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Impact of Clinical Expertise on Inferior Alveolar Nerve Block Anaesthesia Resulting in Transient Facial Nerve Palsy; A Cross-sectional Study Amid Pakistani Dental Graduates

Rehan Ahmad, Sabeen Masood, Jehan Alam

ABSTRACT

Objective: The purpose of the study is to observe the impact of clinical expertise on inferior alveolar nerve block (IANB) anaesthesia resulting in transient facial nerve palsy (FNP) in dental operators having different levels of clinical experience.

Methodology: This observational cross-sectional study was conducted in the Department of Dentistry, Jinnah Postgraduate Medical Center. The study was conducted over a period of six months, starting from September 2021 and lasting till February 2022. The patients who required IANB for any dental treatment in lower posterior teeth were divided into three groups between dental operators: Undergraduates (Interns), Graduates (House Officers), and Postgraduate trainees, having 100 cases in each group. A structured questionnaire was administered through convenience sampling to dental operators. Data was analyzed by using SPSS version 24.

Results: A total of 300 cases were part of the study. According to the results, 28% (n=84) of patients suffered from transient facial nerve palsy following IANB. Out of this 84%, 15% (n=45 of total cases) were by Undergraduates (Interns), 10% (n=30 of total cases) were caused by Graduates (Interns), and only 3% (n=9 of total) incidences happened following IANB by Postgraduate trainees.

Conclusions: The incidence of IANB-related facial nerve palsy (FNP) is comparatively more in junior dental operators, which depicts their lack of clinical experience.

Keywords: Complications, Inferior alveolar nerve block, Facial nerve palsy, Transient facial nerve palsy.

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INTRODUCTION:

In routine dental practice, local anaesthetic administration is a required step. To get the patient's participation and finish the session successfully, it is imperative to achieve enough analgesia in the operative area.[1] One of the chief methods of attaining mandibular numbness during dental procedures is the Inferior alveolar nerve block (IANB).[2] Facial nerve palsy (FNP) occasionally presents as a sequel to IANB.[1] Immediate or delayed types of paralysis can be observed starting from the instant of needle insertion until the beginning of symptoms.[1] It should be remembered that dental procedures involving mandibular anaesthesia can result in paralysis of the facial nerve.[1] Therefore, keen attention is needed while injecting the anaesthetic solution.[2,3] IANB involves positioning a needle adjacent to the mandibular foramen so that a local anaesthetic solution can be injected into the inferior alveolar nerve before this arrives to enter the mandibular canal.[4]

The reported incidence of facial palsy to IANB is approximately 20 to 25%.[5,6] Failure in the induction of profound anaesthesia is often caused by the absence of a distinct anatomic bone landmark, changes in the width and height of the ramus, and the location of the inferior alveolar nerve foramen.[5] The attainment of adequate analgesia in the operating field is essential to achieve the required cooperation with the patient and complete the session successfully. A variety of localized and systemic complications may arise from the IANB procedure. Some of the reported regional complications are the emergence of hematoma, trismus, infection, breakage of the needle, necrosis of soft tissue, persistent post-injection paresthesia, the spread of infection and ocular complications. In contrast, unintentional injection into the regional blood vessels, anaesthetic overdosage, speedy absorption, delay in the metabolism of anaesthetic

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drug or anaphylactic reaction are common systemic presentations of IANB.[7]

Facial nerve palsy, being a localized neurologic complication after inferior dental nerve block anaesthesia, can have several aetiologies, including viral, bacterial or fungal infections, trauma or unknown aetiology (Bell's palsy), and from a dental perspective, dental interventional procedures can be its culprit.[8] Dentistry-related peripheral facial nerve paralysis can arise from recurrent local anaesthetic shots, infections, or trauma while extracting mandibular third molars.[9]

The following factors can be used to explain the mechanism of facial weakness following dental procedures: direct anaesthesia to the facial nerve can cause a rapid onset while the anaesthetic agent is being injected; reflex vasospasms of the external carotid artery can cause the ischemia of the facial nerve, and dental infections may also indirectly affect the facial nerve.[1] Local anaesthetics, including vasoconstrictor drugs, may indirectly influence the sympathetic vascular reflex, resulting in an ischemic reaction leading to FNP. The needle's mechanical impact can also excite the sympathetic plexus, which may lead to FNP.[10]

Additionally, local anaesthetics can be neurotoxic and cause damage to the facial nerve. For example, procaine and tetracaine are more destructive than bupivacaine and lidocaine.[11] Moreover, alterations to a person's typical anatomy are, without a doubt, another contributor to the elevated risk of facial nerve paralysis.[1]

No matter what the underlying mechanisms of the FNP are, according to Andrew K et al., the operator is the only known variable influencing the likelihood of a successful local analgesic outcome.[12] This concludes with the rationale that the present study intends to discover and report the influence of clinical experience in terms of designation on the incidence of FNP after IANB among dental graduates which would provide the required statistics for the construction of a dentistry curriculum with greater emphasis on clinical IANB technique learning.

METHODOLOGY:

The purpose of this observational study is to investigate the incidence of transitory facial nerve palsy following IANB among Undergraduates (Interns), Graduates (House Officers), and Postgraduate trainees in the Department of Dentistry at Jinnah Postgraduate Medical Center. Approval was taken from the Institutional Review Board (IRB no: F.2-81/2019-GENL/35453/JPMC) of Jinnah Postgraduate Medical Center, Karachi. The sample size of 300 patients was calculated using OpenEpi software. Three hundred patients were enrolled in the research after the signing of written and informed consent. Both genders of dental professionals were randomly invited and selected to participate in the research.

Data was collected over the period of six months, starting from September 2021 and lasting till February 2022. The Regardless of age, gender or socioeconomic status, the patients who required IANB for any kind of dental treatment in lower posterior teeth were divided into three groups between dental operators, namely, Undergraduates (Interns), Graduates (House Officers), and Postgraduate trainees having randomly assigned 100 cases in each group. IANB was administered using a conventional technique, and patients were evaluated at an interval of 30 minutes for transient facial nerve palsy. Patients were especially screened for allergies to lidocaine (via transdermal patch test), latex allergy. the ones who had a history of systemic diseases, smoking habits and pregnancy were excluded.

Frequencies and percentages were calculated, and their correlation was assessed via Pearson Chi-Square in SPSS version 24. The questionnaire provided had two components. The first one was comprised of questions on the participant's demographic information about their age, gender, and socioeconomic standing. The next section included relevant questions about the incidence of facial nerve palsy and the designation of the dental operator administering IANB.

The identification of facial palsy was established initially via visual inspection and subsequently in detail by assessing and noting the motor functions of the facial nerve via a set of questions in which patients were asked to open the mouth, make a smiley face, to blow their cheeks and clenching their teeth. The patients were asked to rate the pain experienced during administration of IANB on a like-rt scale of 1 to 10. Score more than equal to 8 rating was considered painful.

The questionnaire was completed by the author, who was responsible for data collection. Only acute facial nerve palsy was included in this investigation. Each patient was evaluated for 60±10 minutes for the signs and symptoms of FNP, as mentioned earlier. The patients who received FNP following IANB were reassured that this is a transient occurrence and that they will return to normal within three to six hours, estimated from the time IANB was delivered.

Keeping the patient history into account, all the patients were administered MEDICAINE® Inj. (2% lidocaine hydrochloride with epinephrine 1:100,000), Huons Co., Ltd, Korea.)

RESULTS:

A total of 300 cases were divided into three groups: Undergraduates (Interns), Graduates (house officers) and Postgraduate dental trainees, with 100 cases in each group. Out of which 54% (n=162) were males while 46% (n=138) were females. Following the findings of the research, 28% (n=84) of patients suffered from transient facial nerve palsy following IANB (Fig 1). Out of them, 15% (n=45 of total cases) were by Undergraduates (Interns), 10% (n=30 of total cases) were caused by Graduates (Interns), and only 3% (n=9 of total) incidences happened following IANB by Postgraduate trainees (Figure 1). The proportions of cases showing facial palsy did differ by designation reaching

statistical significance, $X2$ (2, N = 300) = 32.44, p < 0.01.(Table 1) The odds of incidence of FNP is 8.27 times more if the dental operator is an undergraduate when compared to a postgraduate trainee. In contrast, the odds of occurrence of FNP are comparatively less, i.e., 4.33 if the IANB is administered by a graduate when compared to a postgraduate trainee.

In addition, when gender was considered for the 84 patients with FNP, it was discovered that the majority were female (56%, n=47), while the number of men was less (44%, n=37) (Table 1).

Most of the patients in which FNP happened (73 out of 84), were unable to recall anything uncomfortable or unsettling about the IANB injection, while 11 individuals had a painful IANB injection. All eleven patients with a painful IANB injection were given block anaesthesia by undergraduate dental students. Based on symptom interpretation, only 13 patients rated dysesthesia as their most problematic symptom, while paresthesia was prominent in the majority of patients (n=71)

Figure 1: Diagramatic representation of Incidence of Facial Palsy

Table 1: Summary of the Results showing Designation wise incidence.

Dental Operators	Incidence	
	Transient FNP Present (n=84) (M=37, F=47)	**Transient FNP Absent (n=216)**
Undergraduates (Interns)	15% (n=45) (M=19, F=26)	18.3% (n=55)
Graduates (House Officers)	10% (n=30) (M=13, F=17)	23.3% (n=70)
Postgraduate Trainees	3% (n=9) (M=5, F=4)	30.3% (n=91)
Overall Incidence	28% (n=84) (p < 0.01) * X^2 (2, N = 300) = 32.44, p < 0.01	

*A p-value less than 0.05 is statistically significant. M=Males; F=Females

DISCUSSION:

An essential part of routine dental practise is administering local anaesthetic. To complete the session and obtain the necessary cooperation from the patient, appropriate analgesia must be achieved in the operating area. Depending on how long it was between the time of the injection and the commencement of the symptoms, the paralysis might either be instantaneous or delayed. This article's goal is to describe cases of transient facial palsy caused by inferior alveolar nerve block patients who experienced it at intervals of 30 minutes.[1]

This study reports overall 28% prevalence of FNP which occurs as a complication of IANB administration. Being dental procedure as a causative identity, facial nerve palsy is a rare condition, and dental infections or paradental foci are mostly thought to be accountable.[13,14] Overall the total number of cases of facial palsy has been estimated to vary between 17 and 35 cases per 100,000 for all causes.[15] While in a later study, facial palsy by local anesthetic administration has reported incidence between 1:42 and 1:750,000 with multiple causative mechanisms.[16]

Vasconcelos BC et al. suggested three possible mechanisms by which nerve damage can occur, resulting in Facial Nerve Palsy (FNP), i.e., direct nerve trauma, intraneural hematoma and injury due to local anesthetic toxicity.[13] Dental work-related facial palsy can occur as acute or delayed presentation. The complication of facial nerve palsy of acute origin most commonly arises following local anesthesia administration during dental treatment, initiating the facial paresis shortly following the insertion of a local anesthetic for an IANB, which is usually followed by recovery within 12 to 24 hours.[17] About 90% complete recovery in patients with incomplete palsy has been reported,[18] while delayed facial palsy following the local anesthetic administration is uncommon.[19]

It has been reported by Thangavelu K et al., facial nerve palsy might be caused directly or indirectly by iatrogenic sources.[5] So, it can be hypothesized that clinical experience assumes a significant part in the incidence of facial palsy in dental procedures, which is supported by the results of this study. Therefore a good knowledge of anatomical structures and their orientation is very crucial for a successful and complication-free inferior alveolar nerve block (IANB).[21] According to Harini K et al., only 10% of dentistry students have an adequate understanding of the neurological consequences of IANB while managing and providing local anesthetic, whereas 60% have intermediate knowledge. Compared to this, 30% of individuals have inadequate knowledge.[22] The findings of Harini K et al. are also supported by a study by Aburas H et al., which concludes that more experience in the clinical field a dentist gains results in a lesser amount of complications, including facial nerve palsy.[23] Furthermore, considering the gender of the patients, the majority of published case reports describe facial palsies in females,[9,24-27] which is supported by the findings of this paper, which indicate a 56% incidence in females compared to 44% in men. But the results of this paper could be biased as no gender-centered randomization was aimed.

In this study, we used MEDICAINE® Inj. (2% lidocaine

hydrochloride with epinephrine 1:100,000), Huons Co., Ltd, Korea.), the main reason for choosing lidocaine was because it is an amide and there is a relatively minimal risk of allergic reaction; according to research published in North American publications, the rate of allergic reactions is around 0.7%.[28,29]

Moreover, only conventional technique for IANB administration was included in this research because the Vazirani-Akinosi nerve block and the conventional inferior alveolar nerve block techniques have been compared in multiple research; nevertheless, these investigations have produced inconsistent outcomes.[30,31]

The findings of this research provide a source for further detailed studies. It will be beneficial for designing a more clinically oriented curriculum by providing relevant statistics on IANB-related transient facial palsy. Furthermore, as the incidence of FNP was highest in undergraduate students, statistics from this paper encourage the introduction of virtual reality simulators, as presented by C G Correa et al.,[32] which could be incorporated into the undergraduate curriculum, aiding the dental students in minimizing the IANB-related FNP in their clinical practice. Limitation of time and resources, which rendered us to get ourselves limited to a small sample size, are some of the drawbacks of this study.

CONCLUSION:

Incidence of IANB-related facial palsy is more among junior dental operators depicting their lower clinical experience. Clinical expertise increases as the designation of dental operators change from Undergraduates to Postgraduate trainees. So, to minimize its incidence, dental operators must be critically taught via a comprehensive curriculum.

Limitations of the Study:

This study is limited to one institutional data. It may be possible that the demographic factors of the patients coming to the dental out-patient department where this study was conducted are the same, which can create a bias as the results will lack the diversity of the patients demographically. Moreover, the professional expertise possessed by any dental professional from different institutes may differ. Expanding the same methodology in multi-institutional data collection may eliminate this bias.

Conflict of Interest: The authors of this study agree with the conclusions drawn from this investigation and do not have any competing interests to declare.

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Authors Contribution:
Rehan Ahmad: data collection, performed data analysis, drafted the manuscript and final review
Sabeen Masood: designed the study, drafted the manuscript and performed literature search.
Jehan Alam: Supervisor, performed the critical review of the manuscript

REFERENCES:

1. Tzermpos FH, Cocos A, Kleftogiannis M, Zarakas M, Iatrou I. Transient delayed facial nerve palsy after inferior alveolar nerve block anesthesia. Anesth Prog. 2012;59(1):22– 27. doi: 10.2344/11-03.1.
2. Potocnik I, Bajroviæ F. Failure of inferior alveolar nerve block in endodontics. Endod Dent Traumatol. 1999 Dec;15(6):247-51. doi: 10.1111/j.1600-9657.1999.tb00782.x. PMID: 10825834.
3. Sweta VR, Thenmozhi MS. Facial nerve paralysis after anaesthetic usage-a review. J. Pharm. Sci. & Res. 2014;6(9):308.
4. Malamed S. 6th ed. Maryland Heights: Mosby; 2012. Handbook of Local Anesthesia; pp. 157–253. .
5. Thangavelu K, Kannan R, Kumar NS, Rethish E, Sabitha S, Sayeeganesh N. Significance of localization of mandibular foramen in an inferior alveolar nerve block. J Nat Sci Biol Med. 2012; 3:156–60. doi: 10.4103/0976-9668.101896. .
6. Quinn JH. Inferior alveolar nerve block using the internal oblique ridge. J Am Dent Assoc. 1998;129:1147–8. doi: 10.14219/jada.archive.1998.0392.
7. Blanton PL, Jeske AH. Avoiding complications in local anesthesia induction: anatomical considerations. J Am Dent Assoc. 2003; 134:888–893. doi: 10.14219/jada.archive .2003. 0288.
8. Miles PG. Facial palsy in the dental surgery. Case report and review. Australian dental journal. 1992;37(4):262-5. doi: 10.1111/j.1834-7819.1992.tb04741.x.
9. Ramoglu M, Demirkol M, Aras MH, Ege B. Peripheral Facial Nerve Paralysis Triggered by Alveolar Osteitis. J Craniofac Surg. 2015;26(4): e292-3. doi: 10.1097/SCS. 000000000000-1596. .
10. Pogrel MA, Bryan J, Regezi J. Nerve damage associated with inferior alveolar nerve blocks. J Am Dent Assoc 1995;126: 1150-5.
11. Crean J, Powis A. Neurological complications of local anaesthetics in dentistry. Dent Update. 1999;26:344–349.
12. Keetley A, Moles DR. A clinical audit into the success rate of inferior alveolar nerve block analgesia in general dental practice. Prim dent care. 2001(4):139-42. doi.org/10.1308/135576101322462174.
13. Rahman I, Sadiq SA. Ophthalmic management of facial nerve palsy: a review. Surv Ophthalmol 2007;52(2):121–44. doi: 10.1016/j.survophthal.2006.12.009. .
14. McKay J, Ford E. Anaesthesia: Pause for palsy. Br Dent J. 2016;221(1):3. doi:10.1038/sj.bdj.2016.472.
15. Misirlioglu M, Adisen MZ, Okkesim A, Akyil YY. Facial nerve paralysis after dental procedure. JOMR. 2016; 4(3):80. doi:10.4103/2321-3841.196356.

16. Zalagh M, Boukhari A, Attifi H, Hmidi M, Messary A. Contralateral facial nerve palsy following mandibular second molar removal: is there co-relation or just coincidence?. The Pan Afr Med J. 2014;18. doi: 10.11604/pamj.2014. 18.173. 3750.

17. Gaudin RA, Remenschneider AK, Phillips K, Knipfer C, Smeets R, Heiland M, Hadlock TA. Facial palsy after dental procedures–Is viral reactivation responsible?. J Cranio Maxill Surg. 2017;45(1):71-5. doi: 10.1016/j.jcms.2016.11.002. .

18. Holland NJ, Weiner GM. Recent developments in Bell's palsy. Br Med J. 2004;329:553– 557. doi: 10.1136/bmj.329.7465.553.

19. Brar RS, Kaur H, Kaur M, Mehta A. Rare Complications following posterior superior alveolar nerve block (PSANB) for tooth extraction: A report of two cases and review of literature. J Adv Med Dent Scie Res 2018;6(9):24-26. doi: 10.21276/jamdsr.

20. Gray RL. Peripheral facial nerve paralysis of dental origin. Br J Oral Surg. 1978;16(2):143-50. .

21. Al Meslet A, Aldhafeeri S, Alzahrani A. Knowledge and Awareness of Bell's Palsy Among Dentists and Dental Students in Riyadh City, Kingdom of Saudi Arabia. Microbiol Infect Dis. 2019;3(3):1-5. .

22. Harini K, Prabu D. Awareness and Knowledge of Neurological Complications and its Management while administering Local Anaesthesia among The Dental Students. Res J Pharm Technol. 2019;12(2):483-8. doi: 10.5958/0974-360X.2019.00085.4.

23. Aburas H, Al-Ali N, Al-Omair T, Al-asmari A, Al-jrais M, Al-rizqi M. Awareness and knowledge of neurological complications while administering local anesthesia among the dental professionals of Riyadh. Pediatr Dent Care. 2016;1(128):2. doi: 10.4172/2573-444X.1000128.

24. Miles PG. Facial palsy in the dental surgery. Case report and review. Aust Dent J. 1992 Aug;37(4):262-5. doi: 10.1111/j. 1834- 7819.1992.tb04741.x. PMID: 1444944.

25. Chevalier V, Arbab-Chirani R, Tea SH, Roux M. Facial palsy after inferior alveolar nerve block: case report and review of the literature. Int J Oral Maxillofac Surg. 2010;39(11):1139-42.

26. Ezirganli S, Kazancioglu HO. An unforeseen complication arising from inferior alveolar nerve block: is anemia possible? J Craniofac Surg. 2013;24(6):2178-9.

27. Jenyon T, Panthagani J, Green D. Transient facial nerve palsy following dental local anaesthesia. BMJ Case Rep. 2020;13(9).

28. Mackley CL, Marks JG, Anderson BE. Delayed-type hypersensitivity to lidocaine. Archives of dermatology. 2003;139(3):343-6.

29. Lottinger C, McNeish J. Local Anesthesia. In: Ferneini EM, Goupil MT, editors. Office-Based Maxillofacial Surgical Procedures: A Step-by-step Approach. Cham: Springer International Publishing; 2019. p. 66.

30. Prabhu Nakkeeran K, Ravi P, Doss GT, Raja KK. Is the Vazirani-Akinosi Nerve Block a Better Technique Than the Conventional Inferior Alveolar Nerve Block for Beginners? Journal of Oral and Maxillofacial Surgery. 2019;77(3):489-92.

31. Goldberg S, Reader A, Drum M, Nusstein J, Beck M. Comparison of the anesthetic efficacy of the conventional inferior alveolar, Gow-Gates, and Vazirani-Akinosi techniques. Journal of endodontics. 2008;34(11):1306-11.

32. Correa CG, Machado MAdAM, Ranzini E, Tori R, Nunes FdLS. Virtual Reality simulator for dental anesthesia training in the inferior alveolar nerve block. Journal of Applied Oral Science. 2017;25:357-66.