

How We Do It: - Making Local Anesthesia Safe and A Pleasant Experience

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ABSTRACT

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Introduction

Number of patients undergoing surgery under local anesthesia is about 13000 per year in the Department of Surgical disciplines at All India Institute of Medical Sciences (AIIMS), New Delhi, India. While performing minor surgical procedures under local anesthesia prevents unnecessary use of General Anesthesia and its inherent risks, it also allows patients to be discharged on the same day. This minimizes unnecessary use of hospital manpower and resources. However, do all the patients tolerate the procedure without pain? Do they have unpleasant experience during or after the procedure? In this era, when pain has been described as the FIFTH vital element for assessing patients' well-being [1], every patient has the right to be pain-free. It's the duty of every doctor to ensure this, more so in cases of procedure under local anesthesia. We as the Surgeons should do our best to make the procedure pain-free. Anxiety related to the procedure and fear of the operation theatre (OT) itself, conscious awareness of the procedure being performed, nausea, vomiting and palpitation are few of the so many important concerns that our patients go through and tolerate in the pursuit of getting surgical treatment. Therefore, it is the one and utmost responsibility of the operating Surgeon to perform the surgical procedure in a well-planned manner with all the precautions to avoid any problems related to the local anesthesia.

Challenges

In our daily practice, we see patients go through this phase in a varied and often apparently trivial manner which, nevertheless, means a great deal for any individual. Therefore, it's very essential to be vigilant and expectant so as to prevent and / or to identify and address these concerns. How exactly can we overcome these problems? We intend to discuss some important strategies to minimize problems during local anesthesia and making it a pleasant experience.

Consent and Counseling

Every Individual has the right to be pain-free. There are various ways to minimize or abolish the perioperative pain. Overall being communicative with the patient and explaining them the progress of the procedure and getting their constant feedback will result in more compliance and satisfaction [2,3]. We do need well-trained Nursing staff and OT technician in this regard.

OT Set Up

Operation Theatre has its own standards to be met [4]. Minor OT settings are basically similar to the main OT settings. Besides all the standards that are usually met at the time of OT set up, adequate

illumination is the key to any successful operative procedure. It saves time and prevents unnecessary tissue damage.

Patient Selection

It is a well-known paradigm to any medical care personnel that medical acumen has its success when proper treatment is given to suitable patient at the right time [5]. We need to select patients who are fit for local anesthesia. Patients with coronary artery disease or compromised respiratory status or even patients with high BMI though feasible might not be able to tolerate even the minor stress of pain during day care procedure [6-9]. Hence, those candidates would better undergo procedure under General anesthesia with specialized Anesthetists team. Therefore, we usually avoid local anesthesia in patients like in the extremes of ages, with obesity, patients with uncontrolled hypertension, other cardiovascular disease and those with compromised respiratory status.

Preparation

Before taking patient to the operation theatre, we should be cognizant of the comorbidities of the patients and any medications patients is taking like anticoagulants, antidiabetic, antihypertensive medications etc. We should be aware of any allergic reactions to Local Anesthesia (LA) in the past. We should always try to keep the Anesthesiologist in the loop for any immediate help that might be needed. Intravenous (IV) cannula, IV fluids, analgesics, oxygen supply and lifesaving drugs and intubation set should always be available in the vicinity, irrespective of the procedure we perform.

Pleasant Anesthesia

There are certain mechanisms by which we can prevent the pain cycle itself to start.

a) Dermal Analgesia

Eutectic Mixture of Local Anesthetics (EMLA) cream contains topical lidocaine and prilocaine as active ingredients [10,11]. This has been commonly practiced in plastic surgery before harvesting skin grafts. It should be used 30 minutes to 1 hour before surgery as topical anesthesia [12]. It works by stabilizing the neuronal membrane by suppression of the ionic fluxes providing dermal analgesia in the vicinity of pain receptor and nerve endings [10]. EMLA cream also decreases the dose of injectable local anesthetic drugs [13].

b) Infiltrating Needle

Wide bore needle causes more pain at the time of infiltration. In our set up, we usually use 26-gauge needle for infiltration. We have learnt from our experience at AIIMS that cold needle causes numbness, soothing effect and less pain during the procedure. We usually keep the needle in the freezer compartment an hour before use.

c) Pre-Oxygenation

Oxygen: - The aim of oxygen supplementation is to increase pulmonary oxygen reserve by raising the functional residual capacity. Thereby, in the event of a decrease in cardiovascular or respiratory function such as arrhythmia, hypotension or bronchospasm, oxygen transport is already optimal and there is enough time to secure the airway if the need arises [14].

Energy Sources

Various modalities of new energy sources are available. Judicious use of these energy sources can help in minimizing complications like intra-operative bleeding or post-operative hematoma. Energy sources are usually not used in minor procedure under local anesthesia. In cases operated under local anesthesia, incision is usually small and the limited exposure precludes easy control of hemorrhage lest the bleeding occurs. Therefore, we routinely use energy sources [monopolar or bipolar electrocautery] which helps to reduce the operative time, blood loss and excessive tissue damage which may occur in the struggle to secure bleeders [15].

Support and Conscious Awareness

It has been well-known fact that proper patient communication and assurance is the best way not only to best support the patient but also to avoid unnecessary medicolegal issues [2,3]. Counselling is also very important part of local anesthesia. We generally counsel the patient what to expect during and after the procedure including the expected pain during infiltration of local anesthesia. Occasionally, patients might feel little pain despite full analgesia. Patients might also feel some traction/tugging sensation during the procedure. The other important aspect is that patient may feel pressure effect. Patient remains awake throughout the procedure, and hence, they may feel undue pressure when the Surgeons or the assistants put their hand to rest on patient's body around the operative site.

Regional Blocks

Majority of the procedures are better operated with regional block [16]. Regional block is usually indicated in local procedures requiring wider surgical field [17]. However, the procedure is technically demanding. At our center, we usually practice ankle block, wrist block and digital block.

a) Ankle block

Ankle block is essentially the block of four terminal branches of the sciatic nerve viz. deep & superficial peroneal nerve, tibial and sural nerve and one cutaneous branch of the femoral nerve [18]. Ankle block is very safe and highly effective for a wide variety of procedures on the feet and toes. In our centre we usually do

dressing, debridement and amputation of gangrenous toes and forefoot, and skin grafting over raw area of foot and toes under ankle block. Blocks are done just proximal to the level of malleoli, above the ankle joint using surface anatomical landmarks for the respective nerves [18].

b) Wrist block

Wrist block is essentially a block of radial nerve, ulnar nerve and median nerve [19]. Wrist block is performed for surgery of hand and fingers.

c) Digital block

Digital block is the technique of blocking the nerve of the digits to achieve anesthesia of fingers. This technique is commonly used for a wide variety of minor surgical procedure of digits such as partial excision for ingrowing nail, excision of corn, excision of cyst, amputation of digits for gangrene of digit, dressing and debridement of wound over digits. Combination of LA with epinephrine has been found to be safe [20,21], however, it has to be used with extra precautions.

Know Your Drugs and Side Effects

Local anesthetic agents are broadly categorized into two groups; Benzoic acid esters that includes procaine, tetracaine etc. and Acid amides that include articaine, lidocaine, bupivacaine, prilocaine, ropivacaine etc [22]. At our center, lidocaine and bupivacaine are mainly used and will be the focus of further discussion.

a) Lidocaine [Xylocaine]

Lidocaine has rapid onset of action [< 2 minutes] and acts for medium duration of about 30-60 minutes (longer with epinephrine) [23]. Maximum safe dose without vasoconstrictor is 3mg/kg body weight [maximum up to 300mg]. Whereas, maximum safe dose with vasoconstrictor is 7mg/kg body weight [up to 500mg] [24]. We generally use 2% lidocaine at our center. One ml of 2% lidocaine contains 20 mg of lidocaine. So we can use 15 ml of 2% lidocaine as maximum safe dose without vasoconstrictor and 25 ml of 2% lidocaine with vasoconstrictors for a standard Indian male. We usually use xylocaine 2% with adrenaline 1: 2,00,000. One ml of this solution contains 20 mg of lidocaine and 5 micrograms of adrenaline.

b) Mechanism of Action

Lidocaine alters signal conduction in neurons by blocking the fast voltage gated sodium $[Na^+]$ channels in the neuronal cell membrane that are responsible for signal propagation [25]. With sufficient blockage, the membrane of postsynaptic neuron will not depolarize and will thus fail to transmit an action potential. This creates the anaesthetic effect by not merely preventing pain signal

from propagating to the brain but by aborting their generation in the first place itself.

c) Side effects

Common side effects include nausea, dizziness, bruising, redness, Itching or swelling where the medication is injected. Unlikely but serious side effects include CNS related side effects such as drowsiness, mental/mood changes, ringing in the ears, vision changes, headache, tremors, numbness [24]. Cardiovascular related side effects are bradycardia, hypotension and cardiovascular collapse which may lead to cardiac arrest [26]. Allergic reactions have also been noted as characterized by cutaneous lesions such as urticaria, edema or anaphylactoid reaction [27].

d) Bupivacaine

Other commonly used local anesthetics is Bupivacaine. Its onset of action is about 5-10 minutes [23]. Duration of action of Bupivacaine without vasoconstrictor is about 200 minutes and with vasoconstrictor is about 540 minutes [23]. Maximum safe dose of plain Bupivacaine is 2mg/kg body weight and with vasoconstrictor it is 2.5 mg/kg body weight [28]. We generally use 0.5% bupivacaine. 1ml contains 5mg of bupivacaine. Its mechanism of action is essentially similar to that of Lidocaine. Common side effects of Bupivacaine includes nausea, vomiting, chills or shivering, headache, backache, dizziness, problems with sexual function, restlessness, anxiety, ringing in the ears, blurred vision, tremors, constipation, low blood pressure, etc [29]. We should avoid use of bupivacaine during pregnancy and lactation because it harms the fetus and also gets concentrated in breast milk and may harm the nursing baby. Overall precautions that we routinely take into consideration to avoid these preventable side effects of local anesthetics are proper dose calculation, prior testing of sensitivity and aspiration prior to injection so as to ensure local anaesthetics are not being injected into blood vessels.

Additional Medications

a) Non-Steroidal Anti-inflammatory Drugs (NSAIDS)

Non-Steroidal Anti-inflammatory Drugs can be used along with L.A. in the patients where LA alone is not sufficient to control pain despite administering maximum safe dose [30] or situations where local anesthetics cannot be administered at the whole area of interest.

b) Bicarbonates

In case of abscess, cellulitis and inflamed tissues, the tissue pH is acidic. In acidic pH lidocaine and bupivacaine do not work [31]. Therefore, the use of bicarbonates along with lidocaine or bupivacaine helps to make the medium alkaline, so that the local anesthetics may be effective in such scenarios.

c) Anti-Emetics

Anti-emetics can be added pre-emptively or as on demand basis.

Essential Care

Any surgical procedures in the day care procedure under local anesthesia needs essential care. Besides the specific considerations mentioned previously, every patient needs special attention throughout the course of procedure to address their specific concerns. It's essential that all the patients undergo vitals monitoring with at least pulse rate and saturation throughout the procedure. Oxygen supply can be provided to anxious patients or those with cardiovascular, respiratory or other comorbidities. Maintenance Intravenous fluid should be administered to replace insensible loss in day care procedures that are expected to take longer duration [32]. Even after the procedure it is essential to hold the patient and make her/him sit down or leave the patient to the attender to avoid any sudden hypotension or fall of the patient. One should never neglect patient's complaints of any problems like dizziness following the procedure. One should always be aware of the possible side effects of local anesthetics. Therefore, Proper teamwork with the Nursing and OT staff with routine habit of taking into considerations the minute details during the surgery is the key to providing a safe and pleasurable local anesthesia for any day care procedures.

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