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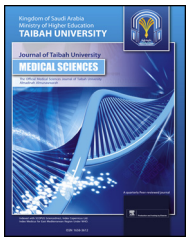

Letter to the Editor

Rules of selection for a safe local anesthetic in dentistry

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There are two distinct types of local anesthetics used in dentistry. The first type belongs to the ester group, whose use is limited to topical local anaesthetic applications because of their high toxicity.[1] Ester group anesthetics have a short time of action (not exceeding that 15 min) and are metabolized by the enzyme plasma cholinesterase.[1–3] It can only be considered as an alternative in patients who are sensitive to the amide group anesthetics. For example, chloroprocaine is an ester class local anaesthetic, indicated for patients with allergies to amide group and is considered the safest local anesthetic for pedodontics.[1–4] Amide group anaesthetics are the second type of widely used local dental anesthetics[1,4] It has a remarkably long time of action, metabolized in the liver and their toxicity is almost non-existent.[1,5]

Popular amide local anesthetics used in dentistry include mepivacaine, lidocaine, prilocaine, articaine, and bupivacaine.[1] Lidocaine is the "gold standard" local anaesthetic drug which is widely used worldwide.[1,2] As a general rule, all local anaesthetic drugs cause vasodilation, except for cocaine.[2–5] Vasodilating property leads to the rapid absorption of the anesthetic solution into the blood, which in turn causes an increase in toxicity and a decrease in the time of action.[2–5] Therefore the safest anesthetic drug is the one that has the least vasodilation property.

Based on a systematic review conducted by Mathison and Pepper[1] demonstrated that, mepivacaine is considered the anesthetic with the least vasodilating property. It is suitable for patients with hyperthyroidism, as it can be administered without the addition of a vasoconstrictor (adrenaline). Articaine is considered the safest local anaesthetic drug for use in patients with hepatic and renal impairments. Only 10–15% of articaine is metabolized in the liver. The rest of the drug, 85–90%, is metabolized in the blood and transformed into articaine acid, considered ineffective and non-toxic.[1,4,6] On the other hand, lidocaine and mepivacaine are primarily metabolized in the liver.[1] Only a small amount of mepivacaine is excreted by the kidneys unchanged.[1,3] Prilocaine is metabolized in the kidneys, lungs, and liver.[2] Therefore, the least harmful anaesthetic drugs for patients with kidney and liver diseases is articaine, then prilocaine, while mepivacaine and lidocaine are the worst. Moreover, the permissible dose of local anaesthetics should be reduced for patients with liver and kidney disease, due to the decrease in the functional capacity of both the liver and kidneys.[2,6–8]

A study by Gazal[2] reported that the patients with cardiovascular disease, the maximum permissible dose of adrenaline should not exceed 0.04 mg, which is equivalent to 2 cartridges of 2% lidocaine with epinephrine (1:100,000). However, a healthy patient can be given up to 0.2 mg [approximately 10 cartridges of 2% lidocaine with epinephrine (1:100,000)].[1,2,9] Using a low dose of adrenaline does not significantly affect blood pressure or heart rates.[1] The second option is 3% plain mepivacaine, which is considered the least vasodilating local anaesthetic. The third option is 3% prilocaine with felypressin (0.03 I.U. per ml).[2] Felypressin is a weaker vasoconstrictor than adrenaline because it constricts venous outflow.[2,3,9] Intraligamentary and intraosseous injecting with adrenaline containing anaesthesia is not recommended for patients with cardiovascular disease because drug easily enters the blood circulation with these techniques.[1,3,4,8] In elderly patients, the amount of local anesthetics should be reduced due to the decline in the functional capacity of both the liver and kidneys.[1,2,8] Majority of elderly patients suffer from heart diseases, so limiting the amount of local anaesthetic with adrenaline is recommended.[1,4,6,7]

For pregnant women, lidocaine is relatively safe and has no risk for mother or fetus.[1,7] However, all local anesthetics cross the placenta to the fetus. Therefore, we should weigh the

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benefits and risks of local anaesthesia.[2] Prilocaine with felypressin should be avoided during pregnancy because there is a theoretical risk of labor induction with felypressin (felypressin mimics the action of oxytocin hormone) and fetal methemoglobinemia with prilocaine.[1,2] Patients with inherited bleeding disorders, local anaesthetic infiltration techniques are preferred over block anesthesia.[1,9] These patients are at a risk of the formation of intramuscular hematomas that may compromise the airway when inferior alveolar nerve (IAN) and posterior superior alveolar (PSA) nerve blocks are given.[5,6] However, mandibular blocks may be safe in patients taking anticoagulants.[6,7,9]

In conclusion, mepivacaine, lidocaine and prilocaine are best used for healthy patients. Articaine is the safest local anesthetic for patients with liver and kidney disease. Plain mepivacaine, prilocaine with felypressin, or a maximum of two cartridges of lidocaine with adrenaline are the best indications for cardiovascular patients. Chloroprocaine has low toxicity, and very safe anaesthetic for use in children. It is the best alternative in case of allergy to amide drugs. However, prilocaine with felypressin is not recommended during pregnancy.

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GG conceived the idea, and wrote the initial draft of the article, WE and EO wrote a part of the article and critically revised the final draft. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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