10.5005/jp-journals-10051-0021

ORIGINAL RESEARCH

Comparative Evaluation of Anterior Middle Superior Alveolar Nerve Block and Conventional Nerve Block for Scaling and Root Planing in Maxilla

[1]Heenal Adhyaru, [2]Varsha Rathod, [3]Nilesh V Joshi

ABSTRACT

Objectives: The aim is to compare and evaluate the efficacy, pain on administration, and duration of anesthesia during scaling and root planing (SRP) using anterior middle superior nerve block and conventional nerve block.

Materials and methods: Ten patients with mild-to-moderate chronic periodontitis were recruited and divided into study group [anterior middle superior alveolar (AMSA) nerve block] and control group (conventional technique) in a split mouth study design. The following parameters were recorded: Pain during injection and SRP, time required for injection technique, onset of anesthesia, objective symptoms for pulpal anesthesia and soft-tissue anesthesia, effect of collateral anesthesia (deviation in smile line), and patient's preference.

Results: Anterior middle superior alveolar was more preferred anesthetic technique by patients. There was no significant difference for visual analog scale score between the groups for injection technique and for SRP procedure as well as the time required for injection technique and procedure. The onset was significantly delayed for AMSA compared to conventional nerve block technique. Pulpal anesthesia for central and lateral incisor was not achieved in higher number of patients with AMSA. However, soft-tissue anesthesia was comparable for both the nerve block techniques. Collateral anesthesia was not seen with AMSA.

Conclusion: Within the limitation of the study, it can be concluded that AMSA nerve block technique was equally effective as conventional nerve block technique for SRP with maxillary anteriors and premolars. With no facial collateral anesthesia, AMSA technique was more preferred by the patients.

Keywords: Anesthesia, Injection, Local, Maxilla, Nerve block, Root planing.

How to cite this article: Adhyaru H, Rathod V, Joshi NV. Comparative Evaluation of Anterior Middle Superior Alveolar Nerve Block and Conventional Nerve Block for Scaling and Root Planing in Maxilla. Int J Oral Care Res 2016;4(2):91-97.

Source of support: Nil

Conflicts of interest: None

[1]Postgraduate Student, [2]Professor and Head, [3]Reader

[1-3]Department of Periodontology, Bharati Vidyapeeth Dental College & Hospital, Navi Mumbai, Maharashtra, India

Corresponding Author: Heenal Adhyaru, Postgraduate Student, Department of Periodontology, Bharati Vidyapeeth Dental College & Hospital, Navi Mumbai, Maharashtra, India Phone: +917715838790, e-mail: heenaladhyaru@yahoo.com

INTRODUCTION

Periodontal diseases are initiated by dental plaque in a susceptible host. Periodontitis develops when an imbalance occurs between the microbial attack and the host defense.[1] If the disease is untreated, it will lead to attachment loss, loss of supporting structures of the teeth, and eventual tooth loss.[2]

Periodontal treatment has mainly aimed at reinstalling the balance by reducing the microbial attack. Treatment consists of oral hygiene instruction, supragingival and subgingival debridement, or surgical pocket reduction.[1]

Cobb et al suggested that scaling and root planing (SRP) is an essential and effective component of therapy for inflammatory periodontal disease. A long-term study by Ramfjord et al supports that the removal of plaque and calculus helps to promote healing and prevent further progression of inflammation and periodontal tissue destruction. Thorough SRP of patients with moderate-to-severe periodontitis results in a marked clinical improvement in the resolution of visible manifestations of inflammation, decreased probing depth, and either a gain or stabilization of attachment levels.[3]

Injection required during dental procedures is the most commonly perceived painful procedure and is the cause of patient apprehension.[4] An effective therapeutic periodontal SRP procedure frequently requires use of local anesthesia to maintain patient comfort while permitting adequate instrumentation of root surface. This allows the clinician to adequately perform the procedures without fear of causing pain in the patient.[5]

Achieving adequate local anesthesia in the maxilla requires the administration of posterior superior alveolar nerve block, anterior superior alveolar (ASA) nerve block, middle superior alveolar (MSA) nerve block, greater palatine, and nasopalatine nerve block and/or multiple "pricks" for infiltration anesthesia. The infra-orbital nerve block is associated with collateral anesthesia and numbness of the upper lip, side of the nose, and lower eyelid. This can be discomforting for the patient once he is discharged from the office.[4]

The anterior middle superior alveolar (AMSA) injection is most accurately described as a field block of the terminal branches (subneural dental plexus) of the

Fig. 1: Area anesthetized through AMSA

ASA nerve.[4] Friedman and Hochman described the AMSA nerve block technique. This technique anesthetizes the ASA nerve, the MSA nerve, and the subneural dental nerve plexus, which results in the anesthesia of pulpal tissue, buccal attached gingival and attached palatal tissues from midline to free gingival margin on the maxillary incisors, canines, and premolars of one quadrant using a single palatal injection without anesthetizing muscles of facial expression and upper lip as shown in Figure 1.[4,6]

Figure 2 shows the nutrient canals. Depositing a sufficient volume of local anesthetic allows it to diffuse through nutrient canals and porous cortical bone to envelope the concentrated subneural dental plexus at this location.[4]

Fukayma et al[4] tested the efficacy of the AMSA injection technique and concluded that it is an effective local anesthetic technique for the above-mentioned areas. This technique is most easily accomplished when performed with a computer-controlled local anesthetic delivery system; however, this injection also has been successful using a standard aspirating dental syringe.

The present study was conducted to compare and evaluate the efficacy, pain on administration, and duration of anesthesia during SRP using AMSA nerve block with conventional nerve block for SRP in maxilla.

Fig. 2: Anatomical landmark of AMSA: Presence of nutrient canals

MATERIALS AND METHODS

Participants

Participants were recruited from Department of Periodontology, Bharati Vidyapeeth Deemed University Dental College and Hospital, Navi Mumbai, India. An ethical approval was received from the Institutional Ethical Committee. Written informed consent was obtained from all participants prior to study. All participants underwent full periodontal dental checkup using a manual UNC-15 probe.

Ten patients with mild-to-moderate chronic periodontitis were enrolled in the study according to mentioned inclusion and exclusion criteria.

Inclusion Criteria

- Participants of either sex should be of 18 years of age or above
- Medically fit patients
- Probing pocket depth of ≥5 mm.

Exclusion Criteria

- Patients allergic to local anesthetic solution
- Pregnant and lactating women
- Patients on any medication that may influence the result, which includes any analgesics, or opioids.
- Patients with active sites of pathosis in the area of injection.

A split mouth study design was carried out by randomly dividing the participants based on a predetermined computer-generated chart into following groups:

- Study group – AMSA nerve block
- Control group – conventional nerve block:
  - Infra-orbital nerve block
  - Nasopalatine nerve block
  - Palatal infiltration

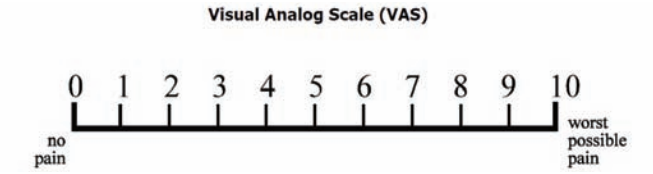


Fig. 3: 0–10 points VAS

MEASURES

The following parameters were measured:

- Pain score [using 0–10 visual analog scale (VAS)] after injection and after SRP, as shown in Figure 3.
- Time required (seconds) for giving the nerve block and completion of the procedure in each appointment.
- Time required for onset (seconds) of the block was assessed by subjective symptoms (numbness). The patient was asked after every 30 seconds for the symptoms.
- Electric pulp testing: From central incisor to second premolar at baseline and after onset of anesthesia (pain present/absent).
- Transgingival probing after onset of anesthesia (pain present/absent).
- Preference of the injection by patient: After both the visits, patients were asked about preference of nerve block.
- Photographs of smile line were taken before and after anesthesia.

Scaling and root planing in maxillary anteriors and premolars was carried out under local anesthesia in two appointments to avoid the overlap of anesthesia in the anterior region by conventional nasopalatine nerve block and AMSA nerve block.

All patients received lignocaine 2% with epinephrine (1:80,000) with 26-gauge needle after topical application of local anesthetic gel at the site of insertion.

For AMSA needle was inserted on the hard palate about halfway along an imaginary line connecting the mid-palatal suture to the free gingival margin; the location of the line is at the contact point between the first and second premolar as shown in Figure 4. The needle was held at a 45° angle to the palate. Anesthesia was delivered at a rate of approximately 0.5 mL during the injection for a final dosage of approximately 1.4 to 1.8 mL. Blanching of the soft tissue of the palate was evident extending from central incisor to the premolar region, as shown in Figure 5.

Anesthetic effect, i.e., absence or presence of pain on pulpal and buccal/palatal soft tissues was recorded using electric pulp tester and transgingival probing respectively after the onset of the anesthesia.

The mean values of VAS pain score, time required for giving nerve block (seconds), and time required for onset of block (seconds) were compared between the two groups using two-sample "t" test. Between group comparisons

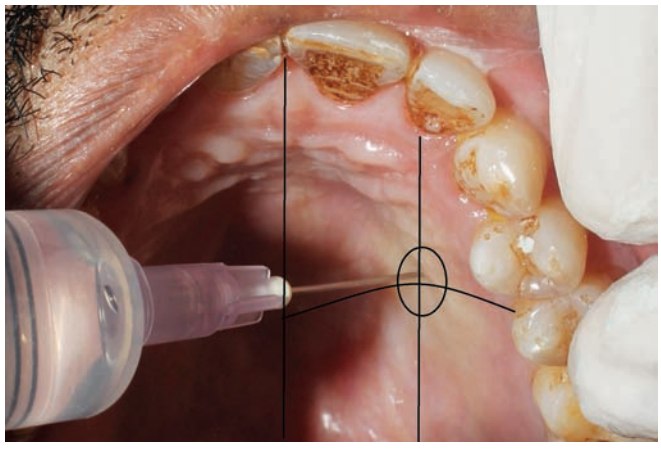


Fig. 4: Insertion of needle for AMSA

Fig. 5: Blanching of palatal soft tissue

for proportion of patients having preference for nerve block injection (AMSA or conventional), presence of pain on electrical pulp testing, and transgingival probing were compared using proportions test. All testing were done using two-side tests at alpha 0.05.

RESULTS

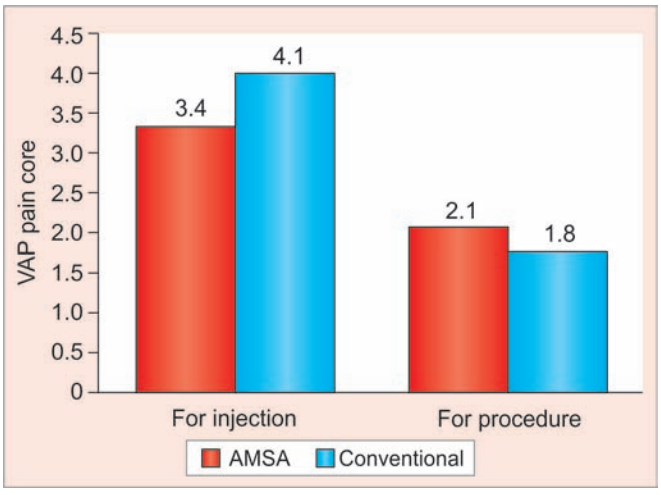
Ten patients (9 males and 1 female), aged 30 to 55 years suffering from mild-to-moderate chronic periodontitis participated in the study.

- Comparing both the groups for VAS score for injection procedure and SRP procedure, statistically non-significant results were obtained as shown in Table 1 and Graph 1.
- Statistically non-significant difference was present between the groups regarding time taken for anesthetic and SPR procedure, as shown in Table 1 and Graph 2.
- Statistically significant difference was present between the groups for onset of anesthesia, with more time required for AMSA nerve block compared to conventional nerve block, as shown in Table 1 and Graph 2.
- Statistically significant difference was present between the groups for effect of pulpal anesthesia for central and lateral incisor, with presence of pain with AMSA

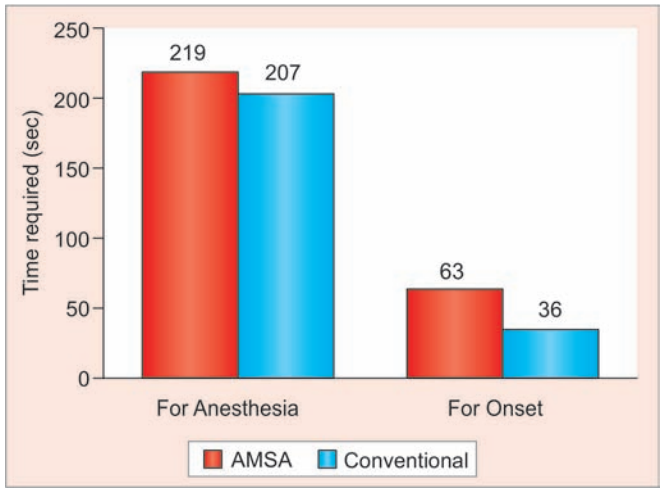
Table 1: Visual analogue scale score, time measurements, and subjective symptoms

Parameter		*AMSA*	*Conventional technique*	*Significance**
Pain score	After injection	3.40±0.97	4.10±1.66	0.265
	After procedure	2.10±0.88	1.80±0.79	0.431
Time (min)	For anesthesia	219.00±76.25	207.30±78.39	0.739
	For procedure	23.30±5.10	22.60±3.47	0.724
Subjective symptoms				
Onset of anesthesia (min)		63.00±26.27	36.00±12.65	0.009†

*Two-sample "t" test, †Indicates statistical significance (p<0.05)



Graph 1: Mean VAS scores for injection and SRP procedure



Graph 2: Mean time taken for injecting anesthetic solution and onset of anesthesia (seconds)

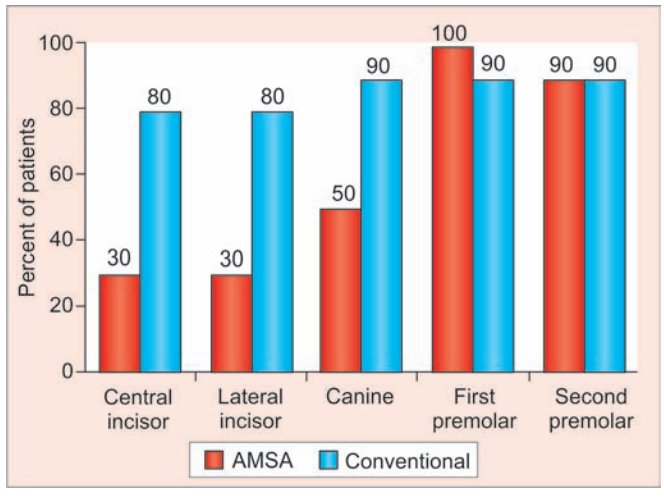
Table 2: Absence of pain after onset of anesthesia (n=10)

	Pulp tester			*Buccal probing transgingival*			*Palatal probing transgingival*		
Tooth	*AMSA*	*Conventional*	*Significance**	*AMSA*	*Conventional*	*Significance**	*AMSA*	*Conventional*	*Significance**
Central incisor	3	8	0.035†	3	6	0.185	10	9	0.500
Lateral incisor	3	8	0.035†	5	9	0.070	9	10	0.500
Canine	5	9	0.070	7	9	0.291	10	10	1.000
First premolar	10	9	0.500	9	9	0.763	10	10	1.000
Second premolar	9	9	0.763	9	10	0.500	10	10	1.000

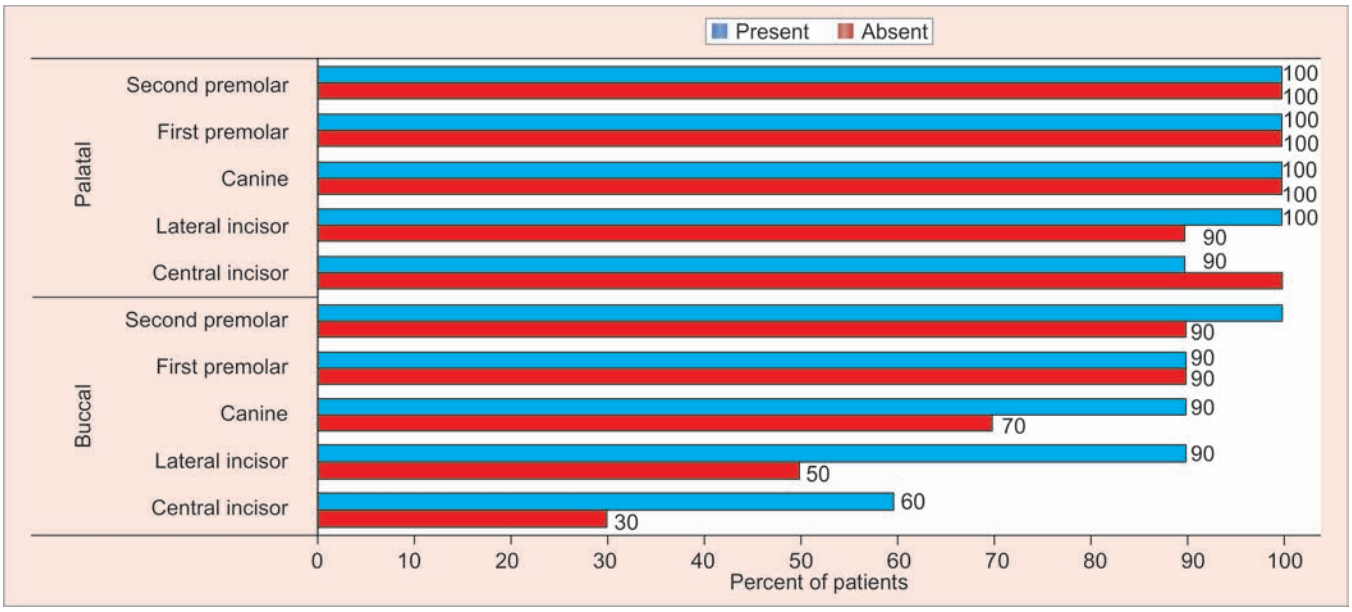
*Two-sample "t" test, †Indicates statistical significance (p<0.05)

in higher number of patients, as shown in Table 2 and Graph 3.

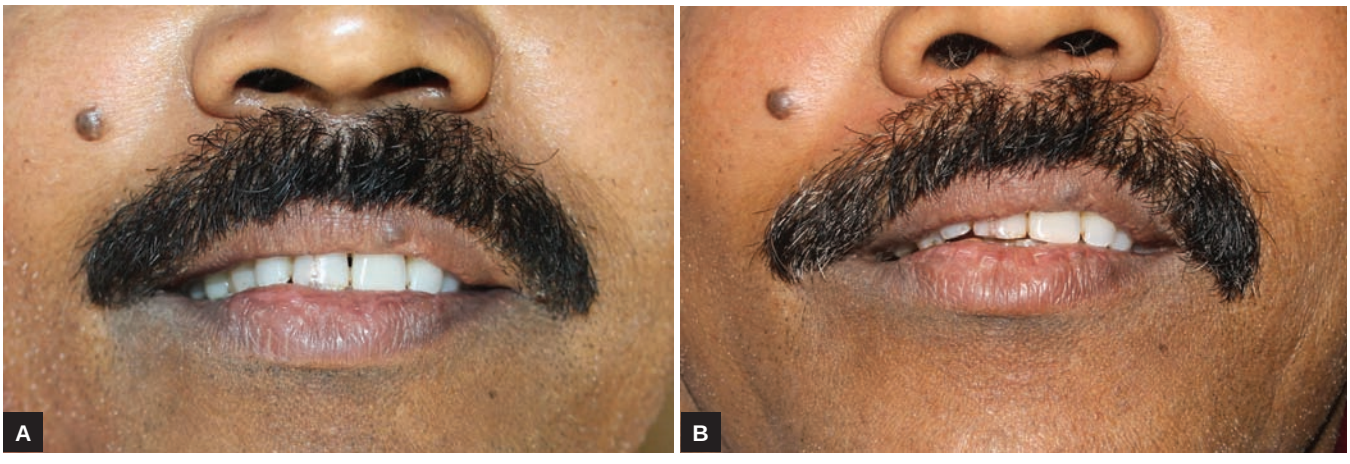
- No statistically significant difference was present between the groups regarding the buccal/palatal soft-tissue anesthesia, as shown in Table 2 and Graph 4.
- Anterior middle superior alveolar nerve block technique was more preferred by the patients as compared to conventional technique. Out of 10 patients, 6 patients preferred AMSA nerve block, 4 patients preferred conventional nerve block technique, and 1 patient did not prefer any of the nerve block technique for SRP procedure.
- Smile-line photographs were taken after injection to observe effect of anesthesia on muscles of facial



Graph 3: Percentage of patients with successful pulpal anesthesia (objective symptom)



Graph 4: Percentage of patients with successful soft-tissue anesthesia (objective symptom)



Figs 6A and B: Effect of anesthesia on smile line: (A) AMSA nerve block on left side; and (B) conventional nerve block on right side

expression and upper lip. After conventional nerve block muscles of facial expression and upper lip were anesthetized and perceptible change was noted patients smile as shown in Figures 6A and B.

DISCUSSION

Loomer and Perry[5] demonstrated a patient preference for AMSA compared with supraperiosteal infiltration technique for SRP. Anterior middle superior alveolar was found to be as effective as multiple maxillary infiltrations in the maxilla. Sculean et al[7] also found similar results when comparing AMSA with conventional injection technique for SRP.

The numerical VAS is unidimensional measure of pain intensity in adults. It is an 11-point numeric scale, with 0 representing no pain and 10 representing the extreme pain. The ease of application is the advantage of the numerical VAS score. Higher scores indicate greater pain intensity.[8] Numerical VAS for measuring pain intensity has been used for SRP with various injection techniques.[9] In this study VAS was used to measure both the pain intensity at the time of injection and during the SRP procedure. Results indicate no significant difference between both the nerve block techniques. This result was similar to the results by Shirmohammadi et al[10] in which they have compared the AMSA with conventional infiltration for periodontal surgery. However, Sculean et al[7] reported lower level of pain with AMSA as compared to conventional palatal injection for non-surgical periodontal treatment.

Time required for the administration of the injection was recorded for AMSA and conventional nerve block technique. As AMSA required a slow rate of administration (0.5 mL/minutes) the approximate time required for it was 3 to 4 minutes. For conventional nerve block as multiple injections were carried out, the difference in

time required for both the techniques was not significant. Also the time required for SRP under both the nerve block techniques was similar. For the entire duration of the procedure patient was comfortable and did not require additional anesthesia.

For the onset of anesthesia subjective symptoms that is sensation of firmness and numbness on the palatal tissue for palatal injections while numbness of the upper lip, side of the nose and lower eyelid for infraorbital nerve block were recorded. Patients were asked for the symptoms every 30 seconds. According to the results AMSA took significantly greater time for the onset as compared to the conventional nerve block technique. It can be hypothesized that the relative delayed onset of AMSA may be due to the diffusion time required by the anesthetic solution through the nutrient canals to act on the subneural plexus of the ASA nerve.[11]

Electric pulp tester was used to measure the effectiveness of the pulpal anesthesia. Electric pulp testing works on the premise that electrical stimuli can cause an ionic change across the neural membrane, thereby inducing an action potential with a rapid hopping action at the nodes of Ranvier in myelinated nerves.[12] The "circuit" was completed via the patient's lip clip. Patient was informed to report for a "tingling" sensation once the increasing voltage reaches the pain threshold. As this threshold level varies between patients and teeth, and is affected by factors, such as individual age, pain perception, tooth surface conduction, and resistance, absence or presence of pain with highest value of pulp tester was recorded after the onset of anesthesia. Anesthesia was considered successful when no response was noted at the reading of 65 on digital display of pulp tester. A significant difference for pulpal anesthesia was present for maxillary central and lateral incisor between the groups. Inadequate anesthesia was obtained with AMSA technique for maxillary incisors. The results were similar to the results obtained by Lee et al[11] while testing the efficacy of AMSA nerve block. The low anesthesia percentages for the central and lateral incisor could be attributed to an increased presence of the MSA nerve in the patients of the study. Thus, in such cases, the MSA nerve is anesthetized, and not the ASA nerve, due to its distance from the puncture site. However, the exact role of the absence of the MSA nerve in the AMSA nerve block success is not known.[13]

Transgingival probing on both buccal and palatal soft tissue was carried out to measure the effectiveness of anesthesia for soft tissue. There was no significant difference present for soft-tissue anesthesia for both the technique. Thus AMSA was as adequate as conventional nerve block technique for soft-tissue anesthesia.

Anterior middle superior alveolar technique does not anesthetize the muscles of facial expression and upper lip as compared to conventional nerve block technique, thus adding an advantage of increasing patients comfort and for recording smile line during the aesthetic procedures.

Anterior middle superior alveolar was more preferred by the patients as compared to conventional nerve block. The reason may be single prick for injection and no anesthetic effect on muscles of facial expression and upper lip.

The AMSA nerve block offers several advantages like single injection, less amount of anesthetic solution, avoids collateral anesthesia of face, hemostatic control at donor site for connective tissue graft, and esthetic procedures like evaluation of smile line during crown lengthening can be performed even after anesthesia.[14,15]

CONCLUSION

Within the limitation of the study, it can be concluded that AMSA nerve block technique was equally effective as conventional nerve block technique for SRP with maxillary anteriors and premolars. Anterior middle superior alveolar was more preferred by the patients as it provides a large area of anesthesia with a single prick and absence of collateral anesthesia as compared to conventional nerve blocks. Anterior middle superior alveolar can also act as an excellent nerve block during free gingival and connective tissue grafts.

REFERENCES

1. Van der Weijden GA, Timmerman MF. A systematic review on the clinical efficacy of subgingival debridement in the treatment of chronic periodontitis. J Clin Periodontol 2002;29 (Suppl 3):55-71.
2. Perry DA, Gansky SA, Loomer PM. Effectiveness of a transmucosal lidocaine delivery system for local anaesthesia during scaling and root planing. J Clin Periodontol 2005 Jun;32(6):590-594.
3. Susin C, Valle P, Oppermann RV, Haugejorden O, Albandar JM. Occurrence and risk indicators of increased probing depth in an adult Brazilian population. J Clin Periodontol 2005 Feb;32(2):123-129.
4. Fukayama H, Yoshikawa F, Kohase H, Umino M. Efficacy of anterior and middle superior alveolar (AMSA) anesthesia using a new injection system: The Wand. Quintessence Int 2003; 34: p. 537-541.
5. Loomer PM, Perry DA. Computer-controlled delivery versus syringe delivery of local anesthetic injections for therapeutic scaling and root planing. J Am Dent Assoc 2004 Mar;135(3):358-365.
6. Friedman MJ, Hochman MN. A 21st century computerized injection system for local pain control. Comped Contin Educ Dent 1997 Oct;18(10):995-1004.
7. Sculean A, Kasaj A, Berakdar M, Willershausen B. A comparison of the traditional injection and a new anesthesia

technique (The Wand®) for non-surgical periodontal therapy. PERIO – Periodontal Pract Today 2004;1:363-368.
8. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain. Arthritis Care Res 2011 Nov;63 (Suppl 11): S240-S252.
9. Nicholson JW, Berry TG, Summitt JB, Yuan CH, Witten JM. Pain perception and utility: a comparison of the syringe and computerized local injection techniques. Gen Dent 2001 Mar-Apr;49(2):167-172.
10. Shirmohammadi A, Faramarzi M, Lafzi A, Kashefimehr A, Malek S. Comparison of pain intensity of anterior middle superior alveolar injection with infiltration anesthetic technique in maxillary periodontal surgery. J Periodontal Implant Sci 2012 Apr;42(2):45-49.
11. Lee S, Nusstein J, Beck M, Weaver J. Anesthetic efficacy of the anterior middle superior alveolar (AMSA) injection. Anesth Prog 2004;51(3):80-89.
12. Chen E, Abbott PV. Dental pulp testing: a review. Int J Dent 2009;2009:365785.
13. Velasco I, Soto R. Anterior and middle superior alveolar nerve block for anesthesia of maxillary teeth using conventional syringe. Dent Res J 2012 Sep-Oct;9(5):535-540.
14. Holtzclaw D, Toscano N. Alternative anesthetic technique for maxillary periodontal surgery. J Periodontol 2008 Sep;79(9): 1769-1772.
15. Patel JJ, Asif K, Aspali S, Rao TRG. New anesthetic technique in periodontal procedures. J Indian Soc Periodontol 2012 Apr-Jun;16(2):253-255.