Evaluation of the Efficiency of Naloxone Versus Clonidine Added to Lidocaine-Fentanyl Mixture in Brachial Plexus Block

Thesis

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Rasha Mahmoud Hassan

List of Contents

List of Abbreviations

5HT : Serotonin
ASA : American Society of Anesthesiologists
ATP : Adenosine Triphosphate
AV : Atrioventricular
AXB : Axillary block
b/m : Beats/minute
cAMP : Cyclic adenosine mono-phosphate
CNS : Central Nervous System
ECG : Electro cardiograph
GI : Gastrointestinal
GIT : Gastrointestinal tract
HCL : Hydrochloride
IM : Intramuscular
IT : Intrathecal
IV : Intravenous
KOP : Kappa opioid receptors
LA : Local anesthetics
MBP : Mean blood pressure
MOP : Mu opioid receptors
NE : Norepinephrine
NIBP : Non-invasive blood pressure
OR : Operating room
PNS : Peripheral nerve stimulator
PONV : Post operative nausea and vomiting
RVM : Rostral ventromedial medulla
SA : Sino atrial
SD : Standard deviation
SPO_2 : Arterial oxygen saturation

List of Figures

List of Figures (Cont.)

List of Figures (Cont.)

Fig. No	Title	Page

List of Tables

List of Tables (Cont.)

Introduction

It is possible to perform all surgical procedures while the patient is under general anesthesia, but the addition of peripheral nerve block techniques to the anesthesiologist's armamentarium adds flexibility and skills that benefit the patient intraoperatively and postoperatively. Successfully mastering these techniques and applying them to the appropriate clinical situations add valuable options to anesthetic care. For the anesthesiologist, knowledge of regional anesthesia is essential for the diagnosis and treatment of acute and chronic pain syndromes ***(Wedel and Horlocker, 2010).***

Peripheral nerve blocks are enjoying a wide popularity in anesthesia clinical practice nowadays. Regional blocks especially the brachial plexus block has revolutionized the management of hand injuries in that the patients can be taken immediately for surgery without fear of 'full stomach' as in general anesthesia. Further the role of the anesthesiologist is not over by providing analgesia intra-operatively but also extends well into the postoperative period. This is accomplished by brachial plexus block. ***(Movafegh et al., 2006)***

Pain relief with peripheral nerve block (PNB) avoids side effects such as somnolence, nausea and vomiting, hemodynamic instability and voiding difficulty inherent to general and central neuraxial anesthesia. Patients who undergo

surgery under PNB can bypass phase I recovery room and frequently be discharged expeditiously following ambulatory surgery. Patients with unstable cardiovascular disease can undergo surgery under PNB without significant hemodynamic changes. Patients who have abnormalities in hemostasis or infection which contraindicate use of central neuraxial block can be candidates for surgery under PNB ***(Liu et al., 2005).***

When used as part of a combined general regional technique, PNB facilitates lighter planes of anesthesia, avoiding the use of opioids and allowing a quick emergence and recovery ***(Liu et al., 2005).***

An axillary block is the most commonly performed variety of brachial plexus block. The landmarks are easy to identify and it is associated with fewer complications than other approaches to the brachial plexus. The technique may be used to provide anaesthesia for a variety of surgical procedures on the hand and forearm ***(Tindinwebwa, 1995).***

Local anesthetics of short, intermediate and long duration of action are well known and have been used in brachial plexus blockade. Lidocaine offers the advantage of having a rapid onset yet of short duration of action. Thus, different additives have been used to prolong its action. Based on scientific concepts of peripheral opioid activity, the use of opioids alone or in combination with local anesthetics for peripheral nerve blocks has been evaluated. The effects of opioids on regional

blockade are controversial. The addition of opioids in brachial plexus block is reported to improve success rate and postoperative analgesia, by some authors, whereas others have found no effect ***(Chavan et al., 2011).***

Nowadays brachial plexus block is routinely used for upper extremity surgeries. Addition of fentanyl (1 μg/kg) to local anesthetic solution is useful to extend the period of analgesia ***(Chavan et al., 2011).***

One study indicated that the opioids can elicit excitatory as well as inhibitory modulation of the action potentials of sensory neurons. Ultra-low doses of opioid antagonists could selectively block the excitatory effects of opioids ***(Crain and Shen, 2000).***

Therefore, it is likely that an ultra-low dose of naloxone, added to local anesthetic solution, prolongs nerve sensory and motor blockades with enhanced opioid effect or direct antagonism of these excitatory receptors ***(Movafegh et al., 2009).***

The use of naloxone as an adjuvant to local anesthetics for peripheral nerve block has not been often described. However In human studies, naloxone in the usual or low doses has been used epidurally or intrathecally for reducing opioids side effects or enhancing analgesia ***(Movafegh et al., 2009).***

α 2 adrenergic agonists such as clonidine have been advocated to prolong a single dose of a local anesthetic. Clonidine in brachial plexus block prolongs analgesia of local anesthetics of short and intermediate duration ***(Culebras et al., 2001).***

Many hypotheses have been proposed to explain the analgesic properties of clonidine on the peripheral nerve such as local vasoconstriction ***(Singelyn et al., 1992),*** a direct action on the nerve or a systemic effect ***(Eisenach et al., 1993).***

Aim of the Work

The aim of the study is to assess the efficacy of clonidine versus naloxone used as analgesic adjuncts with lidocaine-fentanyl mixture in axillary brachial plexus block. We assess several variables including onset and duration of the block, duration, sedation score, hemodynamic parameters and incidence of side effects. In the end we conclude which drug is better and more efficient to be used as an adjuvant in peripheral nerve blockade.

Anatomy of the Brachial Plexus

The brachial plexus is derived from the anterior primary rami of the fifth, sixth, seventh, and eighth cervical nerves and the first thoracic nerve, with variable contributions from the fourth cervical and second thoracic nerves. The participation of T2 & C4, gives the variations in the formation of brachial plexus in that when there is greater contribution from C4 and no contribution from T2 with little or no contribution from T1 such is referred to as prefixed brachial plexus. When there is contribution from T2 no contribution from C4 and little or no contribution from C5 this formation is known as the post fixed brachial plexus ***(Standring et al., 2008).***

After leaving their intervertebral foramina, these nerves course anterolaterally and inferiorly to lie between the anterior and middle scalene muscles, which arise from the anterior and posterior tubercles of the cervical vertebra, respectively. The anterior scalene muscle passes caudad and laterally and inserts into the scalene tubercle of the first rib; the middle scalene muscle inserts on the first rib posterior to the subclavian artery, which passes between these two scalene muscles along the subclavian groove. The prevertebral fascia invests the anterior and middle scalene muscles and fuses laterally to enclose the brachial plexus in a fascial sheath ***(Wedel and Horlocker, 2010).***