PSA block for maxillary molar’s anesthesia - an obsolete 
technique?

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Background. Routine use of posterior superior alveolar (PSA) nerve block or maxillary infiltration for the removal of maxillary molars has been validated.

Objective. The present study was undertaken to determine the relative contribution of posterior superior alveolar (PSA) block in cases of anesthesia required for maxillary molars.

Study design. One hundred patients requiring removal of maxillary second and third molars were enrolled. These patients were divided into 2 groups. One group received infiltration for anesthesia and other group received PSA nerve block using lignocaine with vasoconstrictor. All extractions were performed using a consistent technique of intraalveolar extraction. Data relating to the pain during extraction obtained on a visual analog scale and a verbal response scale, requirement of repeated injection for anesthesia, efficacy of these injections in localized infections, and requirement of rescue analgesics 3 hours after extraction.

Results. Statistical data confirmed clinical equivalence between infiltration and PSA nerve block.

Conclusions. Considering the difficulty in mastering the technique of PSA nerve block, and the possibility of more complications associated with it (compared with infiltration); it may not be necessary for anesthesia of maxillary molars. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011;112:e39-e43)

Oral surgical and dental procedures are routinely performed in outpatient settings. Regional anesthesia is the most common method to anesthetize the area of surgery before the office-based procedures. Many techniques can be used to achieve anesthesia of the dentition and surrounding hard and soft tissues of maxilla and mandible. Orofacial anesthetic techniques can be classified into 3 main categories:

● Local infiltration.
● Field block.
● Nerve block.

The maxilla is very porous and highly vascular. Therefore, anesthesia of maxillary teeth can be accomplished more easily than with mandibular teeth. Buccal infiltration of anesthetic solution over the root apices of teeth is quite effective because the bone is so porous. Many pharmacologic strategies have been developed to prevent peripheral and central sensitization, thereby attenuating or even preventing the postoperative amplification of pain sensation. We discuss 2 of these in the present study: local infiltration for maxillary molars and posterior superior alveolar (PSA) block. This study was undertaken to determine the relative contribution of PSA block in cases of anesthesia required for maxillary molars.

MATERIALS AND METHODS

One hundred healthy patients requiring maxillary molar extractions were enrolled in this study. The inclusion criteria were maxillary second and third molars indicated for extraction under local anesthesia, and the patients’ belonging to the category of ASA1 status. Exclusion criteria were impacted maxillary third molars and patients unable to give informed consent or allergic to lignocaine. The included patients were divided into 2 groups of 50 patients in each group on a random basis. One group received local infiltration and the other received PSA block for anesthesia.

Before being administered local anesthetic agent, each patient was given a thorough explanation of the visual analog scale (VAS). The VAS has markings of numbers 0-5; with 0 being no pain and 5 being hurts worst. A solution of 1.8 mL 2% lignocaine with 1:80,000 adrenaline was injected for maxillary infiltration and PSA block. After completion of these injections, and after an interval of 5 minutes to allow for anesthetic effect, teeth were extracted with the use of a consistent technique. If an unacceptable level of pain or discomfort was experienced during extraction, a second injection was given.
Immediately after extraction, patients rated their level of pain on VAS. A verbal response scale (VRS) was additionally used after extraction, by asking 2 additional questions to assess whether the procedure was “acceptable” or “unacceptable”; and to describe pain as “less than expected,” “as expected,” or “greater than expected.”

Data regarding the pain experienced during the extraction, requirement of supplemental anesthesia, requirement of rescue analgesics within the time span of 3 hours after surgery, efficacy of anesthesia in localized infections, frequency of positive aspirations, and post-operative complications related to anesthesia were recorded.

Statistical analyses
Data were subjected to different types of statistical analysis, such as $P$ value, Mann-Whitney $U$, and Wilcoxon $W$ and $Z$.

RESULTS
Pain
In the VAS scale, we did not come across any patients experiencing pain as “hurts a whole lot” or “hurts worst” (scores 4 and 5; Fig. 1; Tables I, II, and III). So the tables and graphs are made by omitting these 2 options. The $P$ values for VAS and VRS were .382 and .442, respectively, which are $>.05$, indicating that there was no significant difference between infiltration and PSA. That is, VAS/VRS are almost equal for both infiltration and PSA. The $P$ value for repeated injections was .798 which is $>.05$, indicating that there was no significant difference between infiltration and PSA. That is, repeated injections were almost equal for infiltration and PSA. The $P$ value for requirement of nonsteroidal antiinflammatory drugs (NSAIDs) after 3 hours was .356, which is $>.05$, indicating no significant difference. That is, requirement of NSAIDs after 3 hours was almost equal for infiltration and PSA.

Efficacy of anesthesia in localized infections
In our data, we had 34 patients who had periapical infection, out of which 14 underwent PSA block and 20 underwent infiltration to achieve anesthesia. Both of the techniques were equally effective. The $P$ value for localized infection was .208, which is $>.05$, indicating that the null hypothesis of no significant difference was accepted. That is, localized infections were almost equal for infiltration and PSA.

Positive aspirations and postoperative complications
We encountered only 2 cases with positive aspiration in case of PSA block; and 2 patients reported with postoperative complication. One reported with hematoma and another 1 with trismus after receiving this block on the fifth postoperative day. No such complications were noticed in patients who received infiltration. In the case of the patient who developed hematoma, we advised the patient to use cold fermentation with ice and observed the patient periodically every three days until the swelling subsided. The patient with trismus was prescribed muscle relaxants and physiotherapy.

The present study was made to compare clinical efficacy of infiltration compared with PSA block by
gauging pain experienced during and after the procedure, requirement of repeated injections, efficacy in localized infections, and complications associated with the anesthetic technique. The results clearly demonstrate that there were no clinical important difference between anesthesia achieved with infiltration or PSA block. In this study, all of the teeth were extracted without the patients indicating that they were experiencing any difference in acceptance of any of the anesthetic techniques. In fact, the maximum discomfort was due to PSA block technique rather than infiltration regarding repeated injections, pain control, and postoperative complications. But there was no significant difference in case of efficacy of anesthesia in localized infections.

**DISCUSSION**

Dental practitioners have the challenge of providing dental care with a minimum amount of discomfort and anxiety for their patients. The science of pain control has continued to evolve since the introduction of local anesthesia into dentistry. Pain is a complex psychologic phenomenon. Pain perception levels are not constant. Pain thresholds, as well as reactions to pain, change significantly under various circumstances. The pain reaction threshold is significantly altered by past experiences and present anxiety levels. The dental profession continually explores new methods to help meet the challenges faced by dental care providers. Traditional methods of anesthetizing maxillary teeth include supraperiosteal infiltration over a specific targeted tooth or a nerve block.

Numerous studies have demonstrated that infiltration injection of anesthetics results in 90%-95% successful pulpal anesthesia in maxillary teeth.\(^1\)\(^2\)\(^3\) Descriptions of conventional techniques for maxillary anesthesia are available for review in numerous articles and textbooks. Clinically, maxillary anesthesia is more successful than mandibular anesthesia, and the infiltration is by far the dominant approach.\(^4\) PSA block is associated with many complications. One of the complications noted by Prakasm et al. (2009) in a case of patient receiving posterior superior alveolar (PSA) block was temporary pupillary dilatation and ptosis.\(^5\) They men-
tioned that this complication could be due to diffusion of local anesthetic into the orbital cavity via pterygomaxillary fossa or to direct deposition of local anesthetic into the PSA artery and thereby to the lacrimal artery and causing these symptoms. Theories put forward by authors to explain these ocular complications after PSA block include:

1. Intraarterial injection under pressure with retrograde flow leading to the occlusion of retinal and choroidal vasculature.

2. Diffusion of anesthetic solution from the pterygomaxillary fossa through the sphenomaxillary cavity to the orbit, thus stimulating the autonomic nervous system and causing parasympathetic and sympathetic involvement and producing the different manifestations.

3. The intraarterial injection of LA can reach the cavernous sinus through the arteries and cause paralysis of cranial nerves III, IV, and VI.

A study on 89 children 3-9 years old requiring the same type of treatment on contralateral mandibular molars was done by Oulis et al. in 1996. Anesthesia was given as infiltration on 1 side and block on other side. No statistically significant differences were found between the 2 anesthetic techniques for either behavior or pain while performing amalgam steel crown restorations. Mandibular infiltration was less effective than mandibular block for pulpotomies and extractions.

Two similar studies were done. Sharaf (1997) compared mandibular infiltration with block in pediatric dentistry; he found that buccal infiltration anesthesia was as effective as block in all situations, except when pulpotomies were performed in mandibular second primary molars. Block anesthesia was significantly more painful than buccal infiltration anesthesia, and behavior of children ranging from 3 to 5 years of age sometimes turned negative after the block injections. The second study was done by Yaseen in 2010. A total of 89 patients ranging from 6 to 9 years of age requiring treatment in primary mandibular canines were selected. Dental procedures were done under both mandibular infiltration and mandibular block. No statistically significant differences were found between the 2 techniques for either pain or behavior during the dental procedures and extractions.

Most problems with maxillary anesthesia can be attributed to individual variances of normal anatomic nerve pathways through the maxillary bone. According to Waltor and Abbott, infiltration anesthesia of maxillary molars fails in situations where the palatal roots flare greatly toward the midline of the palate. PSA block provides consistently reliable pulpal anesthesia to the 2 maxillary molars, even in the presence of infection or widely flared palatal roots. But in our study, we did not encounter any situation like this.

PSA is a technique-sensitive procedure. The operator needs higher skill. It is important that one must aspirate several times before and during drug deposition to avoid inadvertent intravascular injection in the pterygoid plexus. It provides inadequate anesthesia if proper technique is not followed.

The risk of hematoma formation in patients given PSA block is high. An “average” depth of penetration in a patient with a smaller-than-average skull may produce a hematoma, whereas a needle inserted “just right” in a large-skulled patient might not provide anesthesia to any teeth.
When the risk of hemorrhage is too great (as with hemophilia), supraperiosteal or local infiltration is preferred over PSA nerve block. Because the middle superior alveolar nerve provides sensory innervations to the mesiobuccal root of the maxillary first molar, a second, usually supraperiosteal, injection is indicated to achieve adequate anesthesia. PSA nerve block technique is somewhat arbitrary, because there are no bony landmarks during insertion.

Another complication seen after PSA nerve block is mandibular anesthesia. The mandibular division of the fifth cranial nerve (V₃) is located lateral to the PSA nerve. Deposition of local anesthetic lateral to the desired location may produce varying degrees of mandibular anesthesia. Most often, when this occurs, patients mention that their tongue and perhaps their lower lip is anesthetized.

Local infiltration is a technically easy injection. It is usually entirely atraumatic. Positive aspiration is negligible in case of supraperiosteal injection, though possible (≤1%). In case of PSA nerve block, positive aspiration is ~3.1%, which is reportedly higher than local infiltration. Hemostasis is achieved better after infiltration. The rate of failure is higher in PSA nerve block compared with local infiltration. Another reported complication of PSA, though uncommon, is a temporary Bell palsy if the needle is improperly placed into the parotid bed.

According to our experience, PSA block is used for anesthesia of maxillary second and third molars; but infiltration is still by far the equally acceptable mode of achieving anesthesia for maxillary molars. Moreover, infiltration overcomes the difficulty of mastering the technique of PSA block and the few complications caused by it. PSA block has a further limitation in anesthetizing maxillary first molars, where an additional infiltration is mandatory to anesthetize the mesiobuccal roots, which is not the case in infiltration.

So far, we have not come across any such study done earlier to compare PSA block with infiltration technique. We conclude the present report by stating that PSA block can be replaced with infiltration technique to anesthetize maxillary molars with great ease while overcoming the difficulties and complications associated with the block.

REFERENCES


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