

# TEMPERATURE DIFFERENCE OF LOCAL ANESTHESIA AND ITS EFFECTS ON INJECTION PAIN: A DOUBLE BLINDED RANDOMIZED CLINICAL TRIAL

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## ABSTRACT

*Objective of the study were to assess the difference between pain perception of two different temperature anesthesia when injected at two different sites in a split mouth technique. It was a double blinded randomized clinical trial. All the participants and one researcher were kept blinded throughout the research. For this study 50 volunteers were selected by systematic random sampling method from 150 dental volunteers. It is a split mouth technique in which two different sites were randomly selected for anesthetic procedure. Different temperature anesthetics were injected at buccal sulci using infiltration technique. All volunteers were asked for pain perception at the injected site by using visual analogue scoring scale (VAS). The data were collected and analyzed using SPSS (version 16), cross tabulation was done in order to differentiate the pain perception on injecting local anesthesia at two different temperature. The participants who received warm local anesthetic injection at one site perceived less pain as compared to the other site where anesthesia was injected at room temperature. The present study concluded that warming local anesthesia at 42°C reduces pain perception as compared to the anesthetic injection at room temperature 22°C.*

**Key Words:** Temperature difference, local anesthesia, injection pain.

## INTRODUCTION

Local anesthetic agents are widely being used in all aspects of surgical procedures whether it belongs to general surgery or dental surgery. The fear and anxiety of the injection is a constant feature in almost all patients. Most of the patients avoid even the regular checkups just because of this phobia of pain due to needle prick.<sup>1,3</sup>

There are number of factors allied with the pain felt during dental injections, such as location of injection, amount of injected anesthetic fluid, injection rate and proficiency of the dentist. Psychological factors play an important role in the perception of pain.<sup>2</sup> Injection of local anesthesia usually elicits direct tissue irritation which results in pain.<sup>3</sup>

Numbers of ways have been used to reduce the injection pain in general surgical procedures for example

eye surgeries.<sup>3</sup> One way of reducing the injection pain is to warm the anesthetic solution prior to injection. Experiments on pain perception during the injection of anesthetic solution at 10°C, 18°C, 37°C and 42°C in trigeminal area have shown a linear relationship between increases in the anesthetic temperature and reduction in the pain perception.<sup>1</sup> Also, previous reports have shown effectiveness of warming anesthetic solution in areas of the head and neck. The perception of lower intensity of pain was noted during injection using 2% procaine and 1:200,000 epinephrine at 37°C in cataract surgery and 1% lidocaine and 1:100,000 epinephrine between 40°C to 54.4°C in dermatology.<sup>9</sup> Rogers et al stated that in dental students, warm anesthetic injections were more comfortable than at room temperature, anesthetic agents. A recent systematic review evaluates the effectiveness of the warm anesthetic injections in controlling pain when tried at different sites of the body.<sup>5</sup>

Alonso et al reported that warm anesthetic agent at 42°C produces less pain when compared with anesthetic agent at 21°C.<sup>6</sup> The aim of this study was to find out whether warming of local anesthetic agents significantly reduces the pain at injection site in split mouth technique with 1:100,000 epinephrine, lidocaine at two different temperatures 42°C and 22°C.

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## METHODOLOGY

It was a split mouth technique in which both left and right sites of maxilla were used for infiltration and these sites were selected randomly. On the study site, either left or right warmed anesthesia at (42°C) was injected and on the opposite site anesthesia at room temperature (22°C) was injected. Dental volunteers were from Dow International Dental College. Volunteers were selected between the ages 18-25 years regardless of the gender (both male and female), and did not have any pain or infection at injection site. Dental volunteers who were using NSAIDS (Non-Steroidal Anti-Inflammatory Drugs) treatment or on anti-depressant drugs were excluded. Study was contacted from (15<sup>th</sup> August to 15<sup>th</sup> November 2015. There were 50 volunteers. Systematic random sampling technique was used. Study tools consisted of 3 thermometers, incandescent light incubator, incubator made up of transparent glass of 5 mm thickness, 2 thermometers placed in incubator and one was placed in cold water incubator consisting of 4 bulbs of 25 watt. Voltage regulator was installed in order to maintain the temperature at 42°C. Medicaine cartridges were placed in cold water to maintain the temperature at 22°C and in a polythene bag so that water did not change or alter the physical properties of the rubber seal at both sides of the cartridges. Thinnest (30) gauge needles were used to reduce incidence of ulcer formation after anesthesia. Visual analogue scale (VAS) was used to assess the pain perception.

It was a split mouth technique in which both upper buccal sulci of the mouth were selected to perform the anesthetic procedure. There was no specific site for hot and cold anesthesia. Both the researchers were professionally experienced in providing dental treatment. As this was a double blinded study, the volunteers, and the dentist who was facilitating the principal investigator for injecting anesthetic cartridges to the volunteers were blinded for the temperature difference in anesthetic cartridges, while the principal investigator was aware of temperature difference. The medicaine injection was placed in incandescent light incubator in order to warm them up till 42°C and all other medicaine injections were placed in cold water in a polythene bag in order to keep them cold at 22°C. One cartridge of medicaine was composed of lidocaine with 1:100,000 epinephrine total volume of 1.8 ml. Each site received 0.9 ml of hot and cold anesthesia in buccal sulci of the molar region. All the procedure were done on dental chair by seating volunteers in supine position. As soon as the dentist injected the anesthesia to any of the site, the other dentist showed the (VAS) scale to the volunteer so they could mark the perception of pain felt on injection.

## RESULTS

Fifty volunteers were selected using K<sup>th</sup> method. Out of 50, ten were females and 40 were males, mean age was  $21.60 \pm 2.01$  years. Visual analogue scale was provided in order to mark the intensity of injection pain. Details can be seen in Table 1-2.

Wilcoxon's test was used in this study and computed p-value was 0.05. It was concluded that there was difference in injection pain on hot and cold maxillary infiltration.

TABLE 1: PAIN PERCEPTION FELT BY THE PARTICIPANTS WHEN HOT ANESTHESIA WAS INJECTED

Count Age	Hot_Anesthesia		Total
	No Pain	Pain	
18	2	1	3
19	5	0	5
20	6	2	8
21	10	4	14
22	7	1	8
23	5	0	5
24	3	1	4
26	1	0	1
27	2	0	2
Total	41	9	50

TABLE 2: PAIN PERCEPTION FELT BY THE PARTICIPANTS WHEN COLD ANESTHESIA WAS INJECTED

Count Age	Cold_Anesthesia		Total
	No Pain	Pain	
18	2	1	3
19	2	3	5
20	3	5	8
21	5	9	14
22	1	7	8
23	1	4	5
24	0	4	4
26	0	1	1
27	0	2	2
Total	14	36	50

## DISCUSSION

The use of injection is globally accepted in all surgical procedures but the fear and anxiety of needle pricking cannot be neglected.<sup>2</sup> The health care professionals and researchers are continuously in search to find the way, how to minimize the injection pain and discomfort. One way to lessen the pain is to warm the local anesthesia prior to injection.

A reduction in the perception of pain by injecting anesthetic solution at temperature equal to or greater than the body has been shown in different areas of medicine.<sup>5</sup> Injecting 0.5% prilocaine at 37°C reduces

the discomfort and pain in comparison with anesthetic at room temperature and concluded that there is a less discomfort and pain in general by applying pre warmed local anesthetic solution.<sup>8</sup> There is a great decrease in patient's discomfort if warmed local anesthetic agent was injected in retro bulbar and facial nerve injection.<sup>9</sup> Heating lignocaine to 43°C before infiltrative injection for local anesthetics in orthography, angiography and other interventional procedures reduces burning sensation during its administration.<sup>10</sup> Study conducted on 38 volunteers by mandibular nerve block technique and analyzed the results by using (VAS) recorded a significant difference between warm and room temperature anesthetic injection pain.<sup>11</sup>

Along with the positive results of warming anesthetic injections there are some studies that have not shown positive results. Oikarién et al did not find any significant difference between warmed and cold anesthetic agents on injection pain.<sup>12</sup> Another study conducted by Ram et al the researcher did not find any significant change when warm anesthetic agent was used in 6-11 years children.<sup>13</sup> It can be seen from the previous studies that warming or heating the anesthesia prior to injection reduces the pain. In our study it was found that when the anesthetic agent was injected at the temperature of 42°C. Study subjects felt less pain as compared to the anesthetic injection at temperature of 21°C.

### LIMITATIONS OF THE STUDY

In this study the males were more in number as compared to females and since there is a difference in level of perception of pain between both genders these results must be interperated with caution. Secondly the sample size was small so further prospective studies with larger sample size are needed to further ascertain the relationship of pain with temperature difference in anesthetic cartridges.

### CONCLUSION

Results of the current study showed that the volunteers experienced less pain at the site when warm anesthesia was injected. The dental procedures can be made more comfortable by experiencing lower perception of pain with warm anesthesia.<sup>14,15,16</sup> This will decrease the anxiety of the patient to the anesthetic injection during dental treatment. The use of domestic bottle warmer or incubator can considerably reduce the injection pain by warming the anesthetic agent.<sup>5,6,13</sup>

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### CONTRIBUTIONS BY AUTHORS

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| <b>1 Muhammad Zubair Yousuf:</b> | Concept, designing, research, data collection, drafting   |
| <b>2 Afsheen Maqsood:</b>        | Data collection, drafting                                 |
| <b>3 Azmina Hussain:</b>         | Concept, data analysis, critical revision, final approval |