

Survey on Knowledge of Dental Students Towards Periodontal Ligament Injection

Dr. Nivas Sundar. S, Junior Resident, Thai Moogambigai Dental College & Hospital.

Dr. Uma Sudhakar, Professor & Hod, Department of Periodontics , Thai Moogambigai Dental College & Hospital.

Dr. Nimisha Mithradas, Senior Lecturer, Department of Periodontics, Thai Moogambigai Dental College & Hospital.

Dr. Pooja. R , Junior Resident, Thai Moogambigai Dental College & Hospital

Dr. Nishanthi. R, Junior Resident, Thai Moogambigai Dental College & Hospital

Abstract:-

➤ *Introduction:*

Periodontal ligament injection primarily achieves complete anaesthesia in a tooth where regional block anaesthesia had previously failed to provide it. The PDL injection technique is employed as a supplemental injection technique for unsuccessful conventional techniques, particularly inferior alveolar nerve block for mandibular anaesthesia.

➤ *Aim:*

The aim of this survey is to evaluate the knowledge of periodontal ligament injection technique among the dental student and to reinforce these in practice by giving additional education towards the outcome of improper treatment.

➤ *Material and Methodology:*

The cross-sectional questionnaire survey was conducted amongst the dental students to determine their knowledge towards periodontal ligament injection. A total of 160 dental students from different dental colleges in Chennai, India were entered into the study.

➤ *Result:*

On analysis of the given data it was observed 87 out of 160 (54%) belong to internship categories, 34 were senior interns with 23 perusing post-graduation and the remaining 16 (10%) were private dental practitioners. The questions were individually subjected to chi square test. The chi-square statistic is 212.446. The p-value is .0001. The result is significant at $p < .05$

➤ *Conclusion:*

The present study concluded that majority of the dental students are aware about importance and complications of PDL injection. Even though most of the practitioners acquired more knowledge yet minor ignorance by few practitioners has been noted. Thus, the background of this survey is to evaluate the knowledge amongst practitioners and to reinforce additional education towards the outcome of improper treatment.

Keywords:- PDL Injection, Anaesthesia, Supplementary Injection, Haemophilic Patients.

I. INTRODUCTION

Local anaesthesia is defined as the loss of sensation in a circumscribed area of the body caused by depression of excitation in nerve endings or by inhibition of the conduction process in the peripheral nerves without inducing loss of consciousness[1]. The following factors which determines fear at the time of injection or extraction are tissue distensibility, speed of injection, solution temperature, patient characteristics, and, most importantly the type of technique which is employed[2]. Local anaesthesia is considered as a confined treatment modality for maxillary anaesthesia since it is easier to perform and LA solution can easily diffuse through porous maxillary bone and thin bony cortex[3]. As such, the periodontal ligament (PDL) injection was suggested as an alternative to minimize the pain scores during injection of LA for maxillary teeth procedures[4].

The PDL injection technique was first described in 1924 and popularized in the 1970s, when special dental syringes were applied to this technique[5]. PDL injection primarily achieves complete anaesthesia in a tooth where regional block anaesthesia had previously failed to provide it[6]. The needle is placed into the gingival sulcus along the mesial root of the tooth and advanced along the root until resistance is encountered, approximately 0.2 ml of local anaesthetic solution was deposited for 20 seconds. A use of 25-gauge and 27-gauge short needle is highly recommended, to eliminate the problem of needle bending [7]. The PDL injection technique is employed as a supplemental injection technique for unsuccessful conventional techniques, particularly inferior alveolar nerve block for mandibular anaesthesia[8]. However, it is also preferred as a primary technique when anaesthesia of short duration is desired and a safer alternative when limited soft-tissue anaesthesia for simple single-tooth extraction is required. This technique shows a rapid onset of action, 30–45 minutes duration of anaesthesia and rare systemic toxicity[9]. The results of the most recent studies showed that PDL anaesthesia is an effective anaesthetic technique for localized anaesthesia in the mandible. With new devices like the computer-controlled LA-delivery system (CCLADS), the PDL injection has been reported as a convenient primary anaesthetic technique of LA for both patient and dentist. However, local infiltration has been more effective than PDL during extraction procedures. PDL injection with

CCLADS, compared with conventional local infiltration anaesthesia reduces injection pain, while achieving a satisfactory anaesthetic effect[10].

The aim of this survey is to evaluate the knowledge of periodontal ligament injection technique among the dental student and to reinforce these in practice by giving additional education towards the outcome of improper treatment.

II. MATERIAL AND METHODOLOGY

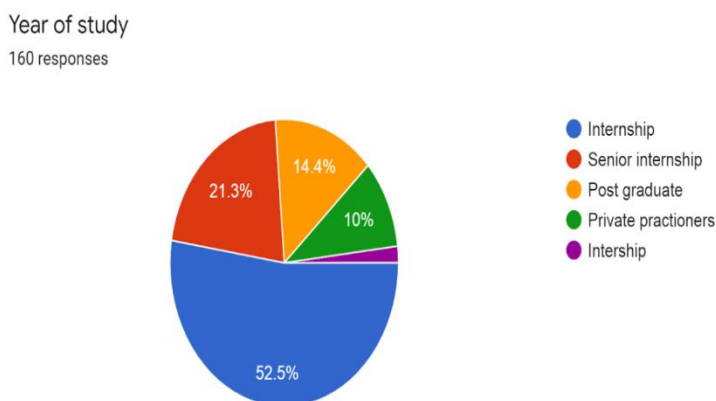
The cross-sectional questionnaire survey was conducted amongst the dental students to determine their knowledge towards periodontal ligament injection. A total of 160 dental students from different dental colleges in Chennai, India were entered into the study.

A 20-item questionnaire was developed explaining the purpose of the survey and requesting participation. The questionnaire was designed as online-based survey which

was converted in google forms and circulated to the samples. The participants enrolled in the study expressed their level of perception about periodontal ligament injection and they were assured that their information provided is kept confidential. The received data was submitted for statistical analysis using SPSS software Version 20.0 and Chi-squared test was performed to determine the significance and to investigate the correlation for measured values. Convenient sampling technique was employed that yielded information from 160 random samples grouped as 55 male and 105 female participants were taken into this observational study.

III. RESULTS

On analysis of the given data it was observed 87 out of 160 (54%) belong to internship categories, 34 were senior interns with 23 perusing post-graduation and the remaining 16 (10%) were private dental practitioners. The questions were individually subjected to chi square test. The chi-square statistic is 212.446. **The p-value is .0001.** The result is significant at $p < .05$ (**Table below**)



(Fig-1) One-way ANOVA was performed to evaluate the interrelationship within and between the study group questionnaires. The ANOVA test showed f-ratio value of 52.19005. **The p-value is < .00001.** The result is highly significant at $p < .05$. (**Table 1**)

Summary of Data	R1	R2	R3	R4	Total
N	20	20	17	7	64
$\sum X$	1600	996	523	81	3200
Mean	80	49.8	30.7647	11.5714	50
$\sum X^2$	138184	51284	17329	1101	207898
Std.Dev.	23.1517	9.4122	8.8001	5.2236	27.5733
Source	SS	df	MS		
Between-Responses	34628.0269	3	11542.6756	F = 52.19005	
Within-Respondents	13269.9731	60	221.1662		
Total	47898	63			

(Table-1) The f-ratio value is 52.19005. The p-value is < .00001. The result is significant at $p < .05$.

Chi-Square Calculator for Goodness of Fit

QUESTIONS	Chi square value	p value*	significance level	Significance*
1	81.225	<0.00001	p<0.05	yes
2	12.658	0.00178	p<0.05	yes
3	51.35	<0.00001	p<0.05	yes
4	29.443	<0.00001	p<0.05	yes
5	22.647	0.00001	p<0.05	yes
6	35.15	<0.00001	p<0.05	yes
7	28.35	<0.00001	p<0.05	yes
8	6.51	0.0385	p<0.05	yes
9	65.05	<0.00001	p<0.05	yes
10	25.04	<0.00001	p<0.05	yes
11	16.85	0.00076	p<0.05	yes
12	46.225	<0.00001	p<0.05	yes
13	40.25	<0.00001	p<0.05	yes
14	27.225	<0.00001	p<0.05	yes
15	10.403	0.00551	p<0.05	yes
16	26.45	<0.00001	p<0.05	yes
17	25.1	<0.00001	p<0.05	yes
18	56.08	<0.00001	p<0.05	yes
19	44.92	<0.00001	p<0.05	yes
20	61.337	<0.00001	p<0.05	yes

(Table-2) *p-value significance is set at <0.05

IV. DISCUSSION

Many researches in their studies found diverse difference in the use of PDL injection in their clinical practice. The main objective of this present study was designed to analyse the perception level of PDL injection amongst dental students with an unbiased approach.

This result showed that maximum participants(85.6%) are aware of PDL injection technique. This is comparable to the study conducted by G. Vinitha, et al[11]. About 41.9% of present study participants prefers infiltration and 38.1% prefers nerve block for extraction and only 20% reported that they use PDL injection for extraction. This result obtained from the present study showed statistically significant difference of $P < 0.05$ (0.00178). Although infiltration and nerve block provide satisfactory results[12,13], Occasionally, when presented with a “hot” tooth with pulpal inflammation, these technique fails[14-17]. For many years, PDL injection have been proposed as an alternative for Inferior alveolar nerve block[18,19] and it also limits the amount of soft tissue anaesthesia, sparing the lip and tongue thus increasing patient comfort[20].

Nearly 41.3% of dentist revealed that they indicate PDL injection for extraction in haemophilic patients, 35% prefers in infected tooth with sinus opening and 23.8% revealed to indicate when routine nerve block fails. PDL injection is administered in haemophiliac patient[21] or other bleeding disorder, in whom post-injection bleeding

may be dangerous and in young children and mentally or physically handicapped person due to soft tissue trauma to the still anaesthetised tongue or lower lip, in accordance with Malamed[1]. Hence in question no.8, Statistically significant difference was observed $P < 0.05$ (0.0385).

PDL injection is not recommended for primary teeth, Because there have been cases of enamel hypoplasia and hypo-mineralisation in un-erupted permanent teeth adjacent to the injection site[22]. In current study 51.9% of dental students asserted that they contraindicate in primary teeth when permanent tooth bud is present as it can cause enamel hypoplasia. This again reveals a positive inference of better perception level towards PDL injection. Statistically significant difference was observed $P < 0.05$ (<0.00001) in question no 17.

In the current study 41.3% (<0.00001) of participants revealed PDL injection as supplementary injection, This is agreed with Malamed[1]. Supplementary injection is efficient and easy to perform with minimal anaesthetic dosage[23] and often administered for unsuccessful conventional technique[24] and same percent of participants reported that they prefer 27-gauge needle for administration of PDL injection, which is correlated with the Malamed. It was stated that 30-gauge needle were bending upon insertion into gingival sulcus and use of 25-27 gauge short needle entirely eliminates the problem of bending[25]. In this result, Statistically significant difference was observed $P < 0.05$ (0.00551). 76.9% of participants strongly advocate

PDL injection with the use of computer-controlled local anaesthetic device[26].38.1% were aware that Luer-Lock syringe barrel is used to secure the administration of Intra-ligamentary injection[27].

In the present study,60% of the dentist reported that they deposit 0.2% of pulpal anaesthesia following PDL injection and the same percent of participants revealed that they administer for 20 seconds of duration.This is in accordance to the study by Suzan et al[26], stated that 0.2 ml of solution injected with a slow fusion for minimum of 20seconds.Then, the same technique is repeated on the distal of the tooth. This injection may be uncomfortable if the rate of injection is too rapid or tissues are inflamed [14]. 31.3% of dentist reported complication of PDL injection as swelling and discolouration of soft tissue , 23.1% revealed as prolonged ischemia of interdental papillae, 8.8% reported as exposure of crestal bone. And 36.2% reported as all of the above which is similar to the study[28].In this result,Statistically significant difference was observed $P < 0.05$ (< 0.00001).This shows sufficient knowledge amongst dental students about the various outcome as a complication of PDL injection.

V. CONCLUSION

The present study concluded that majority of the dental students are aware about importance and complications of PDL injection. It is mainly administered as a alternative treatment option when other injections are contraindicated.Eventhough most of the practitioners acquired more knowledge yet minor ignorance by few practitioners has been noted. Thus, the background of this survey is to evaluate the knowledge amongst practitioners and to reinforce additional education towards the outcome of improper treatment.

➤ *Financial Support And Sponsorship:*
Nil.

➤ *Conflict Of Interest:*
There are no conflicts of interest.

REFERENCES

- [1]. Malamed SF. Handbook of local anesthesia. 6th ed. St. Louis:Elsevier; 2013.
- [2]. Kaufman E, Epstein JB, Naveh E, Gorsky M, Gross A, Cohen G.A survey of pain, pressure and discomfort induce by commonly used oral local anaesthesia injections. *AnaesthProg* 2005 Winter;52(4):122-127.
- [3]. Brunetto PC, Ranali J, Ambrosano GM, et al. Anesthetic efficacy of 3 volumes of lidocaine with epinephrine in maxillary infiltration anesthesia. *AnesthProg*. 2008;55(2):29–34.
- [4]. Allen KD, Kotil D, Larzelere RE, Hutfless S, Beiraghi S. Comparison of a computerized anesthesia device with traditional syringe in preschool children. *Pediatr Dent*. 2002;24(4):315–320.
- [5]. Moore PA, Cuddy MA, Cooke MR, Sokolowski CJ. Periodontal ligament and intraosseous anesthetic injection techniques: alternatives to mandibular nerve blocks. *J Am Dent Assoc*. 2011;142 Suppl 3:13S–18S.
- [6]. Walton, R. E., and Abbott, B. J.: Periodontal Ligament Injection: A Clinical Evaluation, *J. Am. Dent. Assoc*. 103:571, 1981
- [7]. Oral surgery withsecrionosn endodontics anddental radiology Volume 53. Number 2. February, 1982
- [8]. Blanton PL, Jeske AH. Dental local anesthetics: alternate delivery methods. *J Am Dent Assoc*. 2003;134(2):228–234.
- [9]. Hochman MN. Single-tooth anesthesia: pressure-sensing technology provides innovative advancement in the field of dental local anesthesia. *CompendContinEduc Dent*. 2007;28(4):186–188.
- [10]. Elbay UŞ, Elbay M, Kaya E, Cilasun U. Intraligamentary and suprapariostealanesthesia efficacy using a computer controlled delivery system in mandibular molars. *J ClinPediatr Dent*. 2016;40(3):193–199.
- [11]. Vinitha G, Santosh. A survey on knowledge of dental students about periodontal ligament injection. *J. Pharm. Sci& Res*. 2015;7(8):615-617.
- [12]. Haas DA. Alternative mandibular nerve block techniques. A review of the Gow-Gates and Akinosi-Vazirani closed mouth mandibular nerve block techniques. *JADA*.2011;142:8s 12s.
- [13]. Sadiq M, Shafa A, Samir R. Dental practitioner's choice of local anesthesia technique for mandibular molar anesthesia. *Pakistan Oral & Dental Journal*. 2017;37(2):227-230.
- [14]. Kim S. Ligament injection: A physiological explanation of its efficacy. *J Endod*. 1986; 12: 486-491.
- [15]. Davoudi A, Rismanchian M, Akhavan A, Nosouhian S, Bajoghli F, Haghighat A, Arbabzadeh F, Samimi P, Fiez A, Shadmehr E, et al. A brief review on the efficacy of different possible and nonpharmacological techniques in eliminating discomfort of local anesthesia injection during dental procedures. *Anesth Essays Res*. 2016;10(1):13-16.
- [16]. Hemad SA. Anaesthetic efficacy of periodontal ligament injection of 2% lidocaine with 1:80,000 adrenaline. *Al-Rafidain Dent J*. 2006;6:26-34.
- [17]. Reed KL, Malamed SF, Fonner AM. Local anesthesia part 2: Technical considera-tions. *AnesthProg*. 2012;59:127-137.
- [18]. Milgrom P, Coldwell SE, Getz T, Weinstein P, Ramsay DS. Four dimensions of fear of dental injections. *J Am Dent Assoc* 1997 Jun;128(6):756-766.
- [19]. Kaufman E. Transligamentary anaesthesia: A review. *Anesth Pain Contr Dent*.1992;1:133-141.
- [20]. Prasanna N, Sharmraaj S. Local anesthesia in dentistry—clinical considerations. *Int J Drug Dev Res* 2013;5(4):30-36.
- [21]. Jastak, J. T., and Yagiela, J. A.: Regional Anesthesia of the Oral Cavity, St. Louis, 1981, The C.V. Mosby Company.

- [22]. Brannstrom M, Lindskog S, Nordenvall KJ. Enamel hypoplasia in permanent teeth induced by periodontal ligament anesthesia of primary teeth. *JADA* 1984;109(5):735-736
- [23]. Lalabonova H, Kirova D, Dobreva D. Intraligamentary anaesthesia in General dental practice. *Journal of IMAB*. 2005; 11:22-24.
- [24]. Childers M, Reader A, Nist R, Beck M, Meyers WJ. Anesthetic efficacy of the periodontal ligament injection after an inferior alveolar nerve block. *J Endod*. 1996; 22(6): 317-320.
- [25]. Madon GA, Madon SG, Madon AD. Failure of inferior alveolar nerve block: Exploring the alternatives. *J Am Dent Assoc*. 2002;133:843-846.
- [26]. Salem, Suzan, Arwa Namnakani, and Islam Saad. "Cognizance of Undergraduate Students toward Periodontal Ligament Injection in Exodontia." *Journal of Advances in Medicine and Medical Research* (2018): 1-9.
- [27]. Baghlaf K, Elashiry E, Alamoudi N. Computerized intraligamentary anesthesia in children: A review of clinical considerations. *J Dent Anesth Pain Med*. 2018 Aug;18(4):197-204.
- [28]. Wong JK. Adjuncts to local anesthesia: separating fact from fiction. *J Can Dent Assoc* 2001 Jul-Aug;67(7):391-397.
- 6). what do you is the more effective technique for extracting a tooth?
 a) periodontal ligament injection
 b) pulpal injection
 c) nerve block
 d) infiltration
- 7). periodontal ligament injection is given with
 a) syringe needle
 b) special injection apparatus
 c) Conventional syringe
 d) None of the above
- 8). periodontal ligament injection is indicated for extraction in:
 a) haemophilic patients
 b) Extraction of infected tooth with sinus opening
 c) When routine nerve block fails
- 9). Patient response for periodontal injection
 a) Good
 b) Fair
 c) Poor
 d) Not reliable
- 10). Is there any pain experienced during extraction?
 a) as expected,
 b) less than expected
 c) more than expected
- 11). What is the duration of periodontal ligament injection?
 a) 15 minutes to 20 minutes
 b) 25 minutes to 30 minutes
 c) 30 minutes to 35 minutes
 d) 35 minutes to 45 minutes
- 12). Use of a computer – controlled local anesthetic delivery (C-CLAD) device is strongly advocated for PDL injection:
 a) Yes
 b) No
- 13). What syringe barrel is used to secure the administration of intra-ligamentary injection?
 a) luer-lock syringe
 b) normal slip tip syringe
 c) eccentric tip syringe
 d) none of the above
- 14). Have you given periodontal injection for extraction or endodontic treatment?
 a). Yes
 b). No
- 15). which needle is used for periodontal ligament injection?
 a) 25-gauge short needle
 b) 27-gauge short needle
 c) 30-gauge short needle
- 16). What do you think will be the complications of periodontal ligament injection?
 a) Discomfort and swelling

ANNEXURE

SURVEY ON KNOWLEDGE OF DENTAL STUDENTS TOWARDS PERIODONTAL LIGAMENT INJECTION

- 1) Are you aware of periodontal ligament injection technique?
 a) Yes
 b) No
- 2) What injection technique do you commonly give for extraction?
 a) Infiltration
 b) Nerve block
 c) Periodontal ligament injection
- 3). Periodontal ligament injection technique is
 a) conventional injection technique
 b) supplemental injection technique
 c) rarely useful technique
 d) none of the above
- 4). which is the point of entry of periodontal injection?
 a) gingival sulcus
 b) alveolar mucosa
 c) attached gingiva
- 5). How many surfaces do you give periodontal ligament injection?
 a) 1
 b) 2
 c) 3

- b) Discoloration of soft tissues
- c) Prolonged ischemia of interdental papillae
- d) Eventual exposure of crestal bone

17). Do you think PDL injection is contraindicated in primary teeth. when the permanent tooth bud is present?

- a) yes
- b) no
- c) maybe

17A) If your answer is YES, why do you think so?

- a) Enamel hypoplasia of developing permanent tooth
- b) Inflammation and resorption
- c) Reduction in the number of pulp cells

18). What can be the deposition of pulpal anaesthesia following PDL injection?

- a) 0.1ml
- b) 0.2ml
- c) 0.4ml

19). The bevel of the needle directed away from the tooth surface at approximately to the long axis of the tooth?

- a) 20-degree angle
- b) 30-degree angle
- c) 40-degree angle

20). For how long is the pressure given during PDL injection?

- a) 10 seconds
- b) 20 seconds
- c) 30 seconds