ORIGINAL ARTICLE

COMPARISON OF PAIN PERCEPTION WITH INSULIN SYRINGE AND DENTAL INFILTRATION SYRINGE DURING LOCAL PALATAL INFILTRATION ANESTHESIA

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ABSTRACT

Local anesthesia is generally required in dentistry for many procedures. The palatal injection is considered to be quite distressful for the patient causing fear. This fear is an important factor which often leads to dental anxiety and patients avoiding dental treatment, requiring an alternative method which is both convenient and effective. Insulin syringes are considered to be quite comfortable for patients. The current study is designed to compare the pain response associated with palatal anesthesia using a conventional dental syringe with an infiltration needle and an insulin syringe. The study showed that with insulin syringe, only 16.28% of patients experienced severe painful response on VAS scores between 8-10 while in group B, 27.9% of patients showed a severe painful response. The results were significant with p value less than 0.05 and concluded that the insulin syringe does offer a comparatively less painful experience for the patient when compared with the dental infiltration syringe during local palatal infiltration.

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INTRODUCTION

Anesthesia is used in many dental procedures daily in the form of topical anesthetics like gel, pastes and sprays; however most dental procedures involve anesthetic solution to be injected locally in the form of blocks or simple infiltration techniques. The pain induced by these injections is one of the main causes of fear and anxiety among the dental patients.[1] Many patients are anxious about receiving injections so they avoid dental treatment. For example, in the Netherlands an estimated 16.1% of patients report fear of injections, and 1% of the population suffers from injection phobia.[1] It may be that some patients have had negative experiences in the past which have instilled an element of fear in them related to dental anesthesia. This may not always be true as many patients despite having no such negative experiences could still have anxiety because of their overestimation of fear and pain for procedures they did not experience themselves leading to increased anxiety.[2] The application of painless palatal anesthesia has always been a difficult task, and this demands an alternative technique that is both effective and convenient for the patient. Several factors are involved in reducing pain during dental injections such as size and design of dental needle, use of topical anesthesia, needle gauge size along with needle bevel sharpness and temperature of the anesthetic solution etc.[3] Prior to penetration of the needle, topical anesthetic agents as well as anesthetic agent heating or buffering have been used to reduce pain during injection.[4] Also clinical use of a slower delivery of anesthetic solution and topical pre-cooling have also been practiced. Other helpful methods, such as vibration implementation or pressure at the injection site, have been implemented.[5]

Giving local anesthesia painlessly promotes patient cooperation during dental procedures. Insulin syringes used by patients with diabetes mellitus are very comfortable for patients and can provide painless injections. Janani et al has concluded that pain perceived by insulin syringe during palatal infiltration was found to be significantly lower.[6] There are not many local studies comparing insulin syringe with dental infiltration needle to assess whether it can be used as an alternative. We hypothesized that insulin syringe causes less pain during palatal infiltration compared

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with the conventional dental infiltration needle. Therefore this study was undertaken to compare the pain response associated with palatal anesthesia using a conventional dental syringe with an infiltration needle and an insulin syringe.

MATERIALS AND METHODS

After taking approval from the ethical committee, a prospective study was done at operative department in Armed Forces Institute of Dentistry, Rawalpindi from 01 May to 31 October 2019. A sample size of 86 patients from 20-50 years of age was randomly distributed into two equal groups with the help of scientific random number table. Sample size was calculated using the WHO calculator. Keeping the power of test at 80% and level of significance at 95%, population proportions of Group 1= 6.7% and Group 2= 30%.[7]

Total sample size of 86 was calculated and was divided into two (2) equal groups.

Group A included patients that received palatal infiltration anesthesia using insulin syringe.

Group B included patients that received palatal infiltration anesthesia using the conventional dental infiltration needle.

All free entitled patients reporting to the Operative Dentistry Department of Armed Forces Institute of Dentistry, Rawalpindi requiring root canals of their maxillary posterior teeth were screened for inclusion by taking history, performing relevant clinical examination and necessary investigations along with peri-apical radiographs. The whole procedure of the study was explained to the patients in Urdu. After taking written informed consent from the willing participants of this study the procedure was started.

The inclusion criteria included patients with active pain due to symptomatic irreversible pulpitis in maxillary molars, vital pulp with electric pulp tester in preparing the access cavity and capacity to comprehend the pain scale. However patients who were highly anxious, medically compromised, uncooperative, patients on preoperative analgesics and antibiotics, teeth with calcified canals and open apex, previously traumatized teeth and root canal treated teeth along with immunocompromised patients, pregnant and lactating mothers were all excluded from this study.

The syringes used to administer local anesthesia in this study were the disposable U-40 insulin syringe and a conventional dental infiltration syringe. The U-40 insulin syringe is a 1ml syringe attached with a 30 gauge, 8 mm ultra-short needle. The dental infiltration needle is a 27 gauge 25 mm short needle attached to the dental plunger with a cartridge of local anesthetic solution inside.

The patient was placed in a supine position with the mouth wide open, neck extended and the head turned right or left according to the quadrant being anesthetized for improving visibility and access of the operator to the infiltration site. After taking informed consent and explaining full procedure to the patient the needle was inserted from the opposite side of the quadrant at a 45° with the palatal vault. The point of needle insertion is the attached gingiva 5 to 10mm from the free gingival margin along the long axis of tooth being anesthetized. The needle was pushed through the palatal soft tissue until the bone was hit, the needle was withdrawn a few mm and at least 0.3ml anesthetic solution was instilled slowly over a period of 1 minute. This procedure was repeated for both type of syringes in different patients and their pain response was recorded immediately after administering the local anesthetic injection using the visual analogue scale (VAS). VAS score 0 was considered as having no pain response. VAS scores from 1-3 was considered a mild painful response, 4-7 was considered a moderately painful response and 8-10 was considered a severe painful response.

Data was entered and analyzed using SPSS 22. Frequencies and percentages were presented for qualitative variable like post-operative pain. Mean and standard deviation were calculated for quantitative variables like age and gender along with their frequencies in each group. Chi-square test was to compare the frequency of pain between the two groups after administering anesthetic injection. A p value of less than 0.05 was considered significant.

RESULTS

Comparison between the baseline characteristics was done between the two groups. Mean age of group A was 33.43 ± 5.6 years and group B was 32.93 ± 6.5 years. The result of our study comparing insulin syringe and a conventional dental infiltration needle showed that 16.28% of patients recorded a VAS score of 8-10 for insulin syringe while for dental infiltration needle it was 27.9%. A p value of 0.28 was calculated which proved that there is association between the gauge of needle and pain during needle penetration. P values for gender in both groups were calculated to be less than 0.05. Thus our results showed association between gender and pain perception during anesthetic administration. The total males in both groups were 36.04% with only 9.6% experiencing severe pain. While the total females sample size was 64% out of which 29.1% reporting severe pain during the procedure.

DISCUSSION

Dental treatment demands good cooperation and compliance of the patient. In dentistry, local anesthetic injections are considered to be the most painful and anxiety-provoking procedure by both children and adults.[1] Any measure used to potentially minimize the pain during dental treatment can help in reducing patient's anxiety and can ensure compliance. Therefore, dentists use various techniques such as using topical anesthetic agents prior to injections, behavioral management like distraction techniques, electronic dental anesthesia and lidocaine patches before needle puncture to minimize

TABLE 1: COMPARISON OF PAIN AFTER ADMINISTRATION OF PALATAL INFILTRATION ANESTHESIA BETWEEN THE TWO GROUPS.

Pain	Group A (n=43) Insulin Syringe	Group B (n=43) Dental Infiltration needle	P value
No Pain (VAS 0)	1 (2.32%)	0 (0%)	.028
Mild pain (VAS 1-3)	21 (48.8)	12 (27.9%)	
Moderate Pain VAS (4-7)	14 (32.6%)	19 (44.2%)	
Severe Pain (8-10)	7 (16.28%)	12 (27.9%)	

TABLE 2: AGE DISTRIBUTION BETWEEN THE TWO GROUPS.

Variable	Group A		Group B	
Age	Frequency	Percentage	Frequency	Percentage
20-30	17	39.53%	23	53.5
31-40	9	20.93	12	27.9
41-50	17	39.53	8	18.6

TABLE 3: GENDER DISTRIBUTION BETWEEN THE TWO GROUPS

Variable	Group A (n=43) Insulin Syringe				Group B (n=43) Dental Infiltration Needle			
Gender	No Pain	Mild Pain	Moderate Pain	Severe Pain	No Pain	Mild Pain	Moderate Pain	Severe Pain
Male	1	12	3	2	0	6	6	1
Female	0	9	11	5	0	6	13	11
Mean	1.5				1.6			
SD	0.49				0.46			
P value	.036				.026			

pain and discomfort and ensure complete compliance by the patient.[5,8,9]

Pain by injection is usually caused by the penetration of needle into the oral mucosa. Pain during penetration could be influenced by a number of factors including the gauge of the needle. The gauges of the needle commonly used for intra-oral anesthesia are of 30, 27 and 25 gauge.[10] The gauge of the needle represents the diameter of lumen of the needle. The 30 gauge needle will have a smaller internal diameter when compared to the 27 gauge needle and these large gauge needles are usually employed in cases where needle deflection through soft tissue may be affected.[11,12] It has been stated that needle sharpness is most important in avoidance of pain. Sharp needle produces less trauma and pain.[13]

According to Malamed, the trend is slowly shifting towards the use of small diameter having a large gauge needle as opposed to the large diameter needle on the supposition that they are less traumatic and offer better compliance of the patient.[14] The insulin syringe because of its short needle length provides the operator better control over the insertion and positioning of needle into the oral mucosa and also allows for deposition of small amount of anesthetic solutions. It has a 30 gauge with an 8mm ultra-short needle when compared to the gauge of dental infiltration syringe and it has a small internal diameter so we would expect it to be less painful for the patient when administering anesthesia.[7,9,15,16] To confirm this, the present study was undertaken to compare the pain perception using two different syringe designs with different needle gauges while giving Local Anesthesia (LA) using local palatal infiltration technique. Our results showed that insulin syringe shows a less painful response from the patient when compared with the dental infiltration needle. Gurpreet Kour et al concluded that an insulin syringe does exhibit clinical advantage and its use in dentistry for local anesthetics infiltration can prove to be quite beneficial.[9] Likewise our study also concluded that Insulin syringe potentially offers a less painful experience for the patient.

In contrary to our results several studies have found no significant difference between the different needle gauges on pain perception. Kathrine and Trine[17] and Flanagan[18] concluded that despite patients stating that they experienced less pain with thinner needles, the difference between the needles with different gauges was not found to be statistically significant.

However many studies have stated a correlation between needle gauge and pain perception. Cooley and Robison did a comparative evaluation of the 30-gauge dental needle and showed these needles to be tough and resistant to breakage even under the extreme stressed and manipulation causing less pain.[19] Lehtinen and Oksala observed that the 30-gauge needle required significantly less force (69 mN) during puncture than the 27-gauge needle (139 mN) during administration of local anesthetic and this could be the reason why they are generally less painful for patient.[11] Asokan has concluded that using thinner gauge needle could potentially control pain during local infiltration.[7] Despite the small internal diameter of the insulin syringe it would be durable enough to be used for palatal anesthesia and would result is a less painful response by the patient.

Pain is a subjective response which differs greatly for different individuals. It's influenced by psychological, emotional, cultural and social behaviors. Different individuals respond differently to varying degrees of pain depending on their threshold for it. Pain can also be strongly influenced by the element of fear. The dental treatment is often a fear and anxiety provoking event for many patients that could influence their current treatment outcome and response to that treatment in the future. A study conducted to analyze the association between anxiety and pain in endodontic treatment showed that pre-treatment dental anxiety (DA) does have a significant impact on the perception of pain by the patient throughout the treatment. DA influenced inter-appointment pain and also post-operative pain. Likewise another study conducted on the prevalence of DA in dentistry showed that females had 2.12 times more DA than males.[20] This explains that gender could also be a factor influencing the perception of pain.

CONCLUSION

Results of the study showed that insulin syringe shows a less painful response from the patient when compared to a dental infiltration needle during local palatal anesthesia.

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CONTRIBUTIONS BY AUTHORS

1 Fatima Ali: Substantial contribution to write up, literature review of the article and reference citation of the article.

2 Ajmal Yousaf: Conceived the idea, planned the study and helped in manuscript writing.

3 Muzammil Jamil Ahmed Rana: Supervised the study, reviewed and done proof reading

4 Mohib Ullah: Helped in data collection & proof reading of the article

5 Syed Muzammil Hussain: Contributed to the article writing, data collection and proof reading

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