

**Review Article****Relationship between Dental Pulp Stone with the Success of Local Anesthesia for Maxillary Molars with Irreversible Pulpitis****Mousavi E<sup>1\*</sup> and Heshmati M<sup>2</sup>**<sup>1</sup>Assistant professor of endodontic, Dental science research center,  
Faculty of dentistry, Guilan University of Medical Sciences, Rasht, Iran.<sup>2</sup>General dentist. Tehran. Iran\*Corresponding Author: Elnaz Mousavi, [elnaz32@gmail.com](mailto:elnaz32@gmail.com)**ABSTRACT**

**Background:** The full anesthesia of dental pulp occurs when teeth do not respond to provocations of the electric pulp tester (EPT). **Aim:** the aim of the study was to determine the effect of pulp stone on the success of local anesthesia. **Methods:** Cross-sectional study was conducted on 70 patients. The presence of pulp stone confirmed by endodontist, then divided into two groups, teeth without pulp stone group and teeth with pulp stone group. The examination and diagnostic test of pulp vitality were performed. The cold and heat and electric pulp tests were done. Standard infiltration injection of buccal maxillary was done on the area between the apex of the mesiobuccal and distobuccal roots of the tooth. The teeth were retested by EPT 5 minutes after the injection at intervals of 2.5 to 10 minutes. A manual cavity was prepared on the teeth and any pain during milling was recorded based on visual analogue scale (VAS). In the moderate or severe pain (VAS>4), anesthesia failure was recorded and supplementary anesthesia or anesthesia inside of the pulp was performed in patient. **Findings:** The patients without pulp stone EPT response after anesthesia were 100% while in patients with pulp stone was 88.6%. The successful anesthesia rate in first and the second molars on both right and left sides in patients without pulp stone was higher than patients with pulp stone (P<0.0001). Success rate of anesthesia in patients a 30-50 years and older than 50 years was higher (P<0.0001). Success rate of anesthesia was higher in men and women without pulp stone (P<0.001). The patient's subjective experience was effective on success rate of anesthesia (P<0.001). **Conclusion:** Findings suggested the failure rate of anesthesia was more in molars with pulp stone.

**Keywords:** Pulp stone, Local anesthesia, Molar teeth, Irreversible pulpitis**INTRODUCTION**

Anesthesia of the mucous does not considered as appropriate criteria for full teeth anesthesia. 1-4 The full anesthesia of dental pulp occurs when teeth had no respond to provocations of the electric pulp test (EPT). 1, 5-7 Therefore, in the conducted studies, determining of the anesthesia depth at different times consider as the maximum effect in anesthesia of dental pulp and as success criteria for anesthesia. The pulp stone are the foci of the calcification in dental pulp and found in crown areas and root canal. 8 The pulp stones formation increases due to effect of the local chronic irritation such as periodontal diseases,

decay, deep tooth restorations and orthodontic movement of teeth. Despite numerous studies investigated the prevalence of the pulp stones, different results reported based on location, age, dental health and systemic diseases. Based on the reports, the prevalence of the pulp stones range from 4.8 to 41% and their frequency is higher in molars than premolars. Also, higher rate was found in maxillary molars compared to the mandibular molars. 9-13 It is reported a connection exists between the pulp stone and idiopathic pains. 8 Pulp stone is one of the factors which can affect anesthesia, because the potential

foci of the pulp stone are associated with blood vessels and nerves. 14 Recently, it is reported no significant difference on success rate of the anesthesia by injection of the lidocaine 2% or articaine 4% into the first maxillary buccal molar with irreversible pulpitis. Regardless of the anesthetic, the length of the palatal root had negative effect on success of anesthesia. A relationship observed between length of the palatal root and anesthesia failure 15. Researchers evaluate the amount of anesthesia obtained from infiltration 1.8 ml injection and lidocaine (3.6 ml) containing 1.100000 epinephrine. 16 Based on the results, no significant difference was observed on the onset of the anesthesia. For both volumes, the lateral incisor had a greater short-term anesthesia success rate compared to the first premolar and first molar. However, longer anesthesia time observed using volume of 3.6 ml. 16 Since deep anesthesia is a key factor in the determination of a patient's experience and his assessment of dentistry, the aim of the current study was to determine the effect of pulp stone on the success of local anesthesia.

### MATERIAL & METHODS

In this cross-sectional study was conducted on 70 patients admitted to dental clinic of Guilan University of Medical Sciences, Rasht, Iran. Inclusion criteria for the study were age 18-60 years, the need for root canal therapy, first or second maxillary molars with irreversible pulpitis, teeth with vital pulp, lack of underlying diseases and/or comorbidities, not taking medications that affect the status of the pulp (NSAID, analgesics, sedatives), positive response to heat and cold testing, vitality of the pulp and long response to the cold test. The exclusion criteria were patients with systemic problems that were not able to receive anesthesia, pregnant and lactating patients, allergies, unwillingness to cooperate entire the study, lack of pulp stone after preparing a manual cavity. By considering the confidence range of 95%, power test of 90%, the difference of 8.4% and based on similar studies 9, the obtained sample size was 70 patients. The patients were

divided into two groups including: teeth without pulp stone group (control group) and teeth with pulp stone group (case group). The presence of the pulp stone was confirmed by an endodontist based on the periapical radiographic findings. The examination and diagnostic test of the pulp vitality were performed. The cold and heat and electric pulp tests were done. Standard infiltration injection of the buccal maxillary was done on the area between the apex of the mesiobuccal and distobuccal roots of the tooth. The numbness of the soft tissue was checked and in the case of lack of numbness, infiltration injection was repeated. Teeth were retested by the EPT test at 5 minutes after the injection by intervals of 2.5 to maximum of 10 minutes. The criterion for determining the anesthesia success was 2 consecutive negative responses to maximum EPT stimulation in 10 minutes. In the case of positive response to pulp test, injection was repeated. Then, a manual cavity on teeth was prepared and any pain during milling was recorded based on the VAS scale (Figure 1). In the moderate or severe pain (VAS>4), anesthesia failure was recorded and supplementary anesthesia or anesthesia inside of the pulp was performed in patient.

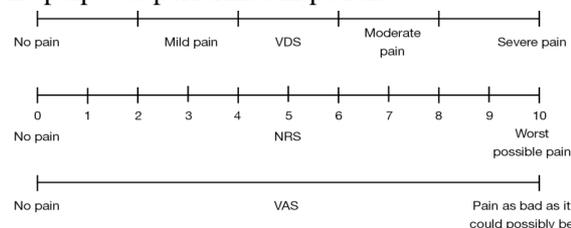


Figure1. The VAS pain scale

Finally, the data analyzed using analysis of variance (ANOVA) and is presented as the mean  $\pm$  Sd. For treatments found to have an effect according to the ANOVA, mean values were compared with Bonferroni test.  $p < 0.05$  were considered to indicate significant differences between the treatments.

### RESULTS

The demographic index of the patients is presented in table 1. In this study, 55.7% of samples were women and 44.3% were men. The average age of participants was  $39.1 \pm 11.7$  (Table 1). Out of the 35 patients with pulp stone, 17

patients were men (48.6%) and 18 were women (51.4%) and out of the 35 patients without pulp stone, 14 patients were men (40%) and 21 were female (60%). The type of teeth in patients with pulp stone in 22 cases were first maxillary molars (62.9%) and 13 were second maxillary molars (37.1%), while in patients without pulp stone, 18 cases were first maxillary molars (51.4%) and 17 were second maxillary molars (48.6%). The both side in the patients with pulp stone in 15 cases was right (42.9%) and 20 cases was left (57.1%), while in patients without pulp stone in 17 cases was right (48.6%) and 18 cases was left (51.4%).

The success rate of the anesthesia in patients with and without pulp stone is shown in table 2. As seen, the EPT negative response after anesthesia in patients without pulp stone was 100% and in patients with pulp stone was 88.6% (P = 0.057). In 8.6% of the patients without pulp stone moderate and severe pain during milling was observed while in patients with pulp stone it was 71% (P<0.0001).

According to the results, successful anesthesia rate in both first and second molar teeth on both the right and left sides in patients without pulp stone was significantly higher than the patients with pulp stone (P<0.0001). No significant difference observed on the success rate based on the teeth type with pulp stone (P=0.599) and teeth without pulp stone (P=0.478). The success rate between two types of teeth in terms of engaged side had not significant (P>0.05). Success rate of the anesthesia was significantly higher in men and women without pulp stone compared to the patients with pulp stone (P<0.001). The patient's subjective experience was effective on success rate of anesthesia (P<0.001). The success rate of the anesthesia in patients without pulp stone and with pulp stone were 93.9 and 29.6%, respectively (P<0.001). The success rate of the anesthesia in patients aged 30-50 years old and 50> years old as well as patients without pulp stone was higher than patients with pulp stone (P<0.001).

**Table 1.** The demographic index of the patients.

	Number	Percent	Sd	Minimum	Maximum
<b>Sex</b>	Male	31	44.3		
	Female	39	55.7		
	Total	70	100		
<b>Type of tooth</b>	First maxillary molar	40	57.1		
	Second maxillary molar	30	42.9		
	Total	70	100		
<b>The involvement side</b>					
<b>Left side</b>	45.7	32			
<b>Right side</b>	54.3	38			
	Total	70	100		
<b>Age</b>		11.7	39.1	18	
<b>Pulp Stone</b>	yes	35	50		
	no	35	50		
<b>Before getting started EPT</b>		52.14	11.2	30	

**Table 2.** rate of anesthesia in patients with and without pulp stone

		Pulp stone				P Value
		Yes		No		
		Numbers	Percentage	Numbers	Percentage	
EPT after Anesthesia	No response to EPT	31	88.6	35	100	0.039
	Response to EPT	4	11.4	0	0	
	Total	35	100	35	100	
Pain during milling (VAS)	Has no pain	9	29	32	91.4	<0.0001
	Has pain	22	71	3	8.6	
	Total	31	100	35	100	
The result of anesthesia	Success	9	25.7	32	91.4	<0.0001
	Failure	26	74.3	3	8.6	
	Total	35	100	35	100	

## DISCUSSION

Effective anesthesia is one of the essential provisions for root canal treatment. 8,14 Pulp stone is one of the factors affect the pulp anesthesia. As seen in this study, buccal infiltration injection was carried out alone and without palatal injection, because not only palatal injection is painful, 17 but also to compare infiltration injection plus infiltration injection palatal injection had no significant difference to the reports by Askari 1, Hoseini 15 and Ulusoy. 18

In the present study, lidocaine 2% with epinephrine 1.80000 was used in volume of 1.8 ml as routine volume in dentistry which was in accordance to the previous reports by Askari 3, Kanna 19 and Hoseini. 15 However, in reports by Aggrawal 17 and Hsiao 3 lidocaine administrated in concentration of 1.200000 and 1.100000. In this study, teeth with irreversible pulpitis were reported without persistent pain which was similar to the previous report 3, while the teeth with symptomatic irreversible pulpitis as studied by Mehrvarzfar 20. Some studies began the treatment 5 minutes or earlier after the anesthesia injection 1, 15, 18 whereas, the evaluation of the numbness in maxillary molars with irreversible pulpitis after 15 minutes studied by Aggrawal et al 17. There is no previous report on the impact of the time between applying anesthesia and initiation of the therapy in teeth with irreversible pulpitis. So, to our knowledge this study was the first report for impact of time between applying anesthesia and initiation of therapy in teeth. In this study, EPT was performed 5 minutes after the injection for evaluating the initial effect and similar to reports 19 which the maximum time to initiate the therapy was considered as 10 minutes.

Based on new findings, the EPT was used as a measuring instrument, because of evaluation with it is easily possible and then numerous studies reported it as the criterion for evaluation. 2, 6, 19, 20, 21 The VAS scale was only used for determining the severity of the pain (the depth of anesthesia) during the preparation of the manual

cavity, in order to achieve reliable clinical results. Numerous studies were used this tool for assessing the patient's pain and pulp numbness during access cavity preparation and root canal preparation. 1-3, 15, 17, 18, 20, 21 The results of the current study showed the success of anesthesia in teeth with irreversible pulpitis and pulp stone is significantly lower than teeth with irreversible pulpitis and without pulp stone.

In the present study, all the teeth were asymptomatic of soft tissue, which similar to previous reports suggest symptoms of the soft tissue are not reliable indication of local anesthesia. 2, 3, 6 The percentage of the moderate and severe pain (VAS = 4) in the patients without pulp stone in patients was 8.6% while in patients with teeth containing pulp stone was 74.3%, which this matter was not reported in previous studies. Our findings were suggested despite there was no significant difference between positive and negative experiences in the two groups, in general, the patient's subjective experience affects the success of pulp anesthesia and patients with a positive experience had greater success rate. Because of the scarce existing information on this field and no previous report, in the current study we were not able to find exact report to compare our findings with it. The success of anesthesia was confirmed 100% using electrical testing, which was consistent with studies by Ulusoy 18 and Askari 3. For patients with irreversible pulpitis, 8.6% of people who had a negative response to the EPT, experienced pain during access cavity preparation, which was 3.4% higher than the report by Mehrvarzfar 20.

## CONCLUSION

In conclusion, based on the results of the current study, high failure rate of anesthesia in molars with pulp stone and irreversible pulpitis in the maxillary showed the negative impact of pulp stone on pulp anesthesia. Gender and age, the type of teeth and engaged side had no effect on success rate of anesthesia. Also, the subjective experience of patient was effective on success rate of

anesthesia. Results of the current study can use as a base information for incoming researches. It is suggested further researches needed to determine possible negative or weak points of this method to improve application of this method in clinical trial.

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