra-articularly produced lesser rescue analgesic consumption and lower VAS score which was similar to our study.^[12] Paul et al concluded that intra-articular dexmedetomidine added as an adjunct to ropivacaine in patients undergoing arthroscopic knee surgery improved the quality and duration of postoperative analgesia.^[13] Das et al in their study compared intra-

articular ropivacaine, fentanyl and dexmedetomidine for pain relief and suggested that ropivacaine was better than both fentanyl and dexmedetomidine.^[14] Above studies confirm that intra-articular levobupivacaine dexmedetomidine combine can produce prolonged analgesia and require less rescue analgesic in comparison to ropivacaine dexmedetomidine combine.

CONCLUSION

Intra-articular levobupivacaine and dexmedetomidine combine prolongs the duration of analgesia and decreases the need for rescue analgesic for the patients undergoing arthroscopic knee surgery under spinal anaesthesia without any side effects.

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