Comparison of Lidocaine Vs Lidocaine + Ketorolac in Intravenous Regional Anaesthesia (Bier's Block)

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Objective: To compare the duration of anaesthesia and degree of analgesia during intravenous regional anaesthesia using Lidocaine alone and Lidocaine with Ketorolac. **Design:** An international quasi experimental study. **Place and duration:** This study was carried out in Nishtar Hospital Multan from 01/01/2006 to 30/06/2006 (6 Months). **Results:** Patients were divided into two groups A & B. In group A injection Lidocaine 0.5% 40ml was given whereas in group B injection Ketorolac 30mg was add to Lidocaine 0.5% 40ml. The degree of anaesthesia and duration of analgesia were compared in both groups. Haemodynamics were also recorded to see any systemic effects of drugs. **Conclusion:** We conclude that 30mg Ketorolac added to Lidocaine in IVRA increases degree of anaesthesia and also provide prolonged postop analgesia.
Key words: Lidocaine, Ketorolac, Bier's Block, Post Operative analgesia.

Pain serves a biological function. It signals the presence of damage or disease within the body. In case of postoperative pain it is the result of surgery. The effective relief of pain is of paramount importance to anyone treating patients undergoing surgery[1]. This should be achieved for humanitarian reasons, but there is now evidence that pain relief has significant physiological benefits. Not only does effective pain relief mean a smoother postoperative course with earlier discharge from hospital, but it may also reduce the incidence of chronic pain syndromes.

The relief of pain during surgery is the main aim of anaesthesia. The choice of pain-relieving techniques may be influenced by the site of surgery, the degree of training and expertise of the staff. Relief of surgical pain with minimal side effects is the primary goal of any anaesthesia[2]. The administration of intravenous local anesthetic in an isolated limb by means of an ischemic cuff is a simple and effective technique, with a low incidence of failure and high degree of safety. Intravenous regional anesthesia (IVRA) was first described in 1908 for anesthesia of the hand and forearm. The earliest agent injected into the isolated vascular space was procaine. The technique regained popularity in the 1960's when Holmes used lidocaine. Lidocaine remains the standard local anesthetic (LA) agent for most of the surgical procedures. IVRA is simple to administer, reliable and cost-effective[3]. It is ideal for short operative procedures on the extremities performed on an ambulatory basis. It is very safe provided excessive doses of local anesthetic are avoided, if the tourniquet pressure is carefully monitored and if resuscitation equipment is always immediately available. Disadvantages include concerns about LA toxicity, slow onset, poor muscle relaxation, tourniquet pain and minimal postoperative pain relief[4]. The ideal IVRA solution should have the following features: rapid onset, safe dose of LA, reduced tourniquet pain and prolonged post deflation analgesia. At present, this may only be achieved by the addition of adjuncts to LA. Ketorolac is a useful adjuvant to lidocaine for IVRA. This nonsteroidal anti-inflammatory drug (NSAID) interferes with the synthesis of inflammatory mediators and can supplement postoperative pain relief. The development and refinement of regional anesthetic techniques for various types of surgery, mainly obstetric, ophthalmic and orthopedic surgery, and of continuous regional analgesia continues[3]. We postulated that using the parenterally available NSAID Ketorolac (K) as a component of intravenous regional anesthesia (IVRA) would suppress intraoperative tourniquet pain and enhance postoperative analgesia. The aim of this study was to compare the duration of anaesthesia and the analgesic efficacy of Lidocaine alone and Lidocaine with Ketorolac during surgery with IVRA.

Material and methods

This was an interventional type quasi experimental study carried out in orthopedic theatre in Nishtar Hospital Multan over a period of six months. It included 60 patients with ASA status I and II, scheduled for minor hand surgery and short orthopedic procedures of forearm who gave the formal written consent to participate in the study. Patients who had allergy to Lidocaine and Ketorolac, hepatic dysfunction, convulsive disorder and decompensated heart failure were excluded form the study.

Patients were randomly assigned to two groups, Group A received solution of 0.5% Lidocaine 40ml and Group B received 0.5% Lidocaine 40ml with Ketorolac (30mg). A double tourniquet was positioned on the upper operative arm. Routine monitors were applied before the drug was injected. Extremity was exsanguinated by elevating it and wrapping it with an esmarch bandage. Lidocaine (0.5%) or Lidocaine (0.5%) + Ketorolac 30mg, according to group assignment was injected I/V.
Sensory and motor loss was assessed at 1, 5, and 10 minutes interval till the complete block and time period noted in both groups. Intraoperative tourniquet pain was assessed at every 5 minute using a verbal analogue scale (VbAS). Patients were asked to quantify tourniquet pain by rating of discomfort between 0 (No Pain) and 10 (worst

pain possible). Post operatively, patients assessed their pain 30 and 60 minutes after tourniquet deflation using a 10 cm visual analogue scale (VAS). All patients were advised to take Naproxin Sodium 550mg when they feel pain. The time from tourniquet deflation to first dose of oral analgesic was noted.

Demographic data and duration of surgery were analyzed using student t-test. VbAS and VAS scores were analyzed by using x^2 analysis. P values were considered significant for values of $p < 0.05$.

Results

Demographic variables, extent of surgical procedure, duration of surgery and tourniquet timings were similar in both groups. Most of the patients in group B (Lidocaine + Ketorolac) had faster onset of the sensory and motor block, this was not significantly different. In both groups all sensations were fully blocked in 10 minutes.

The quality of analgesia observed in both groups showed that 20 patients in Lidocaine + Ketorolac group had excellent analgesia compared with only 4 patients in Lidocaine group. Intraoperative Verbal Analog Scale for the tourniquet pain showed no statistical difference in both groups, owing mostly to the inflation of the distal tourniquet cuff on the anaesthetized part of the arm with release of the proximal tourniquet 10 minutes after the injection of solution.

Post operatively 30 min VAS showed the lower mean VAS in group B (1.57+ 0.68) with Lidocaine + Ketorolac as compared to the group A (2.83+1.12) with Lidocaine alone ($p < 0.05$). In addition group B required no analgesic supplement in recovery room post operatively as compared to group A. Patients in group B had the longer period of the subjective comfort during which they took no analgesia with the mean duration of anesthesia 585+ 227 min when compared to the group A 213+ 88.65 min ($p < 0.05$).

Discussion

Drugs selected as potential adjuncts to conventional LA agents could theoretically potentiate a block by either altering nerve conduction or via peripheral nociceptors binding. The observation that some drugs are analgesic at the spinal level has led researchers to examine if the same is true in the periphery. A variety of receptors mediate nociceptor response and, therefore, peripherally administered agents may have an analgesic benefit, perhaps avoiding systemic side effects[5]. IVRA isolates the limb from the rest of the circulation and is a useful model for studying the peripheral actions of a drug in the absence of central effects.

Surgical trauma results in release of intracellular contents from damaged and inflammatory cells. Nociceptor stimulation causes a neurogenic response with release of mediators such as substance P and neurokinin A[6]. This results in an "inflammatory soup" containing histamine, serotonin, bradykinin and metabolites of the cyclooxygenase and lipooxygenase pathways[6]. NSAIDs inhibit the production of prostaglandins from arachidonic acid in phospholipid membranes. The result is decreased afferent nociceptive signals arising from the site of surgery.

The role of NSAIDs in the management of postoperative pain is well established[7]. Clinical studies have demonstrated an enhanced analgesic effect from NSAIDs when concentrated at a peripheral site compared to the systemic administration of the same drug[7, 8]. This would suggest a predominantly peripheral site of action.

There is good evidence to recommend NSAIDs in general and ketorolac in particular, for improving postoperative analgesia after IVRA.

It is interesting to note that the plasma half-life of ketorolac is four to six hours yet the duration of analgesia reached a plateau at over ten hours[4]. It may be that by concentrating the dose of NSAID at the site of surgery, either as part of IVRA or wound infiltration, the resulting analgesic benefit is longer lasting than the same dose administered parenterally. Presumably there is a persistent drug level in the tissues, and this coupled to the lower dosage could result in reduced systemic side effects.

IVRA with lidocaine and ketorolac provides safe and effective perioperative analgesia for patients undergoing ambulatory hand surgery. This technique results in a longer duration of sensory block and prolonged postoperative analgesia compared with IVRA using Lidocaine alone[3].

Conclusion

We concluded that using the parenterally available NSAID ketorolac (30mg) as a component of intravenous regional anesthesia (IVRA) suppress intraoperative tourniquet pain and enhance postoperative analgesia and decrease the need for analgesic supplement during the first 24 hours.

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