

LOCAL ANAESTHETIC ADMINISTRATION DEPENDING ON TOOTH VITALITY DURING CROWN PREPARATION - A RETROSPECTIVE STUDY

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ABSTRACT

Local anaesthesia has been widely used in the medical and dental field. It produces anaesthesia by inhibiting excitation of nerve endings or by blocking conduction in peripheral nerves. During single crown preparation, dentists use anaesthesia even for root canal treated teeth during cord packing for gingival retraction to achieve haemostasis and to minimize pain. 356 patients who had undergone treatment for single crown preparation were selected and their treatment details like vitality of tooth, type of LA agent used, site of administration were reviewed. Details were tabulated in the Excel sheet and SPSS importing was done. Chi square tests were done between age, gender, type of arch and vitality of tooth with local anaesthetic agent used and the site of local anaesthetic administration. 1:2,00,000 epi+lidocaine was the most administered LA agent in both vital and non vital teeth. Commonly used site was buccal vestibule. This study concluded that buccal vestibule was the most common site of LA administration in both vital and non vital teeth and there was no statistical significance in the local anaesthetic agent used or site of administration in different age groups or gender or type of arch ($p > 0.05$).

Keywords: Crown preparation; Local anaesthesia; Vitality

INTRODUCTION

One of the most important skills for dental practitioners is their ability to attain safe and effective local anaesthesia [LA] (Jung *et al.*, 2017). Local anesthetics have been widely used in both medical and dental fields (Becker and Reed, 2012). Local anaesthetic agents exert their primary pharmacological actions by interfering with the excitation conduction process of peripheral nerve fibres and nerve endings (Covino, 1977). In 1884, cocaine was discovered to have local anaesthetic properties and was widely used in many types of surgery. The many undesirable properties of cocaine led scientists to find safe alternatives. Since then, many more effective local anesthetics have been developed (Ring, 2007).

Two types of sensory fibres are present in pulp: the myelinated A fibres and unmyelinated C fibres. The A fibres predominantly innervate the dentine and are sub grouped into A β and A delta fibres. C fibres innervate

the body of pulp. A-delta fibres mediate acute, sharp pain and are excited by events in dentinal tubules such as drilling or air drying. C fibres mediate a dull, burning, poorly located pain and are activated only by stimuli which reaches the pulp proper(Olgart, 1974; Byers, 1984; Närhi, 1985; Markowitz and Kim, 1990; Gopikrishna, Pradeep and Venkateshbabu, 2009).

LA is administered during tooth preparation in vital teeth to reduce the sensitivity during crown tooth preparation(Subramaniam, Dhanraj and Jain, 2018). Most dentists prefer local anaesthesia use even for root canal treated teeth during gingival retraction to achieve haemostasis during cord packing and to minimize pain. Previously our college had conducted many clinical trials(Ramamoorthi, Nivedhitha and Divyanand, 2015)(Hussainy *et al.*, 2018) in vitro studies(Teja, Ramesh and Priya, 2018)(Ramanathan and Solete, 2015)(Siddique *et al.*, 2019)(Rajendran *et al.*, 2019)(Nandakumar and Nasim, 2018), invivo studies(Janani, Palanivelu and Sandhya, 2020), questionnaire studies (Jose, P. and Subbaiyan, 2020) survey(Manohar and Sharma, 2018) and review studies(Kumar and Delphine Priscilla Antony, 2018)(Ravinthar and Jayalakshmi, 2018)(Noor, S Syed Shihaab and Pradeep, 2016)(Teja and Ramesh, 2019)(R, Rajakeerthi and Ms, 2019) in the last five years.

The aim of this study was to evaluate local anaesthetic administration depending on tooth vitality during single crown preparation. The objectives of this study were to compare the age, gender, type of arch and vitality of tooth with local anaesthetic agent used and the site of local anaesthetic administration.

MATERIALS AND METHODS

The present study was a retrospective study done in a university setting. Ethical approval of this study was obtained from the Scientific review board [SRB] of Saveetha Dental College, Chennai.(SDC/SIHEC/2020/DIASDATA/0619-0320). 86000 patients records from June 2019 to March 2020 were retrieved and 356 patients who had undergone single crown preparation were selected. Their treatment details such as vitality of tooth, type of LA agent used, site of administration were reviewed and analysed. Sample data were cross verified by another examiner to avoid any missing data. Sampling bias was minimised by excluding incomplete data. Age, gender, type of arch and vitality of tooth with local anaesthetic agent used and the site of local anaesthetic administration were the variables compared in this study. Data was tabulated in the Excel sheet and SPSS importing was done. Statistical test used was the Chi-square test for evaluating the association.

RESULTS AND DISCUSSION

In this study, 356 patients had undergone single crown preparation. 192 males, 164 females had undergone single crown preparation. 202 patients were in the 16- 35 years age group, 138 were in the 36-55 years age group, 16 were in the 56-75 years age group. 265 non vital teeth and 91 vital teeth had undergone single crown preparation.

Figure 1 showed 1:2,00,000 epi + Lidocaine was the most administered LA agent in all age groups. Figure 2 showed buccal vestibule was the most common site of LA administration in all age groups. Figure 3 showed that a higher number of non-vital teeth had undergone single crown preparation than vital teeth in all age groups. There was no statistical significance between age groups and type of LA agent, site of LA administration, vitality of tooth ($p>0.05$). Nordenram et al reported a significantly shorter onset time of action in elderly compared to the young group(Nordenram and Danielsson, 1990). Kalra et al reported adrenaline containing LA should be used with caution in type 2 Diabetics as it causes suppression of insulin

release(Kalra *et al.*, 2011). Haas et al reported there were no significant differences in the response to local anesthetics between younger and older adults. He also added it may be necessary to minimize the dose of epinephrine for patients receiving specific medications and those with cardiovascular disease(Haas, 2002).

There was no statistical significance between arches and type of LA agent, vitality of teeth ($p>0.05$). Figure 4 showed 1:2,00,000 epi + Lidocaine was the most administered agent in maxillary and mandibular teeth. Figure 5 showed that more number of non-vital teeth had undergone single crown preparation than vital teeth in both maxillary and mandibular arches. This could be because of the reason that non-vital and root canal treated teeth undergo single crown tooth preparation as part of post endodontic restoration. Full coverage crown is highly recommended in root canal treated teeth to increase the fracture resistance of the tooth and prevent it from any type of fracture under occlusal loading. Single crown preparation may be done in vital teeth when there is attrition of teeth with increased sensitivity. The other most common indication is as part of abutment preparation in case of fixed partial dentures(Subramaniam, Dhanraj and Jain, 2018).

Figure 6 showed 1:2,00,000 epi+Lidocaine was the most commonly used agent in both males and females. Figure 7 showed buccal vestibule was the most common site of LA administration in both males and females. Figure 8 showed non-vital teeth had undergone more single crown preparation than vital teeth in both males and females. There was no statistical significance between gender and type of LA agent, site of LA administration, vitality of tooth ($p>0.05$). Tófoli et al reported pain threshold was higher in men however clinical effectiveness of local anesthetics are not related to sex(Tófoli *et al.*, 2007).

There was no statistical significance between vitality and type of LA agent, site of administration. Figure 9 showed 1:2,00,000 epi+Lidocaine was the most commonly used agent in both vital and non-vital teeth. Wan sik chu et al reported that local infiltration of 2 % lignocaine with 1:1,00,000 epinephrine effectively reduces pulpal blood flow increase caused by cavity preparation(Chu *et al.*, 2006). Figure 10 showed buccal vestibule was the most used site of administration of LA in both vital and non vital teeth. Subramaniam et al concluded both intraligament infiltration and subperiosteal infiltration were equally effective in controlling tooth hypersensitivity during tooth preparation(Subramaniam, Dhanraj and Jain, 2018). Badr et al reported increasing the concentration of epinephrine, with articaine and lidocaine, did not significantly impact the anesthetic efficacy (Badr and Aps, 2018). Nordenram et al also added that there was no statistically significant difference in duration of tooth anesthesia between lidocaine with epinephrine and prilocaine with felypressin(Nordenram and Danielsson, 1990).

Lidocaine with epinephrine is the most common anesthetic agent used in dentistry. The concentration of epinephrine can vary from 50,000 to 2,00,000. In this study, it was observed that 1:2,00,000 epi+lidocaine was the most common anesthetic agent used. The purpose of addition of epinephrine is to increase the bioavailability of local anesthetic, for immediate onset of action and prolong the duration of action of local anesthetic. These actions are achieved because of the vasoconstrictive effect of epinephrine(Haas, 2002).

Buccal vestibule is the most common site of local anesthetic administration. In the case of non-vital teeth, LA is given only during the cord packing step to reduce the pain during cord packing and to reduce the bleeding during the procedure. Hence even for mandibular teeth buccal and lingual infiltration are more than adequate for this purpose instead of nerve block. However in case of vital teeth, an inferior alveolar nerve block was administered during tooth preparation to reduce the sensitivity from vital pulp during the procedure(Haas, 2002). Limitations of the present study include small sample size which does not provide results of the entire population. Studies to be evaluated in a large population and multi centered study.

CONCLUSION

Within the limitation of the study, it can be concluded that there was no significant difference in the local anaesthetic agent used or site of administration in different age groups or gender or type of arch. The buccal vestibule was the most common site of LA administration in vital and non vital teeth and 1:2,00,000 epi+lidocaine was frequently used as an agent in tooth preparation in both vital and non vital teeth.

AUTHOR CONTRIBUTIONS

All authors have equal contribution in bringing out this research work

CONFLICT OF INTEREST

Authors declare no potential conflict of interest for this study.

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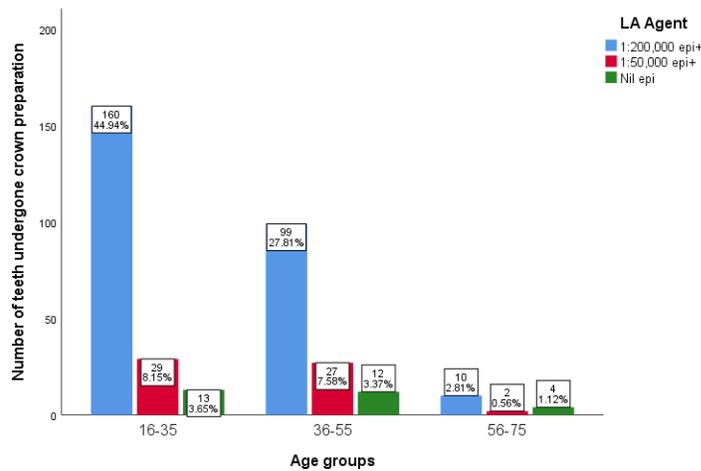


Figure 1: This figure represents the association between age groups and LA agents in single crown preparation. X axis represents age groups and Y axis represents the number of teeth undergone crown preparation. Blue colour denotes 1:200,000 epi+, red colour denotes 1:50,000 epi + and green colour denotes nil epi+. 1:200,000 epi+ was the most administered LA agent in all age groups at 76%. However, association between age groups and LA agents done using Chi-square test (p value=0.065) was found to be statistically not significant.

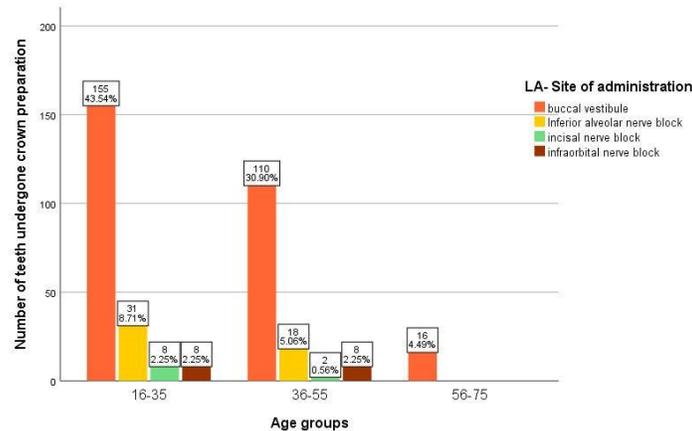


Figure 2: This figure represents the association between age groups and site of administration of LA during single crown preparation. X axis represents age groups and Y axis represents the number of teeth undergone crown preparation. Orange colour denotes buccal vestibule, yellow colour denotes inferior alveolar nerve block, light green colour denotes incisal nerve block, brown colour denotes infraorbital nerve block. Buccal vestibule was the most administered site of administration of LA in all age groups at 79%. However, association between age groups and the site of administration of LA done using Chi-square test (p value=0.291) was found to be statistically not significant.

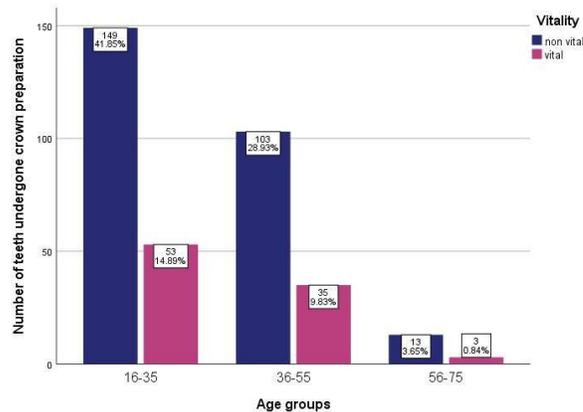


Figure 3: This figure represents the association between age groups and vitality of teeth in single crown preparation. X axis represents age groups and Y axis represents the number of teeth undergone crown preparation. Dark blue colour denotes non vital teeth, violet colour denotes vital teeth. Non vital teeth had undergone more single crown preparation in all age groups at 74.43%. However, association between age groups and vitality of teeth done using Chi-square test (p value=0.802) was found to be statistically not significant.

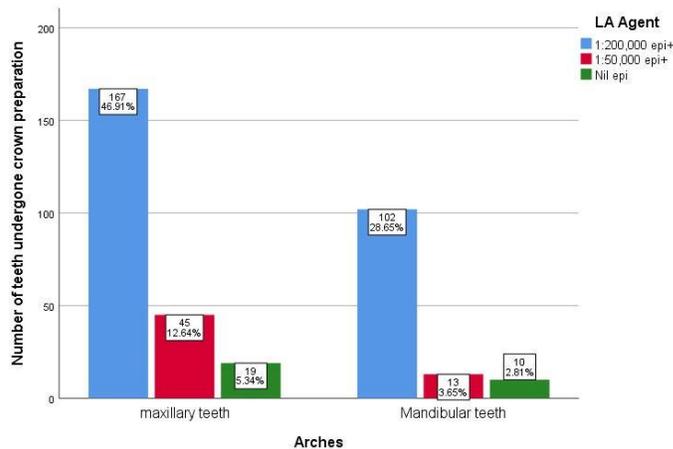


Figure 4: This figure represents the association between arches and LA agents in single crown preparation. X axis represents arches and Y axis represents the number of teeth undergone crown preparation. Blue colour denotes 1:200,000 epi+, red colour denotes 1:50,000 epi+, green colour denotes Nil epi. 1:200,000 epi+ was the most administered LA agent in both maxillary (46.91%) and mandibular teeth (28.65%). However, association between arches and LA agents done using Chi-square test (p value=0.080) was found to be statistically not significant.

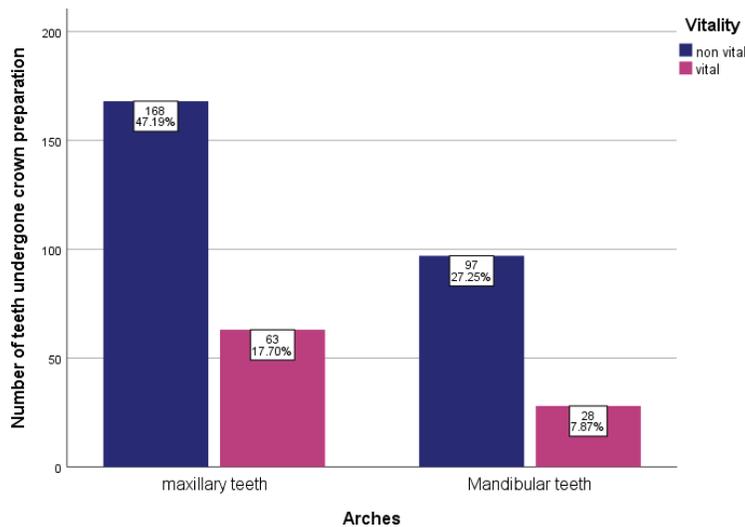


Figure 5: This figure represents the association between arches and vitality of teeth in single crown preparation. X axis represents arches and Y axis represents the number of teeth undergone crown preparation. Dark blue colour denotes non vital teeth, violet colour denotes vital teeth. Non-vital teeth had undergone more single crown preparation in both maxillary teeth (47.19%) and mandibular teeth (27.25%). However, association between arches and vitality of teeth done using Chi-square test (p value=0.314) was found to be statistically not significant.

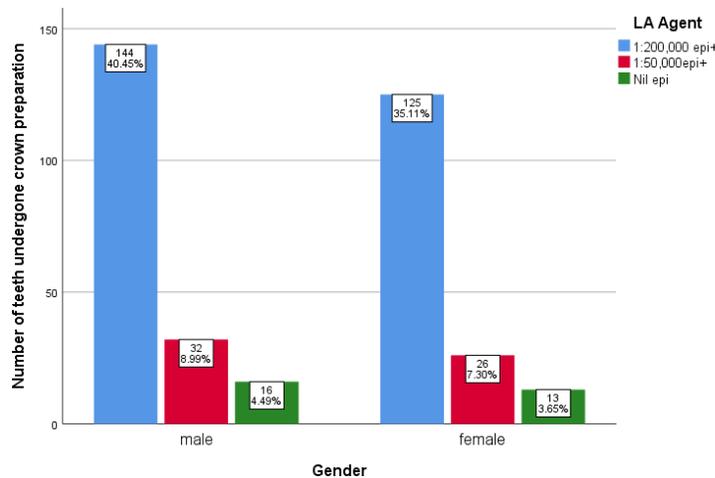


Figure 6: This figure represents the association between gender and LA agents in single crown preparation. X axis represents gender and Y axis represents the number of teeth undergone crown preparation. Blue colour denotes 1:200,000 epi+, red colour denotes 1:50,000 epi + and green colour denotes nil epi+. 1:200,000 epi+ was the most administered LA agent in both male (40.45%) and female patients (35.11%). However, association between gender and LA agents done using Chi-square test (p value=0.965) was found to be statistically not significant.

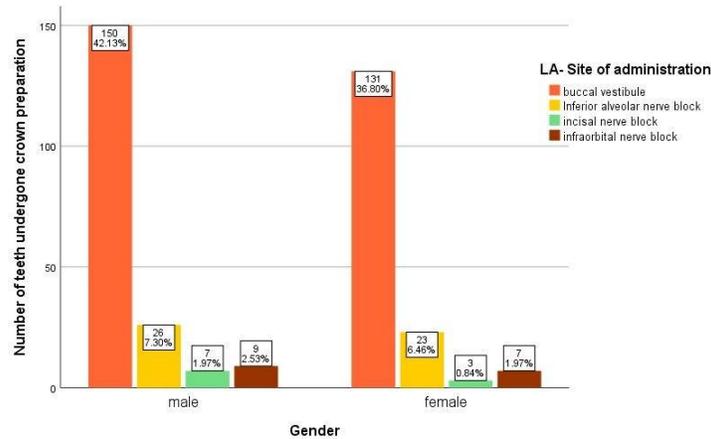


Figure 7: This figure represents the association between gender and site of LA administration in single crown preparation. X axis represents gender and Y axis represents the number of teeth undergone crown preparation. Orange colour denotes buccal vestibule, yellow colour denotes inferior alveolar nerve block, light green colour denotes incisal nerve block, brown colour denotes infraorbital nerve block. Buccal vestibule was the most commonly administered site of LA administration in both male (42.13%) and female patients (36.80%). However, association between gender and site of LA administration done using Chi-square test (p value=0.772) was found to be statistically not significant.

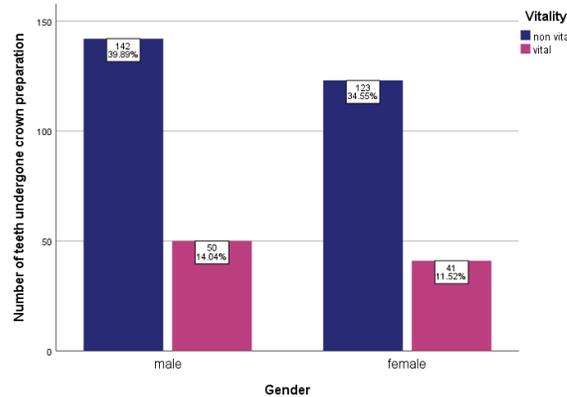


Figure 8: This figure represents the association between gender and vitality of teeth in single crown preparation. X axis represents gender and Y axis represents the number of teeth undergone crown preparation. Dark blue colour denotes non vital teeth, violet colour denotes vital teeth. Non vital teeth had undergone more single crown preparation in both males (39.89%) and females (34.55%). However, association between gender and vitality of teeth done using Chi-square test (p value=0.882) was found to be statistically not significant.

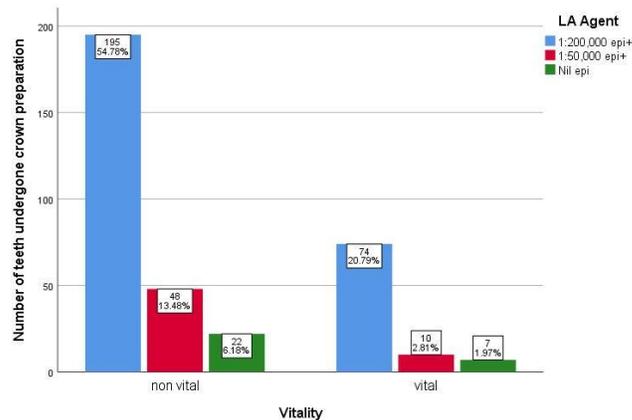


Figure 9: This figure represents the association between vitality of teeth and LA agents in single crown preparation. X axis represents vitality of tooth and Y axis represents the number of teeth undergone crown preparation. Blue colour denotes 1:200,000 epi+, red colour denotes 1:50,000 epi + and green colour denotes nil epi+. 1:200,000 epi+ was the most administered LA agent in both nonvital teeth (54.78%) and vital teeth (20.79%). However, association between vitality and LA agents done using Chi-square test (p value=0.262) was found to be statistically not significant.

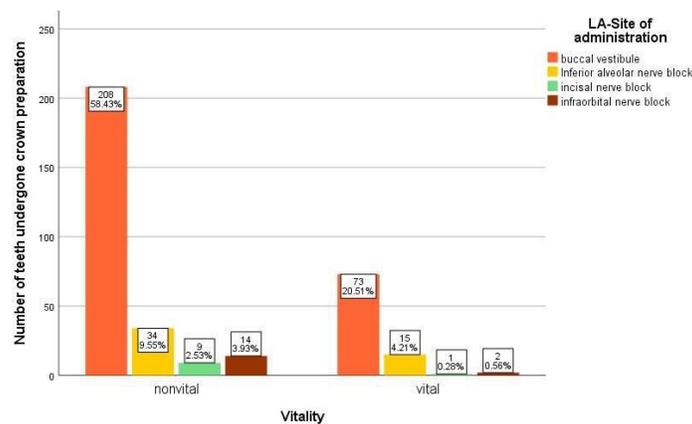


Figure 10: This figure represents the association between vitality of teeth and site of administration of LA in single crown preparation. X axis represents vitality of tooth and Y axis represents the number of teeth undergone crown preparation. Orange colour denotes buccal vestibule, yellow colour denotes inferior alveolar nerve block, light green colour denotes incisal nerve block, brown colour denotes infraorbital nerve block. Buccal vestibule was the most administered site of LA administration in both vital and non-vital teeth at 79%. However, association between vitality and site of LA administration done using Chi-square test (p value=0.335) was found to be statistically not significant.