

## The knowledge of the dentists in dental clinics in Kerman City, Iran, about ocular complications after local anesthesia

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Ocular disorder like, diplopia, mydriasis, blurred vision, ptosis, exophthalmos, and blindness (permanent or temporary) are infrequent complications of an injection of local anesthetics in mouth. The main purpose of this study was to survey the dentist's knowledge and attitude about ocular disorders due to intra-oral anesthetics injection.

**METHODS:** A three-part questionnaire including demographic data and questions on knowledge and attitude about ocular complication was distributed among 197 dentists in Kerman, Iran. Data analysis were performed using the SPSS.

**RESULTS:** Of the study participants, 7.6% did not have any knowledge regarding the ocular complications after local anesthetics injection and 10.7% indicated that eye problems have not been occurred following the dental anesthesia. Among the participants who were aware of this issue expressed self-experience in the clinical practice as the major source of their information, while just 2.0% indicated that their awareness on the ocular complications was from the studies published. In addition, this lack of knowledge in general dentists was more than the specialists.

**CONCLUSION:** The knowledge of the dentists regarding the ocular complications due to anesthesia in the present survey investigation is not satisfactory and needs enhancement. There is a necessity for precise protocol for dentists in recognizing and managing ocular complications by intra-oral anesthetics injections.

**KEYWORDS:** Ocular; Complications; Intra-oral; Anesthesia

**Citation:** Kakoei S, Kakoei S, Parirokh M, Nekouei AH, Mostafavi M. **The knowledge of the dentists in dental clinics in Kerman City, Iran, about ocular complications after local anesthesia.** J Oral Health Oral Epidemiol 2019; 8(3): 117-23.

Using appropriate local anesthetics technique is one of the most important challenges for dentists. In previous studies, some complications such as cardiovascular diseases (CVDs), systemic complications, allergic reactions, drug interactions, methemoglobinemia, and peripheral nervous disorders after injection of anesthetics were noted.<sup>1</sup>

One of the most important side effect of the intra-oral anesthetics injection is ocular disorders and most of the dentists were not aware of these side effects based on the

previous studies.<sup>2</sup> These complications can include temporary<sup>3</sup> or permanent blindness,<sup>4,5</sup> blurred vision,<sup>6,7</sup> motor complications such as palpebral ptosis, mydriasis, diplopia and exophthalmos, and eye ptosis.<sup>8</sup>

The survey about dentists' information regarding this issue has been carried out only in one country.<sup>2</sup> In Iran, no study was found published in this regard. Therefore, the present study was conducted with the aim to assess the dentists' awareness of possible emergencies during and after injection of anesthetics in mouth in Kerman province, the largest

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province in Iran. In necessity situation, this study can help dentists to take the best action.

### Methods

From the 200 dentists in Kerman among whom the questionnaires were distributed, 197 of them accepted to participate in this cross-sectional study which was performed in 2019. The individuals were selected by random sampling method from the government sector, private sector, and also universities.

The survey was approved by the research ethics Committee of Kerman University of Medical Sciences (code: IR.KMU.REC.1398.099).

The first and second phases of the study included questionnaire designing and collecting and the data analysis, respectively. In the first phase, the questionnaire was designed in three parts; the first part addressed the demographic and individual characteristics such as age, sex, work experience, and education level and the second and third parts of the questionnaire contained questions around dentist's knowledge and attitude about ocular disorder due to intra-oral anesthetics injection, respectively. The knowledge and attitude parts included respectively 8 and 6 questions. The responses were based on three options: Yes, No, and I do not know.

The validity and reliability of the questionnaire were measured by the content validity index (CVI) and intraclass correlation coefficient (ICC) as 0.78 and 0.80, respectively. The content validity of the questionnaire was approved by 10 experts of the dental school, and the questions' intelligibility and level were discussed as well. Given the experts' opinions, a total of 15 questions were considered appropriate and very appropriate. The ICC was calculated with the test-retest method using SPSS software (version 21, IBM Corporation, Armonk, NY, USA). The validity and reliability indices were at acceptable levels.

All subjects signed the inform consent and they were ensured that the data would remain confidential and would be investigated for purely statistical reasons.

The results were expressed by a 95% confidence interval (CI) and percentages. The results were analyzed using SPSS software (version 21, IBM Corporation, Armonk, NY, USA).

### Results

A total of 197 dentists participated in this survey, with the demographic characteristics presented in table 1.

**Table 1.** Demographic characteristics of study population

Demographic characteristics	General dentists [n (%)]	Specialists [n (%)]
Gender		
Male	72 (55.8)	26 (38.2)
Female	57 (44.2)	42 (61.8)
Age (year)		
≤ 35	90 (69.7)	33 (48.5)
36-45	22 (17.1)	16 (23.6)
> 45	17 (13.2)	19 (27.9)
Work experience (year)		
< 5	54 (42.0)	28 (41.0)
5-10	44 (34.0)	19 (28.0)
> 10	31(24.0)	21 (40.0)

#### *Knowledge on ocular complications:*

Among the dentists who were aware of the ocular complications after dental anesthesia, 26.0% declared that just self-experience in the clinical practice was a major source of their information, while only 2.0% indicated that their information about this issue was from the published studies.

Most of the participants (44.7%) encountered ocular complications following the local dental anesthesia in the clinical practice and the most signs were blurring of vision and double vision together (13.2%) and transient dizziness (13.2%).

Most of the symptoms lasted for few seconds or few minutes and 5.6% of the specialists indicated that the ocular complications remained for few days.

Just 11.6% of all participants consulted an ophthalmologist about ocular signs due to local anesthesia. Surprisingly, only 30.8% general dentists knew about the permanent blindness as an ocular complication due to dental anesthesia.

About 42.6%, 10.2%, and 17.0% of the

participants declared that ocular complications were seen following infra orbital injection, superior alveolar nerve, and inferior alveolar nerve blocks, respectively. Furthermore, the specialists and general dentists indicated that most of the ocular

complications were associated with the infra orbital nerve block, as 51.8% and 39.7%, respectively. However, 21.3% and 3.6% of the participants responded that all and none of the injections could be associated with the ocular complications, respectively (Table 2).

**Table 2.** Percentage of knowledge according to qualification degree in dentists about ocular problems after anesthesia

Knowledge questions	Qualification (%)	
	Specialists	General dentists
Do you know that ocular complications occur due to intra oral local anesthesia?		
Yes	90.4	76.6
No	5.8	13.5
I don't know	3.8	9.9
If yes, then what is the source of your information?		
Personal experience	19.2	34.3
Colleagues	1.9	13.7
Text books	11.5	5.9
Internet	5.8	7.8
Journals	5.8	1.0
Magazines and news papers	0	1.0
Retraining	3.8	3.9
Congress	7.7	5.9
All of the above	44.2	26.5
Did you encounter any ocular complications during or after administration of intra oral local anesthetic?		
Yes	46.4	46.8
No	44.6	42.3
I don't know	8.9	10.8
If yes, what were the symptoms you noticed in a patient?		
Blurred vision	3.0	13.6
Double vision	6.1	10.2
Squinting	0	0
Transient dizziness	18.2	6.8
Loss of vision	3.0	3.4
Difficulty in reading	0	1.7
Drooping of the upper eyelid	6.1	11.9
Decreased sensation on the lateral side of the upper and lower eyelids	3.0	1.7
All of the above	15.2	3.4
Blurred vision and double vision	3.0	15.3
Blurred vision and transient dizziness	6.1	8.5
Blurred vision and decreased sensation on the lateral side of the upper and lower eyelids	6.1	0
Blurred vision and drooping of the upper eyelid	9.1	3.4
Double vision and transient dizziness	6.1	5.1
Blurred vision, double vision, and transient dizziness	3.0	8.5
Blurred vision, double vision, and drooping of the upper eyelid	9.1	6.8
How long did the symptoms last?		
Few seconds	47.2	63.6
Few minutes	27.8	25.8
Few hours	19.4	10.6
Few days	5.6	0
Did you consult an ophthalmologist for ocular complications?		
Yes	22.0	15.6
No	78.0	84.4
Do you know that sometimes an ocular complication due to intra oral local anesthesia causes permanent blindness?		
Yes	51.9	30.8
No	16.7	40.2
Don't know	31.5	29.0
Which intra oral nerve block can cause maximum ocular complications?		
PSA	8.9	11.2
Infra orbital	51.8	39.7
Inferior alveolar	14.3	19.0
Infiltration	1.8	0.9
All of the above	19.6	23.3
None of the above	3.6	4.3
Infra orbital and PSA	0	1.7

PSA: Posterior superior alveolar

**Attitude questions:** Interestingly, the immediate reaction in most of the general dentists (48.7%) and specialists (69.1%) when encountered with an ocular complication was to assure the patient and discontinue the dental procedure. In addition, 14.5% of the specialists and 8.5% of the general practitioners choose to call medical emergencies, and some of the general dentists (14.5%) and specialists (5.5%) preferred to call an ophthalmologist. Besides, about 7.5% of the participants preferred to transfer the patient to a hospital and 3.6% of the specialists and 20.5% of the general dentists ignored the ocular signs and continued the intended dental procedure. Regarding the prevention of the ocular complications, 20% of the participants indicated that these problems could be prevented by knowing the exact anatomy of the nerve block location, in addition, 1.8% of the specialists and 3.4% of the general dentists answered the aspiration and avoiding injection into blood vessels. And some of the specialists (1.8%) and general dentists (7.7%) preferred to follow optimal injection techniques. Furthermore, about 3.5% of the participants indicated that knowing the accurate anatomy of the nerve block area and following the accepted techniques of injection together could prevent the ocular complications. The majority of the participants responded all the questions, however many specialists (3.3%) and general dentists (16.2%) answered none of the questions.

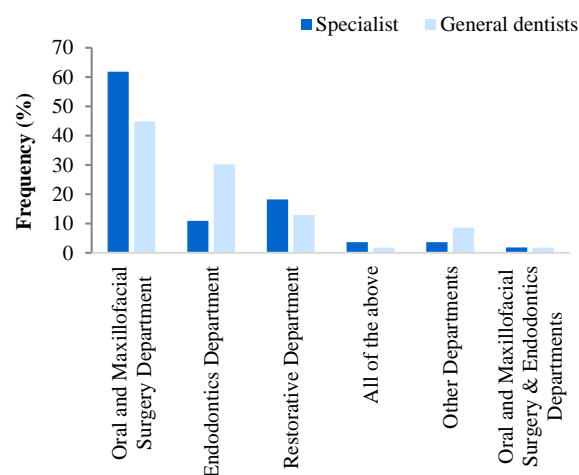
The majority of the participants consulted an ophthalmologist if an ocular complication persisted for 24 hours, however a few of the participants indicated it after completion of the intended dental procedure. The specialists immediately consulted more than the general dentists with an ophthalmologist (41.1% vs. 21.6%). The specialists (16.1%) and general dentists (19.8%) answered whether the symptoms of the ocular complications lasted for more than 4 hours, and only 8.6% of the general dentists expressed they would never consult an ophthalmologist.

Regarding the importance of the ocular

complications due to dental anesthesia, 31.3% of the general dentists and 9.1% of the specialists indicated "no", and 87.3% of the specialists and 51.3% of the general dentists reported it might cause irreversible damage, moreover 3.6% of the specialists and 17.4% of the general dentists responded "I do not know".

Most of the participants (98.0%) had the same opinion, requiring more investigations on ocular complications following the dental anesthesia. Furthermore, they declared that the information about this subject should be trained and published (Table 3).

Most of the participants believed that oral and maxillofacial surgery department was more responsible for teaching primarily in the field of pharmacology and proper techniques of local anesthesia in dentistry (Figure 1).



**Figure 1.** Departments responsible for primary training in the field of pharmacology and techniques of local anesthesia in dentistry

## Discussion

Among the participants in this survey, 7.6% did not have any knowledge on the ocular complications due to dental anesthesia and 10.7% indicated that these complications did not occur following the dental anesthesia. In addition, this lack of knowledge among the general dentists was more than specialists. 96.4% the specialists and 98.3% of the general dentists know that more studies should be conducted on ocular complications after local anesthesia in dentistry.

**Table 3.** Percentage of attitude in participants according to qualification degree

Attitude questions	Qualification (%)	
	Specialists	General dentists
If you encounter ocular complications during or after administration of the intra oral local anesthetics, what would be your immediate reaction?		
Reassuring the patient and stopping the intended dental procedure	69.1	48.7
calling medical emergency	14.5	8.5
Calling ophthalmologist	5.5	14.5
Transferring the patient to a hospital	7.3	7.7
Ignoring and proceeding with the intended dental procedure	3.6	20.5
Prevention of ocular complications due to intra oral local anesthesia is by		
Knowing accurate anatomy of the nerve block area	20.0	20.5
Aspiration before the injection and avoiding injecting into blood vessels	1.8	4.3
Following accepted injection techniques and procedures	1.8	7.7
Knowing accurate anatomy of the nerve block area and following accepted injection techniques and procedures	3.6	3.4
All of the above	69.1	47.9
None of the above	3.6	16.2
If you encountered with ocular complications during or after the administration of the intra oral local anesthetics, when do you consult an ophthalmologist?		
Immediately	41.1	21.6
After completing the intended dental procedure	5.4	7.8
If signs and symptoms of ocular complications persist for more than 4 hours	16.1	19.8
After 24 hours	37.5	42.2
I will never consult an ophthalmologist.	0	8.6
Do you think a dentist should take seriously the ocular complications due to the intra oral local anesthesia?		
Yes because if neglected sometimes it may cause irreversible damage.	87.3	51.3
No, because most of the ocular complications are transient.	9.1	31.3
Don't know.	3.6	17.4
Do you feel more research and review should be carried out on ocular complications due to intra oral local anesthesia?		
Yes	96.4	98.3
No	3.6	1.7
Do you want more information should be published in the journals/books/other literature about ocular complications due to dental anesthesia?		
Yes	96.4	100
No	3.6	0

Only one study was found in this field carried out by Patil et al.<sup>2</sup> reporting that about 14.0% of specialist and 39.0% of general dentists knew about this kind of ocular problems. The outstanding source of knowledge among both specialists and general dentists were journals. Based on the results of this study, 17.6% of the specialists and 8.3% of the general dentists experienced ocular complications. Most of them responded that ocular complications were under-reported in the studies. Besides, 84.3% of the specialists and 90.5% of the general dentists know that more studies should be performed on ocular complications. About

97.3% of the generals and 98.3% specialists preferred to prevent ocular complications after anesthesia.

Ocular complications after intra-oral anesthetics injections are an exceptional issue because they can cause permanent blindness,<sup>4</sup> although it can occur in 0.1% of the cases as estimated twenty years ago by Meyer in Germany. The very low rate of the ocular accident due to the administration of the intra-oral anesthetics injection as 1 case per 500 million or 1 billion cases indicates that this complication is very uncommon, however it does not mean its lack of occurrence, needing more studies.<sup>9</sup>



Complications during the inferior alveolar nerve block anesthesia could be categorized into local and systemic ones. The local side effects are hyperesthesia or permanent post injection paresthesia, burning feeling at the time of injection, and separation of needle and hematoma which may lead to infection, trismus or shedding of tissues, and trauma. The systemic complications are caused by coincidental intravascular injection, fast absorption of anesthetic into the circulation system, slow clearance, toxicity affiliated with vasoconstriction, overdose, drugs interactions, and allergic reaction. Ocular complications, such as ophthalmoplegia, diplopia, and vision loss are very uncommon. These symptoms can be due to visual problems, such as motor problems, like palpebral ptosis, mydriasis, blurred vision, or diplopia and blindness.<sup>5,8,10,11</sup>

The best way to avoid the appearance of complications such as ocular problems is to check the patient and use a correct and careful technique, especially avoiding intravascular injection. In the case of lack of any complication, the most important phase is to calm the patient. In addition, in cases of diplopia, it is recommended to cover the patient's affected eye in order to inhibit the annoying sensation of double vision.<sup>12</sup>

Additionally, Blanton and Jeske suggested injection in the proper location to be as the best way for minimizing the risk of complications considering blood vessels, nerves, and glands.<sup>13</sup> In the case of happening these complications, the patient should be referred to an ophthalmologist for evaluation of the ocular complications lasting longer than 6 hours and before that the patient should be escorted home by a responsible adult.<sup>14,15</sup>

### Conclusion

Dental staff should be able to appropriately recognize and manage ocular complications caused by the intra-oral anesthetics injections. Regrettably, the data from this study indicated that few dentists have enough knowledge on ocular complications due to intra-oral anesthetics injections. This important epidemiologic finding should serve as a warning.

### Conflict of Interests

Authors have no conflict of interest.

### Acknowledgments

This study was financially supported by the research committee of Kerman University of Medical Sciences with approval code 97000998.

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