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THE EFFICACY OF EPIDURAL ROPIVACAINE IN KNEE ARTHROSCOPY SURGERY.

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ABSTRACT

Introduction: Epidural anesthesia is also commonly performed for knee arthroscopy, for early painfree mobilization. Ropivacaine has lesser systemic toxicity and early recovery of motor function. We aimed to study the efficacy of epidural anesthesia using 0.75% ropivacaine in cases of knee arthroscopy.

Materials and Methods: This is study of 50 patients of arthroscopic surgery of knee treated at our institution using epidural 0.75% Ropivacaine. We evaluated the intraoperative pain by visual analog pain scale(VAS). The onset of sensory and motor block, efficacy of postoperative pain relief by VAS were noted.

Results: Mean time required to achieve complete sensory analgesia was 12.4minutes and for complete motor block was 19.7minutes. There were no cases with adverse effects of drug. The mean VAS score before every epidural top-up was 5 and after the top-up was 0.5.

Discussion: The benefits of epidural ropivacaine were short-lasting motor block, early mobilization and micturition. Epidural catheter eases achieving pain free spells for early mobilization but is not suited for day care surgery.

Conclusion: Our results show that epidural block with 0.75% ropivacaine is very effective in terms of onset of motor and sensory block, post-operative analgesia, helps in early mobilization following knee arthroscopy.

KEYWORDS : Epidural, Ropivacaine, Knee, Arthroscopy.

Introduction:

Joints are innerved structures which transmit proprioceptive and nociceptive information, the main afferent pathways are A-delta fibers, which conduct nociceptive impulses, and group C nerve fibers which are slow-conduction nervous fibers, slower than group-A fibers. The receptors react to mechanical and surgical stimuli [1]; the synovial membrane is highly vascularized externally; in some places capillaries are deep and innervation scarce. The afferent pathways are called silenced nociceptors, the cartilage is not innerved, the capsule has free Ruffini-type nerve endings and ligament innervation is through myelinated fibers, therefore the effect of anesthet-ics is direct, thus requiring small doses[2]. The development of less invasive surgical techniques such as arthroscopy, and the improvement of postoperative analgesic control through local anesthetic techniques, have helped patients to reduce their hospital stay, along with the implementation of outpatient surgery and short hospital stay programs, which avoid unnecessary expenses[3]. Most importantly these patients require early and intense mobilization which requires absolute pain free episodes.

It is traditionally performed under spinal block anesthesia and contraindications are rare. The other various modalities are epidural block, local anesthesia with sedation, total intravenous anesthesia, general anesthesia. Each method has got its own advantages and disadvantages.

Amongst the advantages of regional or general anesthesia are a greater convenience for the surgeon and greater analgesic levels; on the other hand, the disadvantages are linked fundamentally with risks for the patient and discomfort during recovery [4], i.e. low-back pain, urinary retention, and post-puncture headaches. These complications are not frequent, however, one must keep in mind the fact that there is a valid alternative: intra-articular local anesthesia [4]. The use of local anesthesia and sedation compares favor-ably with other techniques: surgery time is not increased, the recovery time is significantly shortened and there is a high degree of satisfaction among patients using this technique [5]. But they lack post-operative analgesia which is very important for early mobilization of the patient [5].

Epidural anesthesia is also commonly performed for knee arthroscopy as it showed definite advantage over other methods by blocking nociceptive impulses from the operative site, reduce blood loss (Ease of using tourniquet), decreased incidence of deep vein thrombosis, no respiratory depression or cardiovascular instability, patient's ability to communicate and reduced cost of drugs [6]. However there are few disadvantages as taking time for block initiation and its onset, needs active cooperation of patient, and problems like urinary retention. There is possibility of local anaesthetic toxicity due to use of large volumes of epidural local anaesthetic solution, hence adjuvants like opioids or α 2 agonist can be added to provide a dose sparing of local anaesthetics.

Ropivacaine showed favorable physiochemical profile with lesser systemic toxicity. It showed sensory- motor differentiation by blocking sensory nerve fibres more readily than motor fibre. Early recovery of motor function is associated with early postoperative mobilization, decrease incidences of deep vein thrombosis hence early hospital discharge[7-9].

We aimed to study the efficacy of epidural anesthesia using 0.75% ropivacaine in cases of knee arthroscopy.

Materials and Methods:

A clinical, prospective, non-blind study was conducted with 50 patients treated at our institution after obtaining ethical committee approval. The patients were aged 25-55 years, with ASA I or II, and scheduled for arthroscopic surgery of knee. The various procedures included diagnostic arthroscopy, arthroscopic meniscectomy or meniscal repair, ACL/PCL reconstruction, joint lavage and osteochondral lesions. We excluded patients allergic to amide-type local anesthetics (ropivacaine), patients with combined treatments (such as arthroscopic and open surgery), or the presence of any acute inflammatory condition such as swelling, severe pain, synovitis and/or sepsis. After a detailed pre-anesthetic examination of the patient, in the preoperative period, patients were given 50 mg of ranitidine intravenously (IV), metoclopramide 10 mg (IV), midazolam 0.04 mg/kg (IV), and a single dose of crystalloid at 10 mL/kg. After the pre-anesthetic medication, patients were taken to the operating room where they were placed supine, underwent monitoring in the form of electrocardiography, pulse oximetry and noninvasive blood pressure, and were administered oxygen at 4---5 L/min via face mask.

Under all aseptic condition, lumber epidural anesthesia was administered in the sitting position by midline approach at L2-3 or L3-4 inter-vertebral disc space using an 18 G Touhy needle and location of epidural space was confirmed by loss of resistance technique. With the bevel of Touhy needle in cephalic direction, 18 G epidural catheter threaded and fixed at particular mark leaving 3-4 cm of catheter in epidural space and a test dose of 3 ml of 2% lidocaine with epinephrine was given to detect intrathecal or intravenous injection. Three minutes after test dose, the patients were given 0.75% Ropivacaine epidural injection and were aligned into supine position to achieve adequate level of anesthesia (T10). All patients were supplemented with 100% oxygen at rate of 4L/minute via vent mask during the surgery.

After the start of the surgical procedure, the duration of the surgical procedure was recorded. We recorded the patients' hemodynamic parameters during surgery, time spent in recovery to ambulation, intraoperative pain by visual analog pain scale or VAS. The sensory and motor block characteristics were assessed at 2 minutes interval till the surgical anesthesia was achieved. The segmental level of sensory blockade was assessed by bilateral pin prick method. The onset of motor blockade of lower extremities was evaluated bilaterally by modified Bromage scale (0-3). The onset time of complete sensory block, maximum cephalic dermatome, time taken to achieve complete motor block and total recovery time from sensory and motor blockade was recorded. The surgical anesthesia was considered effective when T10 dermatome was anesthetized. The hemodynamic parameters of heart rate, systemic blood pressure, pulse oximetry and ECG were recorded at every 5 minutes intervals after initiation of epidural block, till end of surgery and followed by at every 15-minutes interval in the post anesthesia room. All patients were observed for shivering, pruritus, sedation, nausea vomiting, respiratory depression, headache, backache, urinary retention or any other adverse effects.

At the end of surgery, the patients were shifted to post anesthesia recovery room and monitored for any changes in vital signs. Post-operatively the epidural top-up with 8ml of 0.2% Ropivacaine was given 6-8 hourly for a period of 48-72 hours depending on the patient's mobilization protocol and duration of hospital stay. VAS scores were noted before and after epidural top-up each time.

Results:

In the present study we evaluated the efficacy of 0.75% Ropivacaine in our study population of 50 patients who underwent knee arthroscopy surgery. The mean age group was 38 years (25-55 years). Of the 50 patients meniscectomy was done in 19 patients, ACL reconstruction in 18 patients, PCL reconstruction in 7 patients, osteochondral lesion fixation in 2 cases, diagnostic arthroscopy alone was done in 4 cases. The average duration of surgery was 100 min.

The mean time required to achieve complete sensory analgesia at T10 dermatome was 12.4±4.7 minutes. The mean time taken for complete motor block was 19.7±3.3 minutes. There were no cases with any adverse effects of the drug. The need for the first top-up was after 4 hours of the epidural block. The top-ups were given at every 6 hours. The mean VAS score before every top-up was 5 and the same after 10 minutes of the epidural top-up was between 0-1.

The hemodynamic parameters of mean heart rate, mean systemic arterial pressure, respiratory rate and oxygen saturation were stable in all the patients exept for two. After 15 minutes of epidural block the mean heart rate and mean systolic blood pressure showed gradual decline in all patients, but the intraoperative mean values of heart rate and systolic blood pressure did not show statistically significant decline from the base values. Two patients had the sustained systolic hypotension (88-98 mm og Hg) but were completely stable. All the patients were easily arousable.

Discussion:

The anesthetic methods used to perform arthroscopic knee surgery are the general, regional peripheral anesthesia (inhaled and/or intravenous), neuraxial regional blockade, and local anesthesia. Each has advantages and disadvantages, as reported in the literature. Mondino, in his study of local anesthesia and sedation, reports a 16% failure rate[5]. The regional anesthesia is becoming popular due to safe, rapid and painless induction with lower postoperative morbidity but it needs active cooperation of patient and surgeon. The practice of epidural anesthesia is gradually gaining acceptance as patient is not rendered unconsciousness and retains spontaneous reflexes with cognitive responsiveness. It provides adequate duration of analgesia, short recovery period and minimal side effects. On the contrary, the spinal anesthesia is associated with few incidences of post spinal puncture headache, transient nerve damage, nausea and vomiting, hemodynamic fluctuation and delayed ambulation. Awareness about anticoagulation schedules and necessary precautions has made epidural anesthesia, a valuable option[6].

The present study evaluated the clinical efficacy of 0.75% ropivacaine in knee arthroscopy performed under epidural anesthesia. Our results show that the use of epidural block with 0.75% ropivacaine is very effective in patients undergoing knee arthroscopy in terms of onset of motor and sensory block, post-operative analgesia. This quality is obtained without compromising the benefits of low-dose epidural ropivacaine, such as short-lasting motor block, early mobilization and micturition. Moreover, it is not associated with detectable systemic side effects, such as significant bradycardia or hypotension, or sedation. The major advantage of using the epidural catheter was ease of achieving pain free spells for early mobilization of the patients, especially in the first 48-72 hours. Ropivacaine produced very effective analgesia in the post-operative period which helped the patients in all their mobilization protocol and successfully reduced the VAS score from an average of 5 before the epidural top-up to 0.5 after the top-up.

Ropivacaine share many physiochemical properties with bupivacaine without its undesirable systemic toxic effects. The low lipid solubility of ropivacaine leads to greater sensory-motor differentiation and adequate duration of analgesia, thus can be used safely for epidural anesthesia for day care knee arthroscopy. The onset of sensory anesthesia begins at 10-25 minutes after epidural administration with 2 to 4-hours duration[8]. Peduto et al reported that epidural injection of 15 ml of either 0.5% levobupivacaine or 0.75% ropivacaine produced similar epidural blockade in patients undergoing lower limb surgery[10].

There are many studies which elaborates the various anaesthetic modalities for the day care knee arthroscopy[11-14]. Literature is divided over the best modality of anesthesia for the day care anesthesia for knee arthroscopy. We in our study did not focus on the out-patient or day care anesthesia for knee arthroscopy. Instead, we focused on the pain free episode for the patient for his physiotherapy so as to achieve good results of the surgery and make the patient return to his pre-occupation status. This required the patient to be admitted as an in-patient for 2-3 days, but it avoids future admissions just for physiotherapy (in case of day care procedures).

The main limitation of our study was that it did not compare the epidural ropivacaine to any other modality for knee arthroscopy so as to know the actual efficacy of our protocol in terms of pain relief and economy.

Conclusion:

The use of epidural block with 0.75% ropivacaine is very effective in patients undergoing knee arthroscopy in terms of onset of motor and sensory block, post-operative analgesia. It also enhances the duration of postoperative analgesia and gives excellent pain relief for early mobilization of the patients.

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