Research and Reviews: Drug Delivery

Classification of Local Anaesthetics and their Efficacy

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Perspective

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ABOUT THE STUDY

The delivery of local anaesthetic directly to the area where surgery is to be conducted is the most direct and simple approach of anaesthesia. A local anaesthetic is a substance that, when administered to nerve tissue, prevents conduction in the nerve. In an ideal world, the local anaesthetic would be completely reversible, having low systemic toxicity, with a quick onset but long term duration for the procedure, be sterilizable, and has primary action on nerve tissue with minimum irritation. Amino-amides and amino-esters are the most often used local anaesthetics. Both of these drugs have a similar effect on nerve function, with the latter having the largest impact on pain transmission.

Small non-myelinated neurons carry pain, which are easily seized by a topical anaesthetic. The senses of temperature, touch, and proprioception are then inhibited in order. Pain and temperature signals are so easily lost, whereas motor function and a sense of pressure or touch are frequently preserved.

The pharmacology of the two types of local anaesthetic drugs is vastly different. Pseudocholinesterase hydrolyzes amino-esters in the plasma, whereas amino-amides are metabolised in the liver. Esters are more volatile in solution and have a higher risk of causing an allergic reaction, whereas amides are more stable in solution and have a higher risk of causing toxicity. Procaine, chloroprocaine, tetracaine, and cocaine are some of the most often used aminoesters. Aminoamides are used more commonly because they have a lower risk of allergic reaction and are

more stable in solution. Lidocaine, mepivacaine, prilocaine, bupivacaine, and etidocaine are some of the most prevalent anaesthetics.

The particular profile of each local anaesthetic should be used to determine which one to use. Because all anaesthetics have a pKa of 7.6 to 9.2, they work best in a neutral or slightly alkaline environment. The anesthetic's efficiency is reduced when acidic tissue is present, such as in inflammation and infection. Even within comparable groups of anaesthetics, potency, onset of action, and duration vary.

The degree of lipid solubility, as well as the quantity of vasodilation caused by the anaesthetic, is used to determine potency. Except for cocaine, all local anaesthetics cause some degree of vasodilation. The more vasodilation there is, the more systemic absorption there is and the less that is absorbed at the nerve cell. This will have a significant impact on how long the local anaesthetic lasts at the surgery site.

Epinephrine with a concentration of 1:200,000 is routinely used to improve the impact of the local anaesthetic. Epinephrine slows the onset of anaesthesia and extends its duration. Other advantages of epinephrine include local vasoconstriction, which reduces bleeding and eliminates the need for a tourniquet, and the requirement for a smaller amount of anaesthetic to establish anaesthesia, lowering the risk of adverse responses. The use of epinephrine in digital surgery is contraindicated, according to historical, anecdotal legend. Many studies, surveys, and publications refute this age-old myth, given that adrenaline causes just a brief vasoconstriction that lasts 20–60 minutes, and even then, circulation is not totally obstructed to the digits.

Thyrotoxicosis, coronary artery disease, severe peripheral vascular disease, vasospastic disorders, and tricyclic antidepressants, such as monoamine oxidase inhibitors, are all contraindications to epinephrine use. Poor tissue handling, bad vascular evaluation, poor injection technique, or an excessive volume of anaesthetic into one location is the most prevalent major adverse effects following the use of epinephrine.

Local anaesthetic agent delivery might result in complications, which are mainly related to toxicity or an allergic reaction to the drug. Urticaria or a skin reaction, bronchospasm or respiratory impairment, edoema, and anaphylactic shock are all symptoms of an allergic reaction. Injection of an excessive dose based on mg/kg of body weight, unintentional intravascular injection, or fast absorption from a highly vascular location can all indicate toxicity. Convulsions, anxiety, restlessness, respiratory and cardiac depression, hypotension, cardiac arrhythmia, and ultimately cardiac arrest are all symptoms of a toxic systemic reaction. The hazardous dose of commonly used local anaesthetics is determined by the drug chosen and the patient's weight.