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Research Article

Vital Signs and Pain in Anxious Patients Undergoing Lower Third Molar Surgery: A Pilot Split-Mouth Clinical Trial

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Abstract

Objectives: The aim of the present clinical trial was to correlate the variability of heart rate and blood pressure with levels of anxiety in patients undergoing extraction of teeth #48 and #38.

Material and Methods: A split-mouth protocol was used, in addition to evaluating pain intermediately and immediately after the surgery. As a result, 16 similar bilateral lower third molars were extracted, according to the Winter and Pell and Gregory classifications, in a split-mouth protocol, in patients considered anxious according to the Corah scale. The correlation with vital signs and pain was assessed at predetermined times.

Results: The values of systolic blood pressure, heart rate and assessments of periods of pain showed no statistical differences, while the diastolic blood pressure in the preoperative period, between the two surgical procedures, showed a statistically significant difference.

Conclusions: Despite being a split-mouth pilot study, the values for anxiety, systolic blood pressure, heart rate, and pain did not decrease but also did not show a significant increase during the second surgical experience, except for diastolic blood pressure. These results may be favorable for controlling risks and complications during and after surgery. In light of this, further studies are recommended for more robust evaluations of this methodology.

Keywords: Oral Surgery; Pain; Dental Anxiety; Third Molar; Vital Signs

Introduction

The fear of dental procedures is real and can be considered one of the main reasons by which many patients avoid dental treatment. Although modern dentistry has rapidly evolved, the anxiety caused by dental treatment still affects the patients' experience in evaluating their pain. Dental anxiety, which is defined as stress, rigidity, fear and concern during dental procedures, often results in unpleasant emotional experience and high physiological stimulation in the patients [1]. With regard to tooth extractions, those involving third molars cause maximum anxiety. Pain, anxiety and nervousness associated with dental treatment can cause acute changes in the autonomic nervous system [2].

Anxious patients present with significant problems and the attempt to perform any type of treatment without addressing their fears and anxiety usually causes frustration and distress to the dental surgeon, which in turn increases significantly their feeling of fear [3]. The current availability of a wide variety of local anaesthetic agents allows for controlling pain very efficiently in the daily clinical routine. However, even in the absence of algic stimuli, many patients still present anxiety [4]. This scenario of psychological stress worsens when the patient needs to undergo dental surgery as there is a previous expectation about painful symptoms [5].

Lago-Mendez, et al., assessed the post-operative recovery from third molar extraction and concluded that highly anxious patients tend to require longer surgery time and have slower recovery [6]. The authors also emphasise that 75% of the medical emergencies in dental offices are related to anxiety and whose incidence has been increasing in the past years. Therefore, it is

very important to identify dental anxiety and its correlation with vital signs and pain in these patients in order to reduce the post-operative risks and complications. In this context, the present pilot clinical trial followed a split-mouth protocol aimed at correlating blood pressure, heart rate and pain with levels of anxiety in anxious patients undergoing extraction of lower third molars at different periods of time.

Therefore, the objective of the present clinical trial was to correlate the variability of heart rate and blood pressure with levels of anxiety in patients undergoing extraction of teeth #48 and #38 by using a split-mouth protocol, in addition to evaluating pain intermediately and immediately after the surgery.

Material and Methods

The study was approved by the Research Ethics Committee according to protocol number CAAE 08827219.0.0000.0077, registered on the Brazilian Registry of Clinical Trials (RBR-3z3fcdk). The methodology followed the CONSORT-STATEMENT norms and is illustrated in Fig. 1 [7]. This research is a pilot study using a split-mouth design. Patients with indication of extraction of partially or completely intruded lower third molar were screened for similarity on both sides according to the Winter's and Pell and Gregory's classifications [8,9]. Corah's dental anxiety scale [10] for extraction of tooth #48, the patient's first surgical experience, had a mean of 9.06 (SD = 2.91), whereas for extraction of tooth #38, the patient's second surgical experience, had a mean of 9.88 (SD = 2.90), which was slightly higher. Next, surgical procedures were scheduled in which tooth #48 was initially extracted and then tooth #38 was also extracted after 20 days. The surgical procedures were performed by the same dental surgeon (1º) and assistant (2 º) with qualification and experience in the field. Only one evaluator (3º) was present throughout the study. Blood Pressure (BP) and Heart Rate (HR) were measured in the pre-operative and post-operative periods, whereas pain was measured by using Visual Analogue Scale (VAS) in the intermediate and immediate post-operative periods.

Inclusion Criteria:

1. Patients needing extraction of third molars, regardless of gender
2. Patients not on analgesic or anti-inflammatory medication in the past 15 days
3. Patients presenting partially or completely intruded teeth in opposite hemi-arches according to the Winter's [8] and Pell and Gregory's classifications [9]
4. Patients aged between 15 and 40 years old

Exclusion Criteria:

1. Patients presenting local or systemic changes which contra-indicate the dental procedure
2. Patients on continuous medication such as anxiolytics, anti-depressants, benzodiazepines which can interfere with the methodology
3. Patients undergoing psychiatric treatment
4. Patients with erupted lower molars
5. Patients allergic to anesthetics and medications

Sampling Calculation

Sample size was calculated according to the electronic site (www.sealedenvelop.com) in which 30 teeth were necessary to achieve 80-percent chance of detection at a significance level of 5% [11]. This calculation was conceived in a pilot split-mouth study, thus allowing to reduce variability between the treatments.

Evaluation of Anxiety

The patients were asked to answer the Corah's dental anxiety scale before undergoing the surgery [10]. This scale ranges between 4 and 20 points, with a score equal to 4 indicating no anxiety, between 5 and 10 indicating low anxiety, between 11 and 15 indicating moderate anxiety, and above 15 indicating high anxiety. The same protocol was followed for tooth extraction on the opposite side.

Evaluation of Vital Signs

Blood Pressure (BP) and Heart Rate (HR) were the vital signs evaluated by means of previous measurements made before anesthesia and after 15 minutes following extraction of tooth #48 as well as of tooth #38.

Evaluation of Pain

The Visual Analogue Scale (VAS) was answered by the patients themselves during and after the procedure to record their experience of pain according to the following parameters: zero for "no pain" and ten for "the worst pain ever" [12].

Statistical Analysis

The resulting data were submitted to statistical analysis by using the SPSS software, version 11 (IBM Corp., Somers, NY, USA). Gaussian distribution was assessed by using Shapiro-Wilk's test, whereas Student's t-test was applied to each variable as they had a normal distribution. All the analyses were performed by a researcher blinded to the measurements (5º). Student's t-test was used compare the levels of anxiety, blood pressure, heart rate and pain, between the extractions of teeth #48 and #38, before and after both procedures.

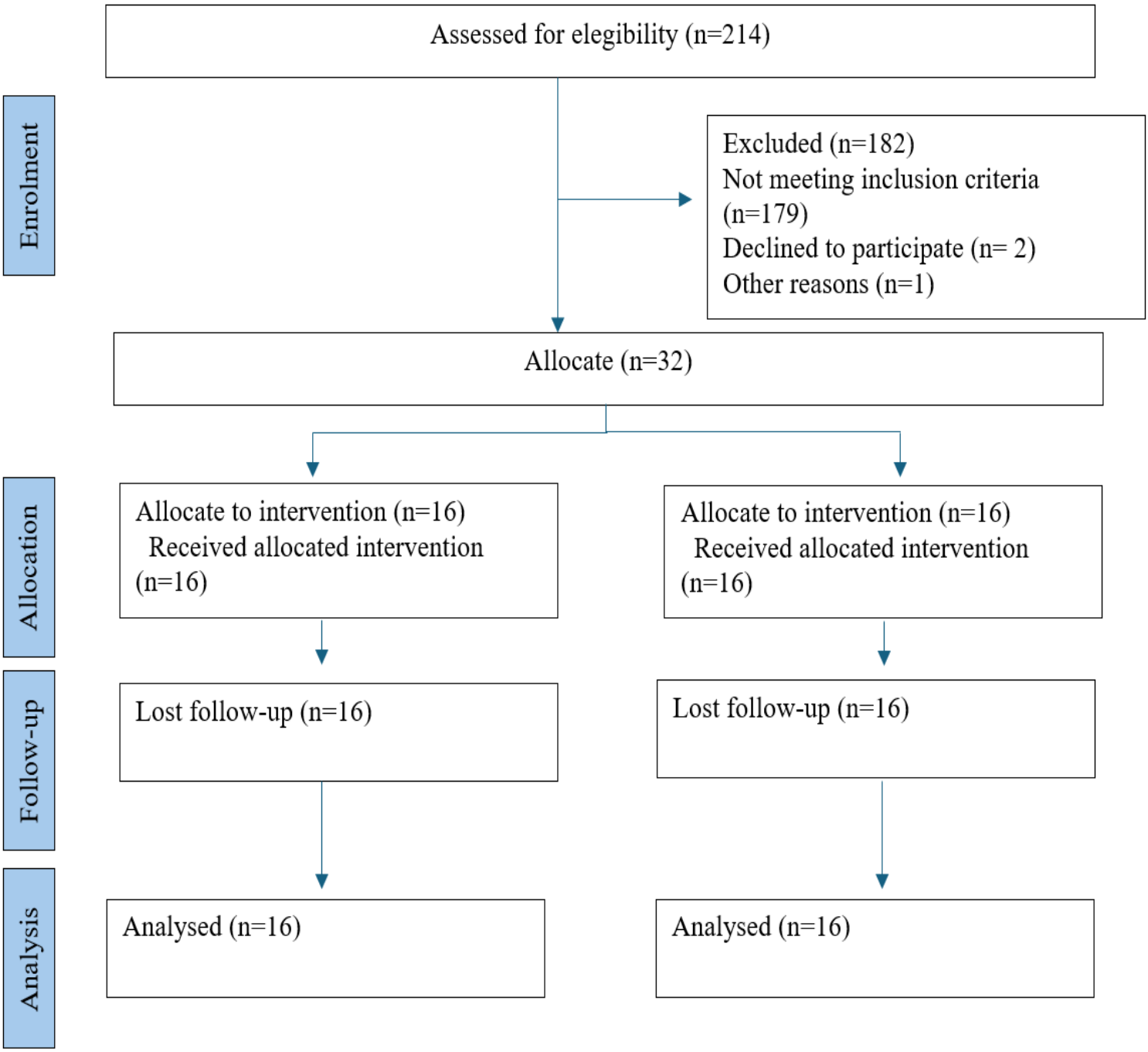

Figure 1: CONSORT flow diagram.

Results

Sixteen patients were selected according to the inclusion and exclusion criteria, totaling 32 teeth extracted.

Anxiety

Student's t-test was used compare the levels of anxiety between the extractions of teeth #48 and #38, but no statistically significant differences were found (P = 0.35) between both operative times. The resulting data revealed that the pre-operative anxiety as measured by the Corah's dental anxiety scale for extraction of tooth #48, the patient's first surgical experience, had a mean of 9.06 (SD = 2.91), whereas for extraction of tooth #38, the patient's second surgical experience, had a mean of 9.88 (SD = 2.90), which was slightly higher [10]. The values of anxiety for tooth extraction are shown in detail in Table 1.

	Valus Found by Corah's Dental Anxiety Scale	
Patients	**Tooth #48**	**Tooth #38**
1	13	13
2	9	10
3	11	14
4	6	6
5	7	9
6	13	11
7	12	12
8	7	14
9	9	13
10	8	8
11	6	6
12	15	6
13	8	9
14	8	8
15	5	7
16	8	12
Mean	9,06	9,88
SD	2,91	2,90

Table 1: Mean and SD values for the variable anxiety as measured by the Corah's dental anxiety scale. SD = Standard Deviation.

Blood Pressure

In the context of Blood Pressure (BP), the resulting data were subdivided into two groups, namely, Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP), which were independently evaluated before and after the surgery. Pre-operative SBP for extraction of tooth #48 had a mean value of 98.38 mmHg (SD = 19.50), whereas for extraction of tooth #38 the mean value was 108.38 mmHg (SD = 9.95). With regard to pre-operative DBP, the mean values were 65.25 mmHg (SD = 7.77) and 77.25 mmHg (SD = 18.87), respectively, for teeth #48 and #38. Post-operative SBP had mean values of 111.44 mmHg (SD = 14.09) and 109.56 mmHg (12.65) for teeth #48 and #38, respectively. With regard to the post-operative DBP, the mean values were 67.44 mmHg for extraction of tooth #48 (SD = 9.99) and 67.19 mmHg (SD = 11.81) for extraction of tooth #38. The specific values of each patient in the pre- and post-operative periods are shown in detail in Table 2. Student-t test was used to compare the variation of SBP and DBP before and after each surgical procedure, showing that there were no statistically significant differences in the values of pre-operative and post-operative SBP as well as of post-operative DBP (P = 0.077, P = 0.6948 and P = 0,9488, respectively). However, a statistically significant difference was observed between both surgical procedures (P = 0.025) regarding the pre-operative DBP, in which the first tooth extraction had lower values compared to those of the second one. The values of mean and standard deviation for the variables SBP and DBP before and after the surgical procedures are shown in Table 2.

	Pre-operative				Post-operative			
	SBP		DBP		SBP		DBP	
Patients	Tooth #48	Tooth #38	Tooth #48	Tooth #38	Tooth #48	Tooth #38	Tooth #48	Tooth #38
1	120	110	70	70	97	110	55	60
2	120	100	60	70	150	110	80	70
3	111	120	78	80	122	121	57	80
4	60	90	62	114	110	100	70	60
5	90	121	60	81	97	90	57	50
6	100	106	60	64	100	130	70	89
7	70	110	70	112	111	120	68	80
8	60	100	72	110	100	110	70	70
9	110	100	50	60	110	90	60	60
10	111	100	67	60	111	110	67	60
11	100	120	60	70	100	120	60	70
12	100	100	60	60	100	100	60	60
13	100	110	70	70	120	110	90	70
14	102	110	65	60	115	100	75	50
15	100	110	60	70	110	100	60	60
16	120	127	80	85	130	132	80	86
Mean	98,38	108,38	65,25	77,25	111,44	109,56	67,44	67,19
SD	19,50	9,95	7,77	18,87	14,09	12,65	9,99	11,81

Table 2: Values of mean and standard deviation for SBP and DBP before and after the surgical procedures. SD: Standard Deviation; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure.

Heart Rate

Still with regard to vital signs, HR was evaluated in beats per minute (bpm) by using the Student's t-test and no statistically significant differences between the pre- and post-operative values were found (P = 0.335). In the pre-operative period, the mean values of HR were 79.69 bmp (SD = 9.49) and 83.25 bpm (SD = 11.5) for extractions of teeth #48 and #38, respectively. In the post-operative period, the mean values of HR were 79.39 bmp (SD = 9.71) and 80.75 bpm (SD = 10.10) for extractions of teeth #48 and #38, respectively. The values found before and after the surgical procedures can be seen in Table 3.

HR (bpm)	Pre-operative		Post-operative	
Patients	Tooth #48	Tooth #38	Tooth #48	Tooth #38
1	88	81	72	63
2	71	76	86	77
3	76	71	77	73
4	57	69	72	83
5	75	83	81	93
6	99	99	99	92
7	91	106	89	97
8	87	95	71	93
9	75	83	63	92
10	82	77	81	80
11	73	75	80	69
12	84	74	90	76
13	79	89	90	79
14	78	90	80	73

15	78	93	67	81
16	82	71	72	71
Mean	79,69	83,25	79,38	80,75
SD	9,49	11,05	9,71	10,10

Table 3: Values of mean and standard deviation for HR in the pre- and post-operative periods. SD: Standard Deviation; HR: Heart Rate; BPM: Beats Per Minute.

Pain

Student's t-test was used for comparison of post-operative pain, showing that statistically significant differences were observed between both surgical procedures in the eight post-operative periods. Post-operative pain was intermediately and immediately evaluated after both surgical procedures. Evaluation was initiated every two hours until an 8-hour period and every 24 hours until 72 hours after the surgical procedure. By using a pain analog scale, it was found that pain had the highest mean value within the second hour after extraction of tooth #48 (5.50), followed by that within the first hours (5.38) and within the fourth hour (5.25), whereas the lowest mean value of pain was within the 72 hours after the surgical procedure (3.25). With regard to tooth #38, the higher mean value of pain was 5.06 within 48 hours after the surgery, reaching the lowest mean value (4.06) within the eighth hour. Table 4 shows the relationship between mean and SD of the variable pain for each tooth extracted.

	Tooth #48		**Tooth #38**		
Time (H)	**Mean**	**SD**	**Mean**	**SD**	***P*-value**
0	5,38	3,34	4,5	3,16	0,460
2	5,5	2,8	4,81	2,76	0,749
4	5,25	2,41	4,88	2,00	0,635
6	4,56	2,53	4,94	1,88	0,632
8	4,00	2,1	4,06	2,24	0,946
24	4,88	2,45	4,63	2,68	0,799
48	4,75	3,09	5,06	2,59	0,731
72	3,25	2,49	4,19	2,93	0,304

Table 4: Values of mean and standard deviation for pain in the post-operative period. SD: Standard Deviation; H: Hours.

Discussion

According to Okawa, et al., dental treatments are painful and terrifying for the majority of patients [5]. And anxiety and stress can cause systemic complications, in addition to increasing the pain. In view of this, the present study evaluated only anxious patients in two different surgical times in order to verify their influence on vital signs.

No statistically significant differences were found in anxious patients prior to the surgical procedures, although anxiety was slightly lower in the extraction of tooth #38. This result differs from the findings by Alfotawi, et al., Akomolafe, et al., and Selimović, et al., who emphasize that anxiety can significantly decrease after explaining to the patient about the dental procedure [1,13,14]. According to Akomolafe, et al., Gonzalez-Martinez, et al., and Selimovic, et al., and Xu, et al., pain control can be related to the control of the patient's emotional state, that is, of the anxiety [13-16].

Although Akomolafe, et al., and Selimovic, et al., state that there is a direct relationship between anxiety and pain, the latter refers to inter- and post-operative perceptions involving extractions of third molars associated with anxiety and guidelines to patients [13,14]. The present study was performed with anxious patients only and no statistically significant difference was observed for the variable pain in the post-operative periods. This finding differs from that by Van Wijk, et al., Kain, et al., and Akomolafe, et al., who report that providing patients with more information on surgical procedures and complications also increases significantly the pain control in the post-operative period, meaning that well-informed patients tend to feel less pain [17-19]. In the present study, the pain reported by the patients was mild to moderate, being higher in the second hour (mean of 5.5) and fourth (5.25) after the extraction of tooth #48, despite not being statistically significant, and slightly lower after the extraction of tooth #38. These values were not statistically different, thus also indicating absence of increased levels of pain after

both tooth extractions.

Brand HS, et al., state that a simple visit to the dental surgeon can provoke an increase in BP and HR, especially in patients with phobia, anxiety and pain prior to dental procedures [20]. Although the present study was performed with anxious patients, no statistically significant variations were observed in BP and HR. Our finding differs from that by Selimović, et al., who reported increased values of BP and HR in patients to be submitted to third molar extraction, especially those with anxiety [14]. However, Alfotawi, et al., and Ping et al., reported that anxious patients can present with alterations in cardiovascular and hemodynamic functions, including heart beat rate [1,21].

Pre-operative DBP had significant differences, with higher pre-operative values in the second surgical procedure, that is, extraction of tooth #38. According to Brand HS, et al., it is not clear that there is a significant increase in pre-operative DBP, whereas Selimović, et al., reported an increase in DBP, especially in patients with anxiety [14,20]. On the other hand, the results found for SBP differ from those by Brand HS, et al., as they reported a pre-operative DBP increase, but no significant differences were found in the present study pre- and post-operatively. The values of HR also differ from those reported by the same authors as we found no significant differences before and after the tooth extractions. Even though it is a pilot study, the results can help in the dentist's clinical conduct when dealing with the third molar removal procedure.

Conclusion

Despite being a pilot study, we can consider the positive factors related to the patient's previous surgical experience. In the second procedure, although there was no decrease in the parameters of systolic blood pressure, heart rate, or pain assessments analyzed during specific periods, these parameters also did not show an increase, except for diastolic blood pressure, which is an important factor for dentists to consider. However, further studies with a larger sample size should be conducted.

Conflict of Interest

The authors declare no conflict of interest.

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None.

Reference

1. Alfotawi R, Alhowikan A, Alfadhel A, Premnath S, Tawhari J, Alhamid A, et al. A novel assessment tool monitoring the level of patient anxiety during third molar surgery procedure. Heliyon. 2019;6(1):e02576.
2. Yamashita K, Kibe T, Aoyama K, Ohno S, Kohjitani A, Sugimura M. The state anxiety inventory is useful for predicting the autonomic nervous system state of patients before the extraction of an impacted mandibular third molar. J Oral Maxillofac Surg. 2020;78(4):538-44.
3. Poeschl PW, Eckel D, Poeschl E. Postoperative prophylactic antibiotic treatment in third molar surgery - a necessity? J Oral Maxillofac Surg. 2004;62(1):3-8.
4. van Wijk A, Lindeboom J. The effect of a separate consultation on anxiety levels before third molar surgery. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008;105(3):303-7.
5. Okawa K, Ichinohe T, Kaneko Y. Anxiety may enhance pain during dental treatment. Bull Tokyo Dent Coll. 2005;46(3):51-8.
6. Lago-Méndez L, Diniz-Freitas M, Senra-Rivera C, Seoane-Pesqueira G, Gándara-Rey JM, García-García A. Postoperative recovery after removal of a lower third molar: Role of trait and dental anxiety. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009;108(6):855-60.
7. Moher D, Hopewell S, Schulz KF, Montori V, Gøtzsche PC, Devereaux PJ, et al. CONSORT 2010 explanation and elaboration: Updated guidelines for reporting parallel group randomised trials. BMJ. 2010;340:c869.
8. Winter GB. Impacted mandibular third molars. St Louis: American Medical Book Co. 1926;241-79.
9. Pell GJ, Gregory GT. Impacted third molars: Classification and modified technique for removal. Dent Dig. 1933;39(9):330-8.
10. Corah NL. Development of a dental anxiety scale. J Dent Res. 1969;48(4):596.
11. Lima CAA, Favarini VT, Torres AM, da Silva RA, Sato FRL. Oral dexamethasone decreases postoperative pain, swelling, and trismus more than diclofenac following third molar removal: A randomized controlled clinical trial. Oral Maxillofac Surg. 2017;21(3):321-6.
12. Maxwell C. Sensitivity and accuracy of the visual analogue scale: A psyco-physical classroom experiment. Br J Clin

Pharmacol. 1978;6:15-24.
13. Akomolafe AG, Fatusi OA, Folayan MO, Mosaku KS, Adejobi AF, Njokanma AR. Relationship between types of information, dental anxiety, and postoperative pain following third molar surgery: A randomized study. J Oral Maxillofac Surg. 2023;81(3):329-36.
14. Selimović E, Bečulić H, Begagić E, Galić I, Juković-Bihorac F, Memić Z. Correlation of blood pressure, heart rate and pain with anxiety, and importance of its prevention in surgery of impacted third molars under local anesthesia. Arch Psychiatry Res. 2024;60:47-53.
15. González-Martínez R, Jovani-Sancho MD, Cortell-Ballester I. Does psychological profile influence third molar extraction and postoperative pain? J Oral Maxillofac Surg. 2017;75(3):484-90.
16. Xu JL, Xia R. Influence factors of dental anxiety in patients with impacted third molar extractions and its correlation with postoperative pain: a prospective study. Med Oral Patol Oral Cir Bucal. 2020;25(6):e714-9.
17. van Wijk AJ, Buchanan H, Coulson N, Hoogstraten J. Preparatory information for third molar extraction: Does preference for information and behavioral involvement matter? Patient Educ Couns. 2010;79(1):94-9.
18. Kain ZN, Wang SM, Caramico LA, Hofstadter M, Mayes LC. Parental desire for perioperative information and informed consent: A two-phase study. Anesth Analg. 1997;84(2):299-306.
19. Almoznino G, Zini A, Sharav Y, Shahar A, Zlutzky H, Haviv Y, et al. Sleep quality in patients with dental anxiety. J Psychiatr Res. 2015;61:214-22.
20. Brand HS, Abraham-Inpijn L. Cardiovascular responses induced by dental treatment. Eur J Oral Sci. 1996;104(3):245-52.
21. Ping B, Kiattavorncharoen S, Durward C, Im P, Saengsirinavin C, Wongsirichat N. Hemodynamic changes associated with a novel concentration of lidocaine HCl for impacted lower third molar surgery. J Dent Anesth Pain Med. 2015;15(3):121-8.