

Anterior and middle superior alveolar block is efficient for maxillary premolar teeth extractions regardless of the injection system or anesthetic with adrenaline used

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SUMMARY

Introduction The anterior and middle superior alveolar nerve block was claimed to be unpredictably efficient for clinical application.

Objective The aim of this report was to establish the efficacy of the anterior and middle superior alveolar nerve block, applied with a computer-controlled injection system or a conventional syringe, for upper premolars extraction.

Methods Sixty healthy adults were divided into two groups regarding the device used as follows: the first group was injected by a computer-controlled injection system, and the second group by a conventional syringe. Pain ratings were obtained via a visual analog scale (VAS) and a verbal rating scale (VRS).

Results Anterior and middle superior alveolar injection enabled a painless extraction in all patients, regardless of the local anesthetic or injection system used. It was slightly less painful when administered by a computer-controlled injection system, but insignificantly when evaluated by VRS.

Conclusion The anterior and middle superior alveolar nerve block may be recommended if maxillary permanent premolars have to be extracted.

Keywords: nerve block; hard palate; analogue pain scale; tooth extraction

INTRODUCTION

Local anesthesia needed for tooth extraction in the maxilla is generally achieved by a supra-periosteal infiltration injection. However, this technique is sometimes inadequate for relieving pain during extraction in cases of teeth affected by periodontal infection; also, paresis of muscles of facial expression, which occurs to some degree, may interfere with esthetic dental work in the region. The anterior and middle superior alveolar (AMSA) nerve block, introduced in 1998 is an alternative technique that could solve the mentioned problems [1]. It derives its name from the fact that both the anterior and the middle (if existing) alveolar nerves are blocked, thus providing anesthesia of several maxillary teeth (including incisors, canines and premolars) [2].

Several studies have shown that AMSA nerve block provides for variable pulpal anesthesia of the mentioned teeth [3, 4, 5]. However, in some researches it was claimed to be too unpredictable in its efficiency to be recommended for clinical application as the first choice [3]; some others, however, ascertained quite efficient anesthesia when a computer-controlled injection system was used [4], or

at least more successful than the AMSA nerve block achieved by use of a conventional syringe [5]. It was stressed that additional advantage of the use of computer-controlled injection system over conventional syringe is less pain during the injection, which is especially important for palatal injections [1, 4, 6]. Nevertheless, there are also reports on the same pain level, mainly of a low intensity, during injection regardless of the injection system used [7].

Interestingly, there are no available studies in literature concerning the efficacy of the AMSA injection in enabling painless permanent maxillary teeth extraction. However, there are results on the AMSA nerve block efficacy for the removal of maxillary primary molars, indicating approximately the same efficacy as that achieved by traditional suprapariosteal injection [8]. Using the AMSA nerve block in patients undergoing extraction of maxillary premolars, Nusstein et al. [9] found no statistical difference in comparison to routine suprapariosteal injection, and found that the incidence of postinjection pain and sequelae was low with both techniques. It was hypothesized that the AMSA nerve block will ensure a painless extraction of permanent maxillary premolars regardless of the local anesthetic or

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injection device used, but that the use of a computer-controlled injection system will enable a less painful delivery of local anesthesia.

OBJECTIVE

The aim of this study was to establish the efficacy of the AMSA nerve block for tooth extraction, applied with a computer-controlled injection system or a conventional syringe, when local anesthetics with different contents of adrenaline were used. An additional aim was to compare the pain experienced when a computer-controlled injection system was used to that of conventional syringes.

METHODS

The clinical trial was conducted at the Department of Oral Surgery, Medical Faculty in Foča, Bosnia and Herzegovina.

Patients

The study protocol was approved by the Ethical Committee of the Faculty of Medicine (registration number 01-8/8, issued 11/2/2009) and conducted in accordance with accepted ethical standards for research practice (guidelines of the Declaration of Helsinki of 1975, as revised in 1983). All participants signed an informed consent form.

Sixty healthy adults randomly selected from patients visiting the Department, requiring extraction of a single upper premolar, participated in the study. They were of both gender, otherwise healthy (determined by a written medical health form), ranging from 18 to 65 years of age, and not taking any medication that could alter their pain perception.

The patients were informed that computer-controlled and conventional injection techniques were being studied. All patients were divided into two groups regarding the device used for applying the AMSA nerve block: the first group received the AMSA nerve block by a computer-controlled injection system (Figure 1), using the Anaeject computer-controlled local anesthetic delivery system (Septodont, Saint-Maur-des-Fossés, France), and the second group received the AMSA block by a conventional syringe with carpules. All the patients had previously experienced a conventional syringe, but no one had previously received a computer-controlled injection.

Each group was subdivided into three subgroups depending on the content of adrenaline in the local anesthetic used – 0.9 mL of 3% mepivacaine plain (Septanest®, Septodont), 0.9 mL of 4% articaine with adrenaline 1:100,000 (Ubistesin™ forte, 3M Deutschland GmbH, Seefeld, Germany), and 0.9 mL of 2% lidocaine with adrenaline 1:80,000 (Xylestesin®, 3M Deutschland GmbH).

All the patients received the AMSA nerve block as previously described for local anesthesia preceding tooth ex-



Figure 1. Anaeject computer-controlled local anesthetic delivery system (Septodont, France)



Figure 2. The AMSA nerve block done with slight hyperextension of the neck

traction [1, 2]. They were positioned supine on the dental chair with slight hyperextension of the neck in order to provide good accessibility and visibility (Figure 2), and informed that the procedure will last slightly longer than usual, especially in the first group that received a computer-controlled injection (approximately 3 minutes).

The pain ratings were explained to the patients before the injection. Verbal pain level descriptions for the pain experienced during the injection were as follows: no pain (0), minimal pain (1), slight pain (2), moderate pain (3) and severe pain (4). The participants provided written and verbal pain ratings via a visual analog scale (VAS) – written, and a verbal rating scale (VRS) – verbal, immediately after the injection. The operator obtained the visual analogue scale filled in for evaluation of possible pain experienced during tooth extraction from each patient immediately after surgery.

Statistical analysis

Data was analyzed using descriptive statistical methods (frequency percentages, means and standard deviations) and Wilcoxon's test using SPSS ver. 13 (SPSS Inc., Chicago, IL, USA). Statistical significance was defined at $p < 0.05$.

RESULTS

The AMSA injection enabled, plainly speaking, a painless extraction in all the selected patients, regardless of the local anesthetic or injection system used, and without statistical significance (Table 1). Descriptions of pain level varied between “no pain” and “minimal pain,” not once being defined as worse or intolerable for tooth extraction (data not presented).

Experience of pain during the AMSA injection differed more, especially when reported by VAS (Table 2) – the greatest difference was noticed when local anesthetic without vasoconstrictor was used. However, when pain during the AMSA injection was evaluated by VRS, the differences were not significant (Table 3); the patients described the injection mostly by expressions “no pain” or “minimal pain,” and only six out of 30 patients from the group who received the AMSA nerve block by conventional syringe experienced “slight pain” (Table 3). Regardless of the pain rating scale used, the pain was slightly stronger in patients who received the AMSA nerve block with conventional syringe (in comparison to those who received the AMSA nerve block with a computer-controlled injection system), but the differences were mostly non-significant (Tables 2 and 3).

Table 1. Intensity of the achieved local anesthesia (painless tooth extraction) after the AMSA injection done by a computer-controlled injection system and conventional syringe

Local anesthetic	Intensity of anesthesia (VAS)		Statistical significance
	Computer-controlled injection system	Conventional syringe	
3% mepivacaine plain	99 ± 1.63	98.3 ± 2.50	ns
2% lidocaine/adrenaline (1:80,000)	99.5 ± 1.27	99.5 ± 0.85	ns
4% articaine/adrenaline (1:100,000)	99.2 ± 1.40	98.9 ± 1.73	ns

VAS – visual analogue scale: maximum intensity – 100 mm;
no anesthesia – 0 mm
ns – not significant

Table 2. Pain experienced during the AMSA injection, expressed by the visual analogue scale (VAS)

Local anesthetic	Pain during the AMSA injection		Statistical significance (p)
	VAS (mm)*		
	Computer-controlled injection system	Conventional syringe	
3% mepivacaine plain	0.7 ± 1.16	3.1 ± 2.38	p = 0.01
2% lidocaine/adrenaline (1:80,000)	0.7 ± 1.49	1.7 ± 1.64	ns
4% articaine/adrenaline (1:100,000)	0.8 ± 1.32	2.9 ± 2.38	p = 0.03

*maximum intensity – 100 mm; no anesthesia – 0 mm
SD – standard deviation; ns – not significant

Table 3. Pain experienced during the AMSA injection, expressed by the verbal rate scale (VRS)

Local anesthetic	Pain during the AMSA injection*											
	Computer-controlled injection system						Conventional syringe					
	0	1	2	3	4	X ± SD	0	1	2	3	4	X ± SD
3% mepivacaine plain	7	3	-	-	-	0.3 ± 0.48	2	6	2	-	-	1.0 ± 0.67
2% lidocaine/adrenaline (1:80,000)	8	2	-	-	-	0.2 ± 0.42	4	5	1	-	-	0.7 ± 0.67
4% articaine/adrenaline (1:100,000)	7	3	-	-	-	0.3 ± 0.48	2	5	3	-	-	1.1 ± 0.74

*0 – no pain; 1 – minimal pain; 2 – slight pain; 3 – moderate pain; 4 – severe pain
X – mean value; SD – standard deviation

DISCUSSION

The main aim of this research was to evaluate efficacy of the AMSA nerve block in providing adequate local anesthesia for extraction of permanent upper premolars. Interestingly, it was difficult to find data concerning that particular matter in related literature. There are results on AMSA nerve block efficacy for removal of maxillary primary molars, indicating approximately the same efficacy as that achieved by traditional supraperiosteal injection [8]. However, two of 30 patients receiving the AMSA nerve block experienced severe pain during tooth extraction (it is not stated whether a supplemental anesthesia was needed and which teeth were extracted in these two patients).

In our study, regardless of the injection device and local anesthetic used for inducing the AMSA nerve block, the obtained anesthesia was sufficient for painless tooth

extraction in all the patients. It is especially interesting that extraction of permanent maxillary premolars was painless or with minimal pain even in patients where local anesthetic without a vasoconstrictor (3% mepivacaine plain) was used. The differences between the devices used (a computer-controlled injection and a conventional syringe) were also insignificant. These results point out the predictable efficacy of the AMSA nerve block in achieving local anesthesia needed for permanent premolars extraction, regardless of the local anesthetic used.

It is well known that palatal injections are, generally speaking, more painful than injections at other sites in the oral cavity [2]. It is usually claimed that computer-controlled delivery systems enable less painful palatal injections compared to those with conventional syringes [1, 4, 6], although there are also different findings [7]. That is why we aimed to evaluate both delivery systems in terms of painlessness of the injection. Our results show that the AMSA nerve block is not as painful as it is usually claimed for palatal injections, possibly due to relatively slow anes-

thetic delivery regardless the device used. However, our results point to some differences in regard to the scale used for pain rating; although both scales (VAS and VRS) pointed to the fact that patients experienced less pain when a computer-controlled injection device was used; however, a conventional syringe was also tolerated very well and it can be said that patients did not experience even moderate pain during the AMSA nerve block, regardless of the injection device used. Comparing the pain experienced during the AMSA nerve block in regard to the injection device used, statistically significant differences were noted only with VAS ratings. The fact that VRS ratings, with the same patients and in the same situation, were similar and insignificantly different, might point to the fact that patients, especially in small and mainly rural milieus, understand VRS better than VAS.

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CONCLUSION

Having in mind all the presented results, our experience with the AMSA nerve block used for local anesthesia needed for maxillary permanent premolars extraction is quite favorable. Therefore, the AMSA nerve block may be recommended if maxillary permanent premolars have to be extracted.

NOTE

This paper is a part of the PhD dissertation titled „The Influence of Adrenaline in Local Anaesthetic Solution on the Characteristics of Anterior and Middle Superior Alveolar Nerve Block Achieved by Palatal Approach“ by Slavoljub Tomić.

Блок предњих и средњих горњих алвеоларних нерава је ефикасан за вађење горњих сталних премолара без обзира на прибор за апликацију и врсту локалног анестетика

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КРАТАК САДРЖАЈ

Увод Ефикасност блока предњих и средњих горњих алвеоларних нерава у клиничкој примени је непредвидљива.

Циљ рада Циљ овог истраживања је био да се утврди ефикасност блока предњих и средњих горњих алвеоларних нерава, апликованог компјутерски потпомогнутим системом за континуирану апликацију анестетика или стандардном карпул бризгалицом, за вађење горњих премолара.

Методе рада Шездесет здравих одраслих особа подељено је у две групе у зависности од система за апликацију: прва група је инјекцију примила компјутерски потпомогнутим системом за континуирану апликацију анестетика и друга је анестетик примила стандардном карпул бризгалицом. Ниво бола је оцењиван путем визуелно аналогне скале (ВАС) и вербалне скале (ВС).

Резултати Блок предњих и средњих горњих алвеоларних нерава омогућио је безболно вађење зуба код свих пацијената, без обзира на коришћени локални анестетички раствор и начин апликације. Нешто је мање болно било код пацијената код којих је анестетик администриран компјутерски потпомогнутим системом за континуирану апликацију локалног анестетика, када је процењивана ВС, али је то безначајно.

Закључак Блок предњих и средњих горњих алвеоларних нерава се може препоручити за вађење горњих сталних премолара.

Кључне речи: нервни блок; тврдо непце; аналогна болна скала; вађење зуба