Int J Pharm Bio Sci 2015 July; 6(3): (P) 112 - 116

Review Article **Pharmacology**

International Journal of Pharma and Bio Sciences **ISSN 0975-6299**

PARESTHESIA FOLLOWING LOCAL ANESTHETIC ADMINISTRATION IN DENTISTRY

DR. M.P.SANTHOSH KUMAR*

Reader, Department of oral and maxillofacial surgery,
Saveetha Dental College, Saveetha university, Chennai.

ABSTRACT

Local anesthetics are the common drugs used in dentistry for several dental procedures. Although they are very safe, there are some reports of occurrence of paresthesia, a post anesthetic complication. Paresthesias can range from slight to complete loss of sensation and can be devastating for the patient.This article reviews the literature about the incidence of paresthesia induced by the administration of local anesthetic, which is not related to surgical trauma. Also, this article discusses the etiology of paresthesias, bias in the research studies, and presents recommendations for use of local anesthetics in clinical practice.

KEY WORDS: Paresthesia, lidocaine, articaine, prilocaine

*Corresponding author

DR. M.P.SANTHOSH KUMAR
Reader, Department of oral and maxillofacial surgery,
saveetha dental college, Saveetha university, Chennai.

INTRODUCTION

Local anesthetic agents are routinely used for dental procedures and are very safe. Because millions of injections are given every year, even rarely, occurring adverse reactions like paresthesia, a post-anesthetic complication, can cause significant morbidity and all measures must be taken to avoid this problem. As these injuries affect one of the most sensitive areas in the human body, they can have a profoundly negative impact on the quality of life of patients. Paresthesias are usually transient and recover within weeks to months. Paresthesias lasting more than 6-9 months become permanent and may need microneurosurgical treatment. The purpose of this article is to review the literature about the incidence of paresthesia following administration of local anesthetic agents, which is not related to surgical trauma. As a result, a safe local anesthetic agent and concentration for clinical dental procedures can be evaluated and recommended for dentists.

DEFINITION

Paresthesia is defined as an abnormal sensation, such as of burning, pricking, tickling, or tingling. Paresthesias may manifest as total loss of sensation (anesthesia), burning or tingling feelings (dysesthesia), pain in response to a normally nonnoxious stimulus (allodynia), or increased pain in response to all stimuli (hyperesthesia).[1] Paresthesia can also be associated with a burning sensation, and patients can experience drooling, speech impediment, loss of taste, and tongue biting.[2]

ETIOLOGY[3]

Paresthesias can be grouped as nonsurgical paresthesia and surgical paresthesia. Nonsurgical paresthesia may occur as a result of administration of local anesthetics for dental treatment like periodontal, restorative, endodontic, prosthetic and surgical procedures. Surgical paresthesia may arise due to third molar surgeries, implant placement, endodontic procedures. Other causes of paresthesia include oral pathologies, infection, maxillofacial trauma. Causes for nonsurgical paresthesia after local anesthetic administration are

1.Direct trauma from the needle - Paresthesia may occur if, during injection, the patient complains of a sensation described as electric shock along the path of the nerve that is contacted by the needle.

2.Intraneural haematoma

3.Local anesthetic neurotoxicity - It is associated with the concentration of the solution.

NERVES AFFECTED[4]

The most commonly affected branches are the inferior alveolar nerve (IAN) and lingual nerve but other trigeminal branches, such as the infraorbital nerve, long buccal nerve, greater palatine nerve and nasopalatine nerve, may also be injured . Injury to the chorda tympani nerve is also possible. Lidocaine is the traditionally used local anesthetic agent since 1948. Need for an longer acting and more efficient agent led to the introduction of mepivacaine in 1960, prilocaine in 1978, bupivacaine in 1982 and articaine in 1983. Paresthesias were reported with the administration of lignocaine and other local anesthetic agents. Research was done on various local anesthetic agents to evaluate their efficacy and recommend the best drug which causes least complications when used in clinical dentistry.

REVIEW OF LITERATURE

Malamed et al[5,6] in their study reported paresthesia in14 of 882 injections of articaine, 3 of 443 injections of lidocaine, and the paresthesia resolved completely in 18 days. The clinical efficacy and safety of 4% articaine with 1:100,000 epinephrine compared to 2% lidocaine with 1:100,000 epinephrine for mandibular blocks and maxillary infiltrations was established in a study on 1325 subjects.[7,8,9] In 1995, Haas and Lennon[10] conducted a retrospective study evaluating the incidence of paresthesia from 1973 to 1993 in Ontario, Canada, which they found an overall incidence of 1 paresthesia out of every 785,000

injections. Compared with the other local anesthetics, a statistically significant higher incidence was noted when either articaine or prilocaine was used. The lingual nerve was involved in 64% of the cases, with the IAN involved in the vast majority of the remainder. A follow-up study was done using the same methodology with data from 1994 to 1998[11] in which the incidence of nonsurgical paresthesia was 1 in 765,000, and other results were same as the previous study. In another study, reports from 1999 to 2008 were compared with the study from 1973 to 1998[12]. Results revealed paresthesias to be greater for both articaine and prilocaine , tongue was most commonly affected and the remainder was found to be the lower lip. Thus all the above three studies are similar and consistent in their findings indicating prilocaine or articaine injections have 5 fold higher chances for causing paresthesias than lidocaine or mepivacaine. No reports of paresthesia were associated with bupivacaine. In a Danish study[13], the,incidence of paresthesia was reported to be 1 in 140,000 for articaine and 1 in 540,000 for mepivacaine, 3% prilocaine had no reports of paresthesias. In an other study[14] on 56 patients, there was neurologic evidence of neurotoxicity due to local anesthetic agent, not mechanical injury. Lingual nerve was commonly affected and articaine contributing to 20 fold increase in paresthesia compared to other local anesthetics. In a follow-up report[15] of an additional 57 patients with paresthesias, the investigators concluded that although prilocaine may have a higher incidence of paresthesias, the rate of paresthesias associated with articaine did not seem to be grossly disproportionate to its use. In a prospective US study[16] only prilocaine was associated with higher, expected incidence of Paresthesia. The FDA's Adverse Event Reporting System (AERS) computerized information database.analysed nonsurgical paresthesias reported following local anesthesia administration from November 1997 through August 2008. Of the 248 cases of nonsurgical paresthesia reported, 89% involved the lingual nerve with a higher rate of paresthesias associated with prilocaine (1 in 2,070,678) and with articaine (1 in 4,159,848) compared to lidocaine (1 in 124,286,050).[17] The most recent study in 2009 from Ontario shows that the increase in the number of reports for articaine persists for more than 25 years since its introduction in Canada [12] and it cannot be attributed to the weber effect. Retrospective studies[4] suggest that articaine has more chances of causing paresthesia than lidocaine, because it is given at a higher concentration, which has a greater potential to cause neurotoxicity and the effect is dose related, not the drug per se. It is also found that both concentration of drug and mechanical injury to nerve by needle are responsible for causing paresthesia. The concentrations of drugs normally used are 0.5% bupivacaine, 2% lidocaine, 2% mepivacaine,3% mepivacaine, 4% articaine, and 4% prilocaine. Study on rats revealed that all local anesthetic agents have the potential of causing neurotoxicity and it is mainly dose related and not drug related[18,19] Higher the concentration of the drug used, more chances of paresthesia occurrence is possible [20,21] Lingual nerve has more predilection to develop paresthesia than inferior alveolar nerve because a unifascicular nerve may be injured more easily than a multifascicular one. A study[22] on cadavers has proved this result.

BIAS IN STUDIES

From Clinical Research Associates (CRA) Newsletter report[23] it becomes questionable whether paresthesia occurred due to articaine or the surgical trauma caused the problem. Dower [2003] [24] estimated the incidence of paresthesia for articaine after mandibular block injections to be 1 in 220,000, higher than that previously reported and stated that articaine had a 20-fold higher rate of paresthesia than lidocaine and that prilocaine had a 15-fold higher incidence. In addition, using the previously described CRA cases of questionable causation, Dower has suggested articaine's rate of paresthesias after lingual or mandibular blocks to be possibly as high as 1 in 3250. Pogrel and Thamby[16] estimated the incidence of paresthesias associated with local anesthesia at 1 in 160,571, but they believe

the true incidence to be five times greater. In contrast, Danish[25,26] medicines agency suggest overestimation might have occurred in obtaining paresthesia reports. A large epidemiologic study has suggested that the 4% solutions used in dentistry, namely prilocaine and articaine, are more likely associated with reports of paresthesias after local anesthesia administration. None of the studies involving articaine or prilocaine published to date have a sample size large enough to detect this potential difference. No conclusions regarding permanent paresthesia should be made from these particular studies.

CONCLUSION

Paresthesias in dentistry are mostly transient and usually recover within a year, although some cases recover after a few years. It is generally accepted that paresthesias lasting longer than 6 to 9 months are unlikely to recover fully. Permanent paresthesias after dental procedures are very rare and are most often the result of surgical trauma. Lingual nerve is most commonly affected followed by inferior alveolar nerve. Because the occurrence of local anesthesia–related paresthesias is extremely rare, data from prospective trials having limited sample sizes are not useful. Conversely, data collected retrospectively, suggesting an association with specific anesthetic agents may be incomplete and may have the potential to reflect a reporting bias. Thus, there is no definitive proof of a cause and effect relationship between 4% solutions and paresthesia. Nevertheless, there exist data that suggest that these solutions are potentially associated with an increased likelihood of paresthesia. 4% articaine or 4% prilocaine must generally be avoided for mandibular nerve blocks, as there is no scientific indication that it is more efficient than the gold standard 2% lidocaine with epinephrine for inferior alveolar nerve block.[3] Negative psychological consequences to patients are particularly evident in protracted paresthesia cases and cases where patients complain of severe discomfort. Implicated dentists are also negatively impacted as they can experience embarrassment and frustration in having to deal with the consequences of these problems. Further distress can ensue in cases where practitioners have to deal with significant patient complaints, litigation and malpractice suits. In fact, paresthesia has been cited as the most common cause of litigious action resulting from oral and maxillofacial surgical procedures.[27] Dentists should carefully assess the risks and benefits of many drugs they prescribe or administer.

REFERENCES

1. Haas DA. Articaine and paresthesia: epidemiological studies. J Am Coll Dent;73(3):5– 10.[2006]
2. Haas DA, Lennon D. A 21-year retrospective study of reports of paresthesia following local anesthetic administration. *J Can Dent Assoc.*;61:319-330.[1995]
3. Paul A. Moore, Daniel A. Haas, Paresthesias in Dentistry Dent Clin N Am 54 ; 715–730 [2010]
4. Andrew S. Gaffen, Retrospective Review of Reports of Non-Surgical Paresthesia in Dentistry. Journal of dental sciences 24[4]: 114-118 [2010]
5. Malamed SF, Gagnon S, Leblanc D. Efficacy of articaine: a new amide local anesthetic. J Am Dent Assoc;131:635–42[2000]
6. Malamed SF, Gagnon S, Leblanc D. Articaine hydrochloride: a study of the safety of a new amide local anesthetic. J Am Dent Assoc;132:177–85.[2001]
7. Claffey E, Reader A, Nusstein J, et al. Anesthetic efficacy of articaine for inferior alveolar nerve blocks in patients with irreversible pulpitis. J Endod;30:568–71[2004]
8. Mikesell P, Nusstein J, Reader A, et al. A comparison of articaine and lidocaine for inferior alveolar nerve blocks. J Endod ;31:265–70.[2005]
9. Ram D, Amir E. Comparison of articaine 4% and lidocaine 2% in paediatric dental

patients. Int J Paediatr Dent ;16:252–6 [2006]
10. Haas DA, Lennon D. A 21 year retrospective study of reports of paresthesia following local anesthetic administration. J Can Dent Assoc;61:319–30.[1995]
11. Miller PA, Haas DA. Incidence of local anesthetic-induced neuropathies in Ontario from 1994–1998 [abstract]. J Dent Res;79:627.[2000]
12. Gaffen AS, Haas DA. Retrospective review of voluntary reports of nonsurgical paresthesia in dentistry. J Can Dent Assoc;75(8):579.[2009]
13. Legarth J. Lesions to the lingual nerve in connection with mandibular analgesia. Tandlaegebladet;109:10.[2005]
14. Hillerup S, Jensen R. Nerve injury caused by mandibular block analgesia. Int J Oral Maxillofac Surg;35:437–43.[2006]
15. Pogrel MA. Permanent nerve damage from inferior alveolar nerve blocks- an update to include articaine. J Calif Dent Assoc ;35(4):271–3[2007] .
16. Pogrel MA, Thamby S. Permanent nerve involvement resulting from inferior alveolar nerve blocks. J Am Dent Assoc ;131:901–7 [2000]
17. Garisto GA, Gaffen AS, Lawrence HP, et al. Occurrence of paresthesia after dental local anesthetic administration in the United States. J Am Dent Assoc;141:836–44.[2010]
18. Selander D. Neurotoxicity of local anesthetics: animal data. Reg Anesth ;18: 461–8 [1993]
19. Kalichman MW, Moorhouse DF, Powell HC, et al. Relative neural toxicity of local anesthetics. J Neuropathol Exp Neurol ;52:234–40[1993]
20. Kalichman MW, Powell HC, Myers RR. Quantitative histologic analysis of local anesthetic- induced injury to rat sciatic nerve. J Pharmacol Exp Ther ;250:406–13 [1989]
21. Kalichman MW. Physiologic mechanisms by which local anesthetics may cause injury to nerve and spinal cord. Reg Anesth ;18:448–52 [1993]
22. Pogrel MA, Schmidt BL, Sambajon V, et al. Lingual nerve damage due to inferior alveolar nerve blocks a possible explanation. J Am Dent Assoc;134:195–9 [2003]
23. Claffey E, Reader A, Nusstein J, et al. Anesthetic efficacy of articaine for inferior alveolar nerve blocks in patients with irreversible pulpitis. J Endod ;30:568–71[2004]
24. Dower JS. A review of paresthesia in association with administration of local anesthesia. Dent Today ;22(2):64–9.[2003]
25. Henrik G. Jensen, Doris I. Stenver and Mona Vestergaard Laursen Study of adverse reactions from anaesthetics for dental treatment. Danish Medicines Agency journal 79-85 [2005.]
26. Henrik G. Jensen, Doris I. Stenver and Mona Vestergaard Laursen Adverse reactions from anaesthetics containing articaine Danish Medicines Agency journal 202-209 [2006].
27. Colin W, Donoff RB. Restoring sensation after trigeminal nerve injury: a review of current management. J Am Dent Assoc; 123(12):80-5.[1992].