Journal of Advances in Medicine and Medical Research

25(1): 1-9, 2018; Article no.JAMMR.38620
ISSN: 2456-8899
(Past name: British Journal of Medicine and Medical Research, Past ISSN: 2231-0614, NLM ID: 101570965)

Cognizance of Undergraduate Students toward Periodontal Ligament Injection in Exodontia

Suzan Salem[1*], Arwa Namnakani[2] and Islam Saad[3]

[1]Department of Oral Surgery, Maxillofacial and Diagnostic Science, College of Dentistry, Qassim University, Kingdom of Saudi Arabia.
[2]College of Dentistry, Taibah University, Kingdom of Saudi Arabia.
[3]Department of Periodontology and Oral Medicine, College of Dentistry, Qassim University, Kingdom of Saudi Arabia.

Authors' contributions

This work was carried out in collaboration between all authors. Author SS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SS and AN managed the analyses of the study. Author IS managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2018/38620
Editor(s):
(1) Thomas I. Nathaniel, University of South Carolina, School of Medicine-Greenville, Greenville, USA.
(2) Sushi Kadanakuppe, Department of Public Health Dentistry, V. S. Dental College and Hospital, Bengaluru, India.
Reviewers:
(1) Amine Khadija, University of Hassan II Casablanca, Morocco.
(2) Gianluigi Caccianiga, University of Milano-Bicocca, Italy, Malta.
(3) Mehmet Yaltirik, Istanbul University, Turkey.
(4) Lauritano Dorina, University of Milan, Italy.
(5) Emre İriboz, Marmara University, Turkey.
Complete Peer review History: http://www.sciencedomain.org/review-history/22734

Original Research Article

Received 2nd December 2017
Accepted 5th January 2018
Published 15th January 2018

ABSTRACT

Aims: This study was aimed to develop a framework based on the existing knowledge among interns and dental students of their awareness of anesthesia technique which may help improve the treatment services provided to the community.
Study Design: Randomized clinical trial.
Place and Duration of Study: College of Dentistry, Taibah University, Madinah, Saudi Arabia between March 2017 and September 2017.
Methodology: The knowledge of Periodontal ligament (PDL) injection as a substitute technique for inferior alveolar nerve block (IANB) used by interns and dental students when performing tooth extraction. This was investigated using a questionnaire consisting of 10 questions and was

**Corresponding author: E-mail: Dr.suzan.salem@qudent.org;*

distributed among 4th, 5th year students and interns at the college of dentistry, Taibah University, Saudi Arabia. Survey participants were asked about commonly administered injection techniques for extraction, awareness of periodontal ligament injection, periodontal injection technique, its point of entry, patient response, its effectiveness and the most common indication.
Statistical software SPSS® for mac .20, Chicago, IL, USA was used for statistical analysis.
Results: Injection technique commonly used for tooth extraction was 58.2%, 35.8% and 6% for nerve block, infiltration and PDL injection 6% respectively, significant difference at P- value (P≤0.05) was found between different academic level. Awareness of the PDL injection technique was 76.1% while 23.9% wasn't aware, significant difference at P- value (P≤0.05) was found between different academic levels. Points of entry of PDL injection was 74.6%, 19.4% and 6% for gingival sulcus, attached gingiva and alveolar mucosa respectively, significant difference at P-value (P≤0.05) was found between different academic level. Participants using PDL injection for extraction and endodontic treatment was 44% while 56% not using it, significant difference at P-value (P≤0.05) was found between different academic levels. Patient response for periodontal injection was good for 50.7% of participants, significant difference at P- value (P≤0.05) was found between different academic level.
Conclusion: Most students know about PDL injection, but they only used it when routine IANB fails, they are also familiar with the technique, but need to increase their knowledge regarding indications and limitations of PDL injection.

Keywords: Tooth extraction; pain; periodontal ligament injection.

1. INTRODUCTION

Pain has been depicted as an unpleasant feeling extending from gentle inconvenience to anguishing trouble which might be related to genuine or potential harm to tissue. It is a complex multifaceted experience, which has singular and subjective goals, causing a different perception of pain among individuals [1].

Most dental procedures require effective anesthesia, which is extremely important for both the patient and the dental expert; additionally, local anesthesia usually affects patient feedback and their dental treatment, and most of them select their treatment specialist according to their ability to reduce pain during the dental procedure [2-4].

Williamson A and Hoggart B [5] revealed that dental pain is usually connected with the most popular technique utilized in preventing pain during dental procedures. Bahl R [6] additionally found that fear from dentistry had an effect on the patients making them reconsider pain and stress as a reason to miss or postpone their dental treatment.

Local anesthesia had been described as a reversible action that triggers a local loss of sensitivity around the anaesthetized site, or along the nerve pathway and initiates a pain relieving impact by interfacing the neuronal cell layers and irritating calcium authoritative. The subsequent closure of voltage gated sodium channels prevents action potentials from happening and accounts for about 90% of local anesthetic activity [7].

In oral surgery, tooth extraction is considered a common procedure that requires the use of local anesthesia (LA). The inferior alveolar nerve block (IANB) injection is the most broadly utilized injection used to perform extraction of mandibular teeth, which on some occasions may be accompanied with some reported complications [8]. Many alternative anesthetic techniques have been introduced to reduce these complications, one of them was the periodontal ligament (PDL) injection which had been prescribed in 1924 by Cassamani, but was not popular because of the increased risk of blood borne infections and septicemia being for the patients [8].

Since 1980s many researchers investigated PDL injections, where the needle is inserted into the PDL space through the gingival sulcus between the tooth and the alveolar crest [9-11]. Although special syringes and needles are available, the effectiveness of this technique is the same as using a standard syringe with a needle gauge–27 [12]. The anesthetic solution will pass through the marrow spaces around the tooth to reach the periapical tissue and not apically through the PDL membrane [13,14].

This study was aimed to develop a framework based on the existing knowledge between interns and dental students of their awareness of

anesthesia technique which may help improve the treatment services provided to the community.

2. MATERIALS AND METHODS

A cross-sectional study through questionnaire-based survey was conducted among a sample of dental students and interns in the college of dentistry, Taibah University.

2.1 Study Setting

Both male and female campus sites in the college of dentistry, Taibah University were included and students and interns were randomly proportionally selected.

2.2 Study Subjects

134 randomly selected students were enrolled. About sixty-two percent of respondents (n =83) were female. Fifty-three percent of respondents (n =71) were fourth year students (Table 1).

2.3 Questionnaire

A specially designed questionnaire form was prepared based on previous studies (Vinitha G, Santosh Dr [15]). The questionnaire consisted of ten questions with multiple-choice answers covering most aspects relating to using (PDL) while performing tooth extraction. The questions were focused to cover all the information regarding commonly given injection techniques for extraction, awareness of periodontal ligament injection, periodontal injection technique, its point of entry, patient response, its effectiveness and the most common indication. The questionnaire was tested for validity and reliability through a pilot study conducted on 30 dental interns in the college of dentistry, Taibah University.

2.4 Data Collection Method

Formal approval for data collection was obtained from the administrative authorities in the college of dentistry, Taibah University. The questionnaire was sent to 4th year students, 5th year students and interns using a Google drive form, allowing one response from each of the participants. The response time was set at four weeks.

2.5 Statistical Analysis

Collected data were analyzed using the statistical Program for Social Sciences (SPSS® for mac .20, Chicago, IL, USA). Descriptive statistics were performed using frequency counts and percentages. The Chi square test was used to assess the difference in the response of each question according to years of practicing at the 5% level of significance.

3. RESULTS AND DISCUSSION

3.1 Results

The most common injection technique used by students and interns was the nerve block technique (58.2%) while 35.8% of them used the infiltration technique and only 6% used periodontal injection in teeth extraction, with statistically significant difference among different academic years (Table 2).

Regarding the awareness of the PDL injection, the majority of participants were aware of PDL injections (76.1%) especially among fifth year students and interns while 23.9% of them weren't aware of PDL injections, with a statistically significant difference among different academic years (Table 2).

89.6% of participants revealed that the PDL injection is a supplemental injection technique while 3.7% of students say that it is a conventional injection technique and 4.5% report it is rarely a useful technique and 2.2%% select none of them, this difference was statistically insignificant (Table 2).

Table 1. Descriptive data for the study sample

		Gender`					
		Male		Female		Total	
		No.	%	No.	%	No.	%
Education level	**4th year**	14	27.5%	57	68.7%	71	53.0%
	5th year	23	45.1%	10	12.0%	33	24.6%
	intern	14	27.5%	16	19.3%	30	22.4%
	Total	51	100.0%	83	100.0%	134	100.0%

Table 2. Comparison between different academic levels in their response to questionnaire

		Education level								p
		4th year		5th year		intern		Total		
		No.	%	No.	%	No.	%	No.	%	
What injection technique do you commonly give for extraction?	Nerve Block	37	52.1%	21	63.6%	20	66.7%	78	58.2%	P<0.001*
	Infiltration	34	47.9%	10	30.3%	4	13.3%	48	35.8%	
	PD ligament	0	0.0%	2	6.1%	6	20.0%	8	6.0%	
Are you aware of periodontal ligament injection technique?	Yes	43	60.6%	31	93.9%	28	93.3%	102	76.1%	P<0.001*
	No	28	39.4%	2	6.1%	2	6.7%	32	23.9%	
Periodontal ligament injection technique is	Supplemental	61	85.9%	29	87.9%	30	100.0%	120	89.6%	0.367
	Conventional	3	4.2%	2	6.1%	`0	0.0%	5	3.7%	
	Rarely used	4	5.6%	2	6.1%	0	0.0%	6	4.5%	
	None of them	3	4.2%	0	0.0%	0	0.0%	3	2.2%	
Point of entry of periodontal injection	Gingival Sulcus	45	63.4%	31	93.9%	24	80.0%	100	74.6%	0.006*
	Attached Gingiva	18	25.4%	2	6.1%	6	20.0%	26	19.4%	
	Alveolar mucosa	8	11.3%	0	0.0%	0	0.0%	8	6.0%	
How many surfaces do you give periodontal ligament injection?	1	19	26.8%	6	18.2%	4	13.3%	29	21.6%	0.060
	2	36	50.7%	25	75.8%	22	73.3%	83	61.9%	
	3	16	22.5%	2	6.1%	4	13.3%	22	16.4%	
Have you given periodontal injection for extraction or endodontic treatment?	Yes	16	22.5%	23	69.7%	20	66.7%	59	44.0%	P<0.001*
	No	55	77.5%	10	30.3%	10	33.3%	75	56.0%	
Patient response for periodontal injection	Good	29	40.8%	23	69.7%	16	53.3%	68	50.7%	0.007*
	Not reliable	25	35.2%	4	12.1%	2	6.7%	31	23.1%	
	Fair	16	22.5%	6	18.2%	12	40.0%	34	25.4%	
	Poor	1	1.4%	0	0.0%	0	0.0%	1	0.7%	
What do you think is more effective for extracting a tooth?	Nerve Block	59	83.1%	27	81.8%	28	93.3%	114	85.1%	0.164
	Infiltration	10	14.1%	4	12.1%	2	6.7%	16	11.9%	
	PD ligament	2	2.8%	0	0.0%	0	0.0%	2	1.5%	
	Pulpal injection	0	0.0%	2	6.1%	0	0.0%	2	1.5%	
Periodontal ligament injection technique is indicated for extraction in	Nerve block failed	47	66.2%	19	57.6%	22	73.3%	88	65.7%	0.501
	infected tooth	15	21.1%	6	18.2%	4	13.3%	25	18.7%	
	Hemophilia	9	12.7%	8	24.2%	4	13.3%	21	15.7%	
Periodontal ligament injection is given	With syringe	14	19.7%	12	36.4%	12	40.0%	38	28.4%	0.075
	special apparatus	13	18.3%	2	6.1%	6	20.0%	21	15.7%	
	Both	44	62.0%	19	57.6%	12	40.0%	75	56.0%	

p: for chi square test

**: Statistically significant at P≤0.05*

Regarding the point of entry for PDL injection, 74.6% of participants chose gingival sulcus while 19.4% chose attached gingiva and the remaining 6% picked alveolar mucosa, this difference was statistically significant. On the other hand, regarding the number of surfaces for the PDL injection, 61.9% of participants use two surfaces while 16.4% use three surfaces and 21.6% use one surface with a statistically insignificant difference among different academic years (Table 2).

Regarding the use of the PDL injection for extraction or endodontic treatment, 44% of participants revealed using it for extraction or endodontic treatment where 56% do not use it either for extraction nor endodontic treatment with statistically significant difference among participants. Also, regarding patient response to the PDL injection most of patients' response is good (50.7) while 25.4% patient response is fair, 0.7% of patients reveals poor and 23.1% of them is not reliable with a statistically significant difference (Table 2).

The most common technique students and interns regarded as the most effective for tooth extraction is nerve block (85.1%) while 11.9% stipulated infiltration is more effective for extracting a tooth, 1.5% say PDL injection is effective and 1.5% say pulpal injection is effective with a statistically insignificant difference (Table 2).

Regarding indication for using PDL injection, 65.7% of participants revealed using periodontal ligament technique for extraction when routine nerve block fails, on the other hand, 18.7% use this technique for extraction of an infected tooth with sinus opening and remaining 15.7% use this technique for hemophilic patients with a statistically insignificant difference.

Also, the difference in regards to what syringe was used to administer the PDL injection was statistically insignificant. 28.4% of participants were given the injection with a syringe needle while 15.7% state the PDL injection is given with special injection apparatus and the remaining 56.0% says that both a syringe needle and special injection apparatus can be used (Table 2).

3.2 Discussion

Successful oral surgical procedures require proper pain control moreover; some patients may not undergo dental treatment due to fear of pain. Using LA techniques which are conducted without pain will reduce anxiety aids in the management of pain [16].

Several anesthetic techniques had been developed to deliver adequate dental treatment to patients. The aim of this study was to analyze the awareness of students and interns about the PDL injection technique, periodontal injection technique, its point of entry, patient response, its effectiveness and the most common indication in order to improve their knowledge and skills for better dental service quality provided to patients.

Commonly used LA techniques such as infiltration and the mandibular block usually provide acceptable results in most situations. However, on some occasions, when a patient presents an inflamed pulp, these techniques may be ineffective in providing anesthesia and require using alternative techniques, one of these techniques is the PDL injection [17]. The PDL injections were originally described in 1924 by Cassamani and during the 1980s, the majority of articles pertaining to PDL injections began to appear, due to a resurgence of interest in the technique [9]. In the PDL injection, the anesthetic solution diffuses apically through the marrow spaces into the intraseptal bone providing satisfactory anesthesia for the inflamed tooth [18].

Although special syringes and needles are available, the technique is equally effective when using a standard 27-gauge needle. The beveled side of 27- gauge short needle is inserted through the gingival sulcus on the mesial of the tooth to be anesthetized and inserted as far apically as possible. About 0.2 ml of anesthetic solution is injected with a slow fusion for a minimum of 20 seconds. 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 the tissues are inflamed [19].

From the results, the participation of the female students was higher than that of the male students although they were at the same level of education of the participants. Also, 4th year students were found to be the dominate respondents in the study in comparison to 5th year students and interns.

Regarding which type of anesthetic techniques are used, 58.2% of participants revealed that

IANB is the most common technique used to perform tooth extraction, this agreed with Hass in 2011 who reported that IANB is the commonly used local anesthetic technique for various applications throughout modern dentistry [20]. On the other hand, 6% of the participants revealed using PDL injection while performing tooth extraction. In 2017 Sadiq et al. [21] reported that out of 116 participants only 35 using the PDL injection for performing tooth extraction.

The results revealed that 76.1% of the participants were familiar with PDL injections and about 89.6% used it as a supplementary technique, this agreed with Malamed [22] who evaluated using the PDL injection as a supplemental injection instead of IANB and since then PDL injections have been advocated as a primary and supplemental injection technique.

74.6% of participants say that the point of entry for periodontal ligament injection is gingival sulcus at two surfaces, this result closely resembled recommendations stated by Malamed [23] of administering PDL injections by using short 27- or 30- gauge dental needles with the tip of the needle approaching the gingival sulcus on the mesial or distal aspect of the tooth.

Of the participants 44% were using PDL injections for tooth extraction and endodontic treatment and 65.7% says that this technique is indicated when routine nerve block fails, which is in agreement with Walton et al. [24] and Smith et al. [25] who reported that the PDL injection has been used to overcome failed conventional methods.

Among the commonly utilized local anesthetic injection techniques, patients described needle placement during the administration of an IANB as most painful, followed by the PDL injection technique and the mental nerve block injection and infiltration anesthetic injection techniques. They reported that the PDL anesthetic injection technique was the most uncomfortable during solution deposition [26]. These results correlate with this study, where 50.7% of patient response to periodontal ligament injection is good, while 26.1% patient response to periodontal ligament injection is fair and poor.

Most of the participants think that IANB is effective for extracting a tooth followed by infiltration injection and then PDL injection, these results are in agreement with Sadiq et al. [21] who reported that IANB was the most common used technique among 160 practice dentists in dental procedures followed by infiltration then, PDL injection and last intrapulpal injection.

4. CONCLUSION

Most students are aware of the PDL injection, but they only used it when routine IANB fails, they are also familiar with the technique, but need to increase their knowledge regarding indications and limitations of the injection. Based upon these results identifying the objectives and the learning outcome for all anesthetic techniques used in dentistry and their indications will allow students to select the proper anesthetic techniques which eventually will increase dental student's perception toward patient needs.

CONSENT

All authors declare that oral informed consent was obtained from the participants for publication of this study.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Svensson P, Baad-Hansen L, Thygesen T, Juhl GI, Jensen TS. Overview on tools and methods to assess neuropathic trigeminal pain. J Orofac Pain Fall. 2004;18(4):332-338.
2. Fan S, Chen W, Pan C, Huang Z, Xian M, Yang Z, et al. Anesthetic efficacy of inferior alveolar nerve block plus buccal infiltration or periodontal liagament injection with articaine in patients with irreversible pulpitis in the mandibular first molar. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009;108(5):e89–e93.
3. Kohler BR, Castellón L, Laissle G. Gow-gates technique: A pilot study for extraction

procedures with clinical evaluation and review. Anesth Prog. 2008;55(1):2–8.
4. Johnson TM, Badovinac R, Shaefer J. Teaching alternatives to the standard inferior alveolar nerve block in dental education: Outomes in clinical practice. J Dental Educ. 2007;7(9):1145–1152.
5. Williamson A, Hoggart B. Pain. A review of three commonly used pain rating scales. J Clin Nurs. 2005;14:798–804.
6. Bahl R. Local anaesthesia in dentistry. Anesth Progress. 2004;51:138-42.
7. Baart JA, Brand HS. Local anesthesia in dentistry. Wiley- Blackwell, Oxford; 2009.
8. Malamed SF. Handbook of local anaesthesia. 4th ed. CV Mosby Co. St Louis. 1997;120-223.
9. Kaufman E. Transligamentary anaesthesia: A review. Anesth Pain Contr Dent. 1992;1:133-141.
10. Kaufman E, LeResche L, Sommers E, Dworkin S, Truelove E. Intraligamentary anaesthesia: A double- blind comparative study. J Am Dent Assoc. 1984;108:175-178.
11. Blanton BL, Jeske AH. Dental local anaesthesia. Alternative delivery methods. J Am Dent Assoc. 2003;134:228-234.
12. Madon GA, Madon SG, Madon AD. Failure of inferior alveolar nerve block: Exploring the alternatives. J Am Dent Assoc. 2002;133:843-846.
13. Smith GN, Walton RE. Periodontal ligament injection: Distribution of injected solutions. Oral Surg Oral Med Oral Pathol. 1983;55:232-238.
14. Walton RE. Distribution of solutions with the periodontal ligament injection: Clinical, anatomical, and histological evidence. J Endod. 1986;12:492-500.
15. Vinitha G, Santosh Dr. A survey on knowledge of dental students about periodontal ligament injection. J. Pharm. Sci. & Res. 2015;7(8):615-617.
16. Margolis FA. Painless injection: An oxymoron? International Dentistry. 2008;11:46-50.
17. 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.
18. Hemad SA. Anaesthetic efficacy of periodontal ligament injection of 2% lidocaine with 1:80,000 adrenaline. Al–Rafidain Dent J. 2006;6:26-34.
19. Reed KL, Malamed SF, Fonner AM. Local anesthesia part 2: Technical considera-tions. Anesth Prog. 2012;59:127-137.
20. 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.
21. 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.
22. Malamed SF. The periodontal ligament (PDL) injection: An altemative to the inferior alveolar block. Oral Surg. 1982;53: 117-121.
23. Malamed SF. Supplemental injection techniques. In: Handbook of Local Anesthesia. 5th Ed. St. Louis: Mosby. 2004;256-275.
24. Walton RE, Abbot BJ. Periodontal ligament injection: A clinical evaluation. J Am Dent Assoc. 1981;103:571-575.
25. Smith GN, Walton RE, Abbot BJ. Clinical evaluation of periodontal ligament anesthesia using a pressure syringe. J Am Dent Assoc. 1983;107:953-956.
26. Kaufman E, Epstein JB, Naveh E, Gorsky M, Gross A, Cohen G. A survey of pain, pressure, and discomfort induced by commonly used oral local anesthesia injections. Anesth Prog. 2005;52(4):122-127.

QUESTIONNAIRE

1. What injection technique do you commonly give for extraction?

   a. Infiltration
   b. Nerve block
   c. Periodontal ligament injection

2. Are you aware of periodontal ligament injection technique?

   1. Yes
   2. No

3. Periodontal ligament injection technique is

   a. Conventional injection technique
   b. Supplemental injection technique
   c. Rarely useful technique
   d. None of the above

4. 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

6. Have you given periodontal injection for extraction or endodontic treatment?

   a. Yes
   b. No

7. Patient response for periodontal injection

   a. Good
   b. Fair
   c. Poor
   d. Not reliable

8. What do you think is more effective for extracting a tooth?

   a. Periodontal ligament injection
   b. Pulpal injection
   c. Nerve block
   d. Infiltration

9. Periodontal ligament injection technique is indicated for extraction in

   a. Haemophilic patients
   b. Extraction of infected tooth with sinus opening
   c. When routine nerve block fails

10. Periodontal ligament injection is given

    a. With syringe needle
    b. With special injection apparatus
    c. Both of the above

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/22734