

Dental Anxiety and Cardiovascular Response Changes In Multiple Implant Surgery – An Observational Study

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ABSTRACT

Objective: The aim of the study is to observe the level of anxiety and its relationship with cardiovascular changes in each implant in the patients with a high number of implants applied in a single session.

Methods: In the prospective observational study, 100 patients, who had undergone 4 or more implant surgeries in the same session electively, were included in the study. Demographic data of each patient were recorded. After Corah Dental Anxiety Scale (C-DAS) was applied to the patients 10 minutes before the surgery, standard heart rate (HR), saturation, systolic (SAP), and diastolic (DAP) blood pressure monitorization were performed and the measured values were recorded during surgery and 30 minutes after the end of the procedure, and the surgery period were recorded.

Results: It was determined that the mean age of the cases was 52.0±11.7 and the number of implants was 5.8±1.5, and the surgery period was 53.7 ± 18 minutes. There was a positive correlation between HR and CDAS at all times and as the number of implants increased, SAP and DAP were added to this correlation ($p < 0.05$). As the number of implants increased, HR, SAP and DAP also increased ($p < 0.05$). As the surgery period increased, postoperative anxiety increased ($p < 0.05$).

Conclusion: It was found that anxiety levels of patients and accordingly the HR, SAP and DAP increased as the number of implants increased in the patients who underwent 4 or more implant surgeries in the same session.

Keywords: Dental anxiety, cardiovascular response, implant surgery

1. INTRODUCTION

Anxiety about dentist and dental treatment is considered as one of the common concerns of people. Dental anxiety includes fears of varying intensity, such as not liking going to the dentist, worrying, being afraid, showing symptomatic symptoms (excessive sweating or feeling unwell as if you have a physical illness).

Anxiety is a consciously perceived emotional response that intensifies the activity of the autonomic nervous system. The sympathetic nervous system promotes the release of epinephrine and norepinephrine. Activation of this system results in changes in heart rate (HR), breathing and blood pressure patterns, and responses such as discomfort, tremor, and increased sweating. Blood pressure and heart rate may also change in dental treatments (1).

In developed countries, great importance is attached to the diagnosis and treatment of dental anxiety. Therefore, there are many scale-development studies oriented at measuring dental anxiety and fear in these countries (2). Dental Anxiety Scale, developed by Corah et al. (3), in 1969, is one of the most commonly used scales (Corah Dental Anxiety Scale – C-DAS).

Corah Dental Anxiety Scale (CDAS) is a scale consisting of 4 items for measuring how people feel concerned and anxious during dental interventions. The highest score of the scale is 20 and the lowest score is 4. A high score indicates that the person has high anxiety. Total dental anxiety score obtained by adding the scores given to the four questions is rated in two groups as low anxiety (4-11 points) and high anxiety (12-20 points). In general, the patients having a total score of 12 and above are considered to be anxious and those having

a score of 15 or above are considered as those with high anxiety.

It has been concluded that Turkish adaptation of C-DAS is valid and reliable for all age groups (4).

To the best of our knowledge, there are no studies evaluating the number of implants and the effect of each implant on anxiety and cardiovascular responses separately. The hypothesis of this study is to test that as the number of implants increases, pre-procedural anxiety and therefore heart rate and blood pressure increase.

2. METHODS

The study was designed as a prospective observational study. It was started after the ethics committee approval was obtained from Erzincan Binali Yildirim University Clinical Trials Ethics Committee and written consents of the patients were obtained (33216249-604.01.02-E.22014). ClinicalTrials.gov ID: NCT04037930. The study was carried out in accordance with the Helsinki Declaration.

One hundred patients over the age of 30 who will undergo elective dental implant surgery were included in the study. Inclusion criteria were four or more implant surgeries in the same session, being literate, good general health, and not using any medication that could cause cardiovascular changes. Exclusion criteria were defined as patients with syndromic disease, systemic disease, cardiac problems, who had undergone other oral or maxillofacial procedures in the last 6 months, who used drugs that could cause changes in heart rate, who used a pacemaker or implantable cardioverter defibrillator (ICD).

Demographic data of each patient (age, gender, medical history, drug use, etc.) were recorded after informed consent was obtained. C-DAS questionnaire (Table 1) was applied to the patients 10 minutes before the operation and preoperative scores were recorded. Preoperative heart rate, peripheral oxygen saturation and non-invasive blood pressure monitoring of each patient were performed, the measured values were recorded and the measurements were continued during the peroperative period. From these measurements; values were included during local anesthesia, at the time of incision, at the beginning of each implant, at the suture stage after the procedure, and 30 minutes after the end of the procedure. In addition to the physiological values at all these times, the CDAS questionnaire was repeated and recorded. When an implant was finished, the surgeon informed the patient for the CDAS questionnaire, a CDAS questionnaire was administered by the dental technician, the results were recorded, and the surgeon moved on to the next implant. This cycle was repeated for each implant throughout the operation. In addition, operation times were also recorded, as anxiety values were examined. The change over time of all values, including CDAS, was determined as the main point of the study.

Infiltration anesthesia with getocaine was performed 10 minutes after the preoperative records. The records at this time were recorded as "anesthesia". As an operation, the flap was removed, the socket was prepared, the implant was placed and an envelope flap was applied. Bone volume and quality were chosen to suit all patients. None of the patients required advanced surgical procedures. Nucleoss T6 of Turkish origin and a South Korean megagen anyridge implant were applied in our hospital.

A senior oral and maxillofacial surgeon was familiar with the purpose of this study. All the implants were performed by the same surgeon.

The primary aim of this study was to observe the level of anxiety in patients with a large number of implants and its relationship with cardiovascular changes in each implant.

TABLE 1. The Corah's Dental Anxiety Scale that formed part of the study questionnaire

1. If you had to go to the dentist tomorrow, how would you feel?
 - (1) Look forward to it as a reasonably enjoyable experience
 - (2) I wouldn't care one way or the other
 - (3) I would be a little uneasy about it
 - (4) I would be afraid that it would be unpleasant and painful
 - (5) I would be very frightened of what the dentist might do
2. When you are waiting in the dentist's office for your turn in the chair, how do you feel?
 - (1) Relaxed
 - (2) A little uneasy
 - (3) Tense
 - (4) Anxious
 - (5) So anxious that I sometimes break out in a sweat or almost feel physically sick
3. When you are in the dentist's chair waiting while he gets his drill ready to begin working on your teeth, how do you feel?

(Same alternatives as Q.2)
4. You are in the dentist's chair to have your teeth cleaned. While you are waiting and the dentist is getting out the instruments which he will use to examine your teeth around the gums, how do you feel?

(Same alternatives as Q.2)

2.1. Statistical Analysis

Results were presented as mean \pm standard deviation for continuous variables. Chi-square or Fisher's exact test was used to compare categorical variables between groups. Student's t-test or Mann-Whitney U test was used to compare independent continuous variables between the two groups. Similarly, paired samples t-test or Wilcoxon signed-rank test was used for dependent continuous variables. Pre-post measurements or percentages of difference were used when comparing dependent groups. Pearson correlation coefficient was used to evaluate correlations between measurements. The statistical significance level was accepted as 0.05 for all tests. Statistical analysis, IBM SPSS ver. 19 packages of software (IBM Software, New York, United States).

3. RESULTS

3.1. Demographic Data

One hundred patients aged over 30 years are included in the study. It was determined that mean age of the patients was 52.0 ± 11.7 , number of implants was 5.8 ± 1.5 ; surgery period was 53.7 ± 18 minutes. Number of men/women was 58 / 42. Table 2 shows the mean score of CDAS levels based on time. According to this table, preoperative anxiety levels are "low (4)" in multiple implant patients, and anxiety levels gradually decrease over time.

When examining the cardiovascular changes and CDAS correlation that is the aim of the study, it was observed that there was a positive correlation between heart rate and CDAS at all times, and systolic and diastolic artery pressures were also added in this correlation as the number of implants increased. As can be seen in this table, heart rate increases

as anxiety level increases, or heart rate decreases as anxiety level decreases, but the correlation between anxiety and blood pressure becomes correlated as the number of implants increases and the duration of the operation increases. Heart rate change seems to reflect anxiety level better than blood pressure (Table 3).

When the conditions affecting the anxiety levels were examined, it was observed that gender, age, and number of implants, surgery period did not affect the anxiety levels (Table 4).

Table 2. Descriptive Statistics

	N	Mean	Std. Deviation
Age	100	52.0	11.7
Number of implants	100	5.8	1.5
4	27		
5	14		
6	31		
7	16		
8	6		
9	3		
10	3		
Surgery period	100	53.7	18.0
Gender			
Male	58		
Female	42		
CDAS Preop	100	8.07	3.1
CDAS Anesthesia	100	7.20	2.9
CDAS 1 st Implant	100	7.20	2.9
CDAS 5 th Implant	72	6.97	2.7
CDAS Final Implant	100	6.19	2.1
CDAS Postop	100	5.49	2.0

CDAS: Corah Dental Anxiety Scale

Table 3. Cardiovascular changes and CDAS correlation based on time

Heart rate (HR)	n	Mean \pm SD	Sig.	SAP	Mean \pm SD	Sig.	DAP	Mean \pm SD	Sig.	CDAS
Preop	100	78.1 \pm 10.9	0.027*	preop	135.4 \pm 15.4	0.218	preop	79.4 \pm 11.6	0.179	8.07
anesthesia	100	83.9 \pm 10.3	0.020*	anesthesia	140.7 \pm 14.1	0.932	anesthesia	83.4 \pm 10.1	0.003	7.20
1st implant	100	80.0 \pm 9.8	0.001*	1st implant	138.0 \pm 14.9	0.691	1st implant	82.9 \pm 9.9	0.903	7.20
5 th implant	73	78.4 \pm 9.8	0.018*	5 th implant	139.1 \pm 15.4	0.853	5 th implant	81.5 \pm 10.2	0.557	6.97
Postop	100	79.1\pm10.4	0.000*	postop	137.6\pm13.2	0.508	postop	82.8\pm10.0	0.367	5.49
6th implant	59	77.3 \pm 10.8	0.001*	6th implant	143.5 \pm 13.9	0.572	6th implant	82.4 \pm 10.8	0.635	6.40
7th implant	28	79.4 \pm 7.4	0.005*	7th implant	142.0 \pm 13.3	0.771	7th implant	84.0 \pm 13.0	0.012*	6.11
8th implant	12	84.2\pm11.2	0.018*	8th implant	144.9\pm14.9	0.047*	8th implant	87.5\pm11.5	0.585	7.25
9th implant	6	87.8\pm9.2	0.000*	9th implant	158.5\pm2.8	0.003*	9th implant	93.8\pm3.9	0.001*	8.17

*Correlation is significant at the level of 0.05 (2-tailed).
diastolic artery pressure

CDAS: Corah Dental Anxiety Scale, HR: heart rate, SAP: systolic artery pressure, DAP:

Table 4. Factors affecting anxiety

Gender	CDAS Preop 1	CDAS Anesthesia 1	CDAS 1st Implant	CDAS 5th Implant	CDAS Final Implant	CDAS Postop 1
Male	8.03	7.41	7.41	7.39	6.41	5.52
Female	8.12	6.90	6.90	6.42	5.88	5.45
P (Sex)	0.975	0.279	0.376	0.153	0.150	0.796
P (Age)	0.292	0.163	0.163	0.458	0.054	0.081
P (No. of implants)	0.209	0.098	0.084	0.911	0.167	0.917
P (Operation period)	0.984	0.806	0.188	0.272	0.268	0.052

* logistic regression, **Correlation is significant at the level of 0.05 (2-tailed). CDAS: Corah Dental Anxiety Scale

4. DISCUSSION

In this study, in which the effect of multiple dental implant surgery on anxiety and cardiovascular system was investigated, it was determined that both anxiety levels and HR, SAP and DAP increased as the number of implants increased.

Pain, anxiety and irritability associated with dental treatment cause acute changes in autonomic nerve activity, resulting in complications such as blood pressure and vagal reflex(5). Therefore, monitoring the changes in autonomic nerve activity during dental treatment may be useful in preventing the complications. According to the study by Nagao et al. (6), in 2002, that is the only study in the literature that investigated autonomic nerve activity in implant surgery (6), heart rate, systolic arterial pressure, and diastolic arterial pressure increased as the number of implants and surgery period increased. In the present study, a correlation was detected between the number of implants and HR, SAP and DAP and as the number of implants increased, HR, SAP and DAP also increased.

The diagnosis and treatment of dental anxiety in developed countries are emphasized with great importance. There are both subjective and objective ways to measure dental anxiety. While objective measurements include blood pressure, heart rate, and respiratory rate (7-9), there are numerous scales that are developed and tested for subjective measurements. Corah Dental Anxiety Scale (CDAS) is one of scales that are tested and proved to be reliable (10, 11). In the present study, it was aimed to demonstrate the association of anxiety and cardiovascular system using both objective and subjective scales. Accordingly, HR levels were correlated with the anxiety level at all times of the study. High anxiety was associated with high HR. SAP and DAP showed correlation only with CDAS as the number of implants increased.

Dental anxiety is expected to decrease after the procedure (12). In a study by Muğlalı et al.(12), the anxiety levels measured immediately after the operation were found to be significantly lower than the preoperative levels, and in our study postoperative anxiety levels decreased in all the patients compared to preoperative levels.

Dental anxiety has several reasons. Early-onset dental anxiety develops in childhood as a result of direct experiences and

by observing the parental examples (7). Anxiety with late onset develops typically when adult patients have tooth cavity (if cavities disturb intraoral appearance) or they have undergone more dental treatments due to tooth cavity about the average in their adolescence or other dental problems (13). In another study, some additional causes of anxiety were listed. If a patient is afraid of suffocation, obstruction, injection, vision, or even thought of blood, they are more likely to experience dental anxiety (14). Other sources of anxiety are caused by the concerns about the numbness via local anesthetics, and low pain tolerance and lack of trust to the dentist are also among the causes of anxiety. However, these studies indicated that age and gender were not specified among the reasons of anxiety. There are also other studies in the literature specifying that age and gender do not affect anxiety (15, 16). In the present study, no correlation was found between age and gender, and anxiety.

In the present study, it was found that the number of implants or operation period and anxiety were not correlated. In fact, it was found that anxiety levels decreased when the operation was completed, regardless of the duration of the operation or the number of implants.

There are some limitations in the present study. First limitation is that the number of implants was not proportional. Since 7 or more implants are very rare, some statistical calculations could not be performed and the results cannot be generalized to this group of patients. Second limitation is that many other factors affecting the reasons of anxiety (educational level, previous dental procedure experiences, etc.) were not included in the study. The results of the present study should be supported by the studies including all of them and more homogeneous groups.

5. CONCLUSION

In the present study, it was found that anxiety levels of patients and accordingly the heart rate and blood pressure increased as the number of implants increased in the patients who underwent 4 and more implant surgeries in the same session. And, when the operation is over, it has been found that anxiety levels decrease regardless of the duration of the operation or the number of implants.

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