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POSTOPERATIVE ANALGESIA FOR ARTHROSCOPIC KNEE SURGERY: A COMPARISON BETWEEN INTRA-ARTICULAR BUPIVACAINE IN COMBINATION WITH MAGNESIUM SULPHATE OR CLONIDINE

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ABSTRACT

Background and Aim: Effective pain relief is important after diagnostic and therapeutic arthroscopic knee surgery to permit early discharge and to improve the comfort and mobility at home. The aim of this study was to assess the efficacy of Bupivacaine with either Clonidine or Magnesium sulphate injected intra-articularly for postoperative pain relief after arthroscopic knee surgery.

Methods: Sixty healthy consenting patients undergoing knee arthroscopy under subarachnoid block were randomized to receive one of the following drugs intra-articularly for postoperative pain relief. Group BC : 0.25% Bupivacaine 10 ml with Clonidine 1 µg /kg; Group BM : 0.25% Bupivacaine 10 ml with Magnesium sulphate 1 gm. Postoperatively, pain was assessed using VAS score. Time of rescue medication was noted.

Results: A longer delay was observed between intra-articular injection of study medication and first requirement of supplementary analgesic in group BM compared to group BC. Mean VAS score in Group BC was 4.930. Mean VAS score in Group BM was 3.819. In Group BC 13 patients opted for rescue medications within six hours of surgery and 17 patients opted for rescue medications after six hours of surgery, whereas in Group BM only 2 patients opted for rescue medications within six hours of surgery and 28 opted for rescue medications six hours after surgery. (p-value 0.01). The Mean Time for Rescue Medication in Group BC is 296 minutes and in Group BM is 452 minutes and this difference observed is statistically significant (P value <.001). No significant side effects were noted.

Conclusion: When compared to clonidine, magnesium sulphate added as adjunct to bupivacaine in patients undergoing arthroscopic knee surgery, improve the quality and duration of postoperative analgesia.

Key words: Arthroscopic knee surgery, Intra articular Injection, Bupivacaine, Magnesium sulphate, Clonidine.

Introduction

Pain relief after surgery is one of the fundamental responsibilities of the anaesthesiologist. There has always been a search for a simple method for providing postoperative analgesia in patients who undergo knee arthroscopy. Intra-articular Analgesia is a popular technique of pain management after Arthroscopic knee surgery. The efficacy of this technique has been reported in some studies using local anaesthetics[1], (like lignocaine, bupivacaine etc.), opioids[2] and NSAIDs[3] . Among the local anaesthetics Bupivacaine[4] has proved useful and effective. Another advent in post arthroscopy analgesia includes multimodal pain therapy[5] (balanced analgesia). Common combinations of local anaesthetics with drugs like Morphine[6], Ketorolac, Magnesium sulphate, Clonidine etc have been tried with good results.

Intra-articular magnesium, a N-methyl-D-aspartate receptor blocker[7], would be of particular interest in either producing postoperative analgesia or enhancing the analgesic effect of intra articular bupivacaine. NMDA antagonists reduce the excitability of nociceptive input terminals of C-fibers, which play a role in the central processing of pain. The anti-inflammatory action in the peripheral tissues occurs through antagonizing the release of inflammatory mediators such as serotonin, histamine and cytokines which in turn excite nociceptors.

Intra-articular Clonidine is an alpha-2 adrenergic agonist which produces analgesia through central and peripheral mechanisms[8]. Clonidine has been used intra-articularly after arthroscopic knee surgery and has provided analgesia.

The primary aim of the present study is to investigate the efficacy of Intra-articular Bupivacaine and Magnesium sulphate compared with Bupivacaine and Clonidine on postoperative pain intensity after knee arthroscopy.

Methods

The study protocol was approved by the ethical committee of Yashoda Super Speciality Hospital, Hyderabad and informed consent was obtained from every patient. Sixty ASA I –II patients of either sex, aged 18-65 years, undergoing elective knee arthroscopy were randomly assigned to one of the two groups, containing thirty patients each. Surgical procedures consisted of meniscectomy and ligament repair. Patients having history of hypersensitivity to study drugs, with contraindications to spinal anaesthesia, altered coagulation parameters or on anticoagulants, pregnancy, receiving chronic pain treatment or α2 – adrenergic agonists, drugs known to have interaction with NMDAs and undergoing surgical procedures requiring intra-articular drainage were excluded from the study. On preoperative rounds, patients were explained of the type of procedure, about spinal anaesthesia and were also taught to interpret the visual analogue scale (VAS) (graded from 0 = no pain to 10 = maximum pain).

Informed written consent was taken from the patient. All patients were kept nil by mouth for 6 hours prior to surgery. Preoperative vital parameters in the form of baseline pulse, blood pressure and SpO2 were recorded. Premedication with Ondansetron 4 mg iv half hour before surgery and Tab Alprazolam 0.5 mg PO night before surgery. All resuscitative equipment's and emergency drugs were kept ready at hand. Anaesthesia machine and circuits were checked and kept ready.

On the operation table, routine monitoring (ECG, pulse oximetry, NIBP) were started and baseline vital parameters like heart rate (HR), blood pressure (systolic, diastolic and mean) and arterial oxygen saturation(SpO2) were recorded. An intravenous line was secured and

crystalloid infusion was started. All the patients were given spinal anaesthesia with a standard technique using 0.5% hyperbaric bupivacaine (12-15 mg) with an addition of 25 μg of fentanyl.

All arthroscopic knee surgeries and intra-articular injections were performed by the same surgeon. After knee Arthroscopy intra-articular injection was given. Patients were randomly assigned to one of the two groups to receive either:

Group BC: Clonidine 1μg/kg with 10 ml 0.25% Bupivacaine. (or)

Group BM: Magnesium sulphate 1 gm with 10 ml 0.25% Bupivacaine

After the surgical procedure patients received either of the drug solution intra-articularly. The tourniquet was deflated 15min after IA injection. The solutions were prepared in 12 ml volume by an anaesthesiologist and administered by a surgeon who was blinded to the contents of the syringe.

Patients were observed in post anaesthesia care unit. In the postoperative period Visual Analogue Scale for pain scores in neutral position was recorded initially at hourly intervals for the first eight hours, second hourly for the next eight hours and fourth hourly for the final 8 hours. Patients were asked to point out the intensity of pain on the VAS pain scale. Patients were given rescue medication on demand. The Initial rescue medication was 75mg Diclofenac Intravenously. In the event of insufficient analgesia 1gm Paracetamol Intravenously was given. The time for the first request for analgesia was recorded, at the same time the VAS would be noted marking the end of the study for that particular patient.

Statistical Analysis:

1) Chi-Square ($\chi 2$) test for (r x c table)

2) The student 't' test was used to determine whether there was a statistical difference between two treatments groups in the parameters measured.

3) One way Analysis of Variance (Anova)

In the entire above test the 'p' value of less than 0.05 was accepted as indicating statistical significance. Data analysis was carried out using MS EXCEL and Statistical Package for Social Science (SPSS) package software.

Results

The two groups were comparable with regard to age, sex, body weight of patients.

Table 1 : Patients Characteristics

	BC	BM
Number of patients	30	30
Weight (Mean ± SD)	60.13 ± 11.86	61.90 ± 10.08
Age (Mean ± SD)	39.80 ± 15.26	32.07 ± 14.39
Gender, n (%) **Male** **Female**	 18 (60%) 12 (40%)\	 23 (77%) 07 (23%)

Table 2: Descriptive of pain score for all the patients across 6 hours in the two Treatment Groups

When patients requested for rescue medications, VAS score was recorded and no further VAS scores were measured in that particular patient. At the first and second hour thirty patients were present in the study in group BC. At the first, second,

third and fourth hours thirty patients were present in the study in Group BM. However in the third and fourth hour patients in Group BC had reduced to 27 and 28 i.e, three and two had asked for rescue medication respectively. By the sixth hour only 13 patients were left in group BC whereas in Group BM 28 patients were left. Mean VAS score in Group BC was 4.930. Mean VAS score in Group BM was 3.819. The Mean VAS score at Sixth hour after surgery in Group BC was 5.923 and in Group BM was 4.714. This difference observed is statistically significant.

Table 3 : Cross tabulation of patients who opted for rescue medicine and time when they opted

Opted for rescue medicine, n (%)	BC	BM	p-value
Within 6 hours	13	2	0.01
After 6 hours	17	28	0.01

In Group BC 13 patients opted for rescue medications within six hours of surgery and 17 patients opted for rescue medications after six hours of surgery, whereas in Group BM only 2 patients opted for rescue medications within six hours of surgery and 28 opted for rescue medications six hours after surgery. (p-value 0.01)

The Mean Time of Rescue Medication in Group BC is 296 minutes and in Group BM is 452 minutes and this difference observed is statistically significant. P value < 0.001.

Discussion

In an attempt to improve the recovery from arthroscopic knee surgery, research has been directed towards newer techniques for postoperative analgesia. The goal of this study was to compare the postoperative pain relief after knee arthroscopy using Intra articular Bupivacaine 10ml of a 0.25% solution (25mg) with either Magnesium sulphate 1gm or Clonidine 1 μg / kg. Our study demonstrate that Intra-articular Bupivacaine with Magnesium sulphate provide better analgesia as compared to the analgesia obtained with Bupivacaine with Clonidine.

A Total of 60 consenting patients scheduled for elective arthroscopy under subarachnoid block fulfilling the inclusion criteria were selected for the study. Diagnostic and minor therapeutic knee arthroscopy is a common ambulatory procedure that can be performed under general, regional, or local anaesthesia (LA).

Majority of the studies choose general anaesthesia as the management of choice for Intraoperative anaesthesia, with the exception of Vintar N, Rawal N, Veselko M in 2005[9] who chose subarachnoid blockade and Raja SN, Dickstein RE and Johnson CA in 1992[10] who chose epidural anaesthesia and Heard S.O, Edwards WT, Ferrari D, Hanna D, Wong PD, Liland A, Willock MM in 1992[11] who choose patients irrespective of the anaesthetic technique. In our study we gave subarachnoid block for every patient. Our patients were randomly allocated into two groups Group BC receiving 0.25% Bupivacaine 10 ml with Clonidine 1 μg / kg and Group BM receiving 0.25%

Bupivacaine 10 ml with Magnesium sulphate 1gm at the end of the surgery through one of the operative portals after closure of the portals five minutes before tourniquet release in accordance with Whitford A, Healy M, Joshi GP, McCarroll SM, O'Brien TM in 1997[12] demonstrated that intra-articular Bupivacaine administered at the conclusion of arthroscopic knee surgery significantly reduced postoperative pain and prolonged the time to first analgesic use when compared with placebo. In our study we added Magnesium sulphate to one group and Clonidine to other group and was compared.

The Mean VAS score in Group BC was 4.930 and in group BM was 3.819. The Mean VAS score at Sixth hour after surgery in Group BC was 5.923 and in Group BM was 4.714 which was similar to the findings of Huey Ping, Ulf Nordstrom, Kjell Axelsson, Anil Gupta[13] where the VAS scores were lower up to 8 hours postoperatively. Rasmussen S, Allan S. Larsen A, Søren T. Thomsen and Henrik K[14] also found that VAS scores were significantly lower in their bupivacaine morphine and ketorolac combination group as compared to their bupivacaine group. In study conducted by Paul Suhrita, Bhattacharjee Dhurjati Prasad, Ghosh Sandip, Dawn Satrajit [15] showed a longer delay between intra-articular injection of study medication and first requirement of supplementary analgesic in group M (12.32±2.8 hours) and group C (10.16±2.4 hours) compared to group B (5.14±1.2 hours). Group B received 19 ml of 0.25% bupivacaine and 1 ml of isotonic saline, Group M received 500 mg (1 ml) of magnesium sulphate added to 19 ml of 0.25% bupivacaine intra-articularly, Group C received 150 μg (1 ml) of clonidine added to 19 ml of 0.25% bupivacaine. In our study, we administered 10 ml of 0.25% bupivacaine with either 1gm Magnesium sulphate (Group BM) or Clonidine 1mcg/kg (Group BC). The Mean Time of Rescue Medication in Group BM is 452 minutes and in Group BC is 296 minutes.

In Group BC 17 of the patients opted for rescue medications within six hours of surgery and 13 of patients opted for rescue medications after six hours of surgery, whereas in group BM only 2 patients opted for rescue medications within six hours of surgery and 28 opted for rescue medications six hours after surgery. (P-value<.001).This proves that the combination of Bupivacaine with Magnesium sulphate provide better analgesia as compared to the analgesia obtained with Bupivacaine with Clonidine.

None of the patients in our study showed any adverse effects like nausea, vomiting, hypotension, bradycardia.

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