

## **Anxiety and variation of clinical parameters during third molar surgery**

**Ansiedade e variação de parâmetros clínicos durante a exodontia de terceiros molares**

**Ansiedad y variación de los parámetros clínicos durante la cirugía de terceros molares**

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### **Abstract**

During dental appointments, patients often present anxiety and exacerbated fear, especially in surgical procedures. These reactions can promote systemic alterations, such as elevated blood pressure, fainting, and convulsions. The aim of this study was to evaluate the level of anxiety of patients during the lower third molar extraction procedure, seeking indicative parameters of possible complications and, at the same time, contributing to a safe and less uncomfortable procedure for the patient. Forty patients needing extraction of the lower third molar were selected. The study had an evaluator to monitor the systemic variables: blood pressure, oxygen saturation, respiratory and heart rate - while the same surgeon performed the surgical procedures, always using the same surgical technique for all patients. At the anamnesis and at the end of the surgery, the patients answered a visual analogue scale (VAS) questionnaire on anxiety. The results showed that for the four variables observed during the surgery, only the oxygen saturation did not present a statistically significant variation during the procedure. All the others showed changes, mainly during the use of the high-speed engine. We concluded that anxiety, fear and stress showed influences on systemic factors during the extraction procedure. It shows the importance of careful anamnesis and the knowledge of patient systemic diseases before starting any surgery to prevent risks or complications.

**Keywords:** Blood pressure; Anxiety; Wisdom tooth; Third molar.

### **Resumo**

Durante a consulta odontológica, os pacientes frequentemente apresentam ansiedade e medo exacerbado, especialmente em procedimentos cirúrgicos. Essas reações podem promover alterações sistêmicas, como pressão arterial elevada, desmaios e convulsões. O objetivo deste estudo foi avaliar o nível de ansiedade dos pacientes durante o procedimento de extração do terceiro molar inferior, buscando parâmetros indicativos de possíveis complicações e, ao mesmo tempo, contribuindo para um procedimento seguro e menos desconfortável para o paciente. Foram selecionados 40 pacientes que necessitavam de extração do terceiro molar inferior. O estudo teve um avaliador para monitorar as variáveis sistêmicas - pressão arterial, saturação de oxigênio, frequência respiratória e cardíaca - enquanto o mesmo cirurgião realizava os procedimentos cirúrgicos, utilizando sempre a mesma técnica cirúrgica para todos os pacientes. Na anamnese e no final da cirurgia, os pacientes responderam a um questionário de escala visual analógica (EVA) sobre ansiedade. Os resultados demonstraram que para as quatro variáveis observadas durante a cirurgia, apenas a saturação de oxigênio não apresentou uma variação estatisticamente significativa durante o procedimento. Todas as outras apresentaram alterações, principalmente durante o uso da alta rotação. Conclui-se que a ansiedade, medo e estresse mostraram influências sobre os fatores sistêmicos durante o procedimento de exodontia. Indicando a importância de uma anamnese cuidadosa e o conhecimento das doenças sistêmicas do paciente antes de iniciar qualquer cirurgia, prevenindo riscos ou complicações.

**Palavras-chave:** Pressão sanguínea; Ansiedade; Dente do juízo; Dente serotino.

## Resumen

Durante la consulta odontológica, los pacientes a menudo presentan ansiedad y medicación exacerbada, especialmente en los procedimientos quirúrgicos. Estas reacciones pueden promover cambios sistémicos, como presión arterial alta, desmayos y convulsiones. El objetivo de este estudio fue evaluar el nivel de ansiedad de los pacientes durante el procedimiento de extracción del tercer molar inferior, buscando parámetros indicativos de posibles complicaciones y, al mismo tiempo, contribuir a un procedimiento seguro y menos incómodo para el paciente. Se seleccionaron 40 pacientes que requerían la extracción del tercer molar inferior. El estudio contaba con un evaluador para controlar las variables sistémicas -presión arterial, saturación de oxígeno, frecuencia respiratoria y cardíaca- mientras el mismo cirujano realizaba los procedimientos quirúrgicos, utilizando siempre la misma técnica quirúrgica para todos los pacientes. En la anamnesis y al final de la cirugía, los pacientes respondieron a un cuestionario de escala visual analógica (EVA) sobre la ansiedad. Los resultados mostraron que de las cuatro variables observadas durante la cirugía, sólo la saturación de oxígeno no presentó una variación estadísticamente significativa durante el procedimiento. Todos los demás mostraron cambios, especialmente durante el uso de la alta rotación. Se puede concluir que la ansiedad, el miedo y el estrés mostraron influencia en los factores sistémicos durante el procedimiento de exodoncia. Indicando la importancia de una cuidadosa anamnesis y conocimiento de las enfermedades sistémicas del paciente antes de iniciar cualquier cirugía, previniendo riesgos o complicaciones.

**Palabras clave:** Presión Sanguínea; Ansiedad; Muela del juicio; Tercer molar.

## 1. Introduction

The extraction of third molars is a procedure commonly performed by oral and maxillofacial surgeons for orthodontic reasons and to avoid pericoronitis, caries, resorption and periodontal problems of adjacent teeth (Oenning et al., 2014; Singh et al., 2015). Before surgical planning, with imaging exams, such as panoramic radiographs and computed tomography scans, a detailed anamnesis of the patient's systemic conditions is necessary for the surgery be performed safely (Fayad et al, 2017; Gaetti-Jardim et al., 2008; Gregori, 1988).

For most patients, undergoing surgery provides a stressful situation, surrounded by fear and anxiety that come from unpleasant memories of previous procedures or from the patient's imagination (Fayad et al., 2017; Gonzáles-Martinez, 2016). The use of medicinal herbs, classical music, virtual reality distraction and eye coverings are some of the alternatives studied to reduce anxiety during surgery. (Cunha et al., 2021; Kupeli et al. 2020; Mladenovic et al. 2021; Moaddabi et al. 2021). In addition, to reduce this discomfort, it is necessary to be a practical and objective surgeon in order to arouse confidence during care (Fayad et al., 2017; Gonzáles-Martinez, 2016).

Trans and postoperative complications are likely to happen in any procedure (Rodrigues et al, 2015). Often, they can be avoided with a careful treatment plan (Silvestre-Rangil et al., 2014; Bennet et al., 2017). In addition, it is always necessary to alert the patient about possible complications with the surgical procedure, and it needs to be performed in the safest way for the patient, ensuring greater comfort (Prado & Salim, 2004).

## 2. Methodology

This clinical, observational and qualitative study was adapted from the methodology written by Gadve et al. (2018). Ethics committee approval was obtained by the Research Ethics Committee of the Dentistry School of Bauru (Protocol number 90560718.0.0000.5417) and written consent was obtained from all patients.

Forty patients who sought the surgery clinic of the Faculty of Dentistry of Bauru, University of São Paulo, for extraction of lower third molars were selected to participate. Clinical evaluations and imaging tests were performed to select teeth with similar classifications, aiming at standardisation for performing surgical procedures. Participants should have at least one lower third molar that would be necessary for the use of osteotomy and odontoseccion for the extraction and age between 17 and 40 years.

The study consisted of two phases: the first was the preoperative assessment, with detailed anamnesis and application of the analogue scale questionnaire (VAS) to verify the patient's anxiety. The second phase referred to the surgical procedure

with monitoring of the variables: saturation, blood pressure, respiratory rate and heart rate at four different times: (T1) during the preoperative evaluation, (T2) during anesthesia, (T3) during osteotomy and odontoseccion and (T4) at the end of surgery with the patient already sutured and without sterile fields. For measurements before, during and after the surgical procedure, manual and digital sphygmomanometer and oximeter were used.

The anxiety questionnaire was applied before the surgical procedure and consisted of 5 tests related to the patient's fear and anxiety. For each question, there were 4 answer alternatives, which later received a value from zero to three, seeking to verify if there is a specific cause for anxiety during dental care or if it was an anxious person in general, being complemented by the application of the visual analog scale (VAS), in which the patient indicated his fear of care on a graduated scale that was later classified as low, moderate and high, according to the score, before and after the surgical procedure.

### Statistical analysis

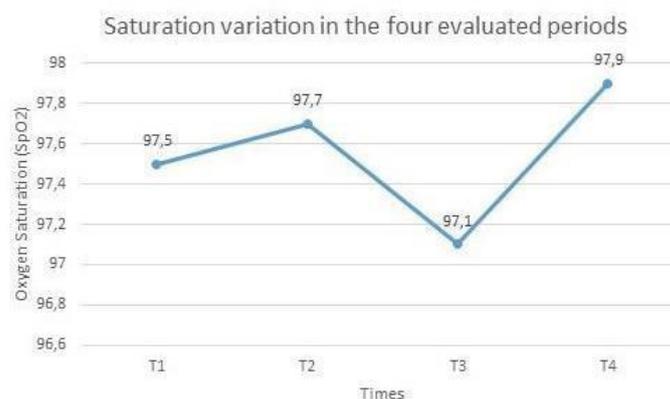
To analyze the results of the entire sample, descriptive statistics of the parameters "mean" and "standard deviation" were used. For comparisons of measurements of the same individual, the paired "t" test was used and, for comparisons between genders, the "t" test. All tests were performed with the Statistica program, adopting a significance level of 5%.

## 3. Results

The VAS analysis showed that most patients present moderate or high anxiety before performing third molar extraction procedures, while in the postoperative period they generally have a low rate of anxiety.

As for the four variables observed at the four times during the surgery, only the oxygen saturation did not show significant variation during the procedure (Figure 1). The others all showed changes.

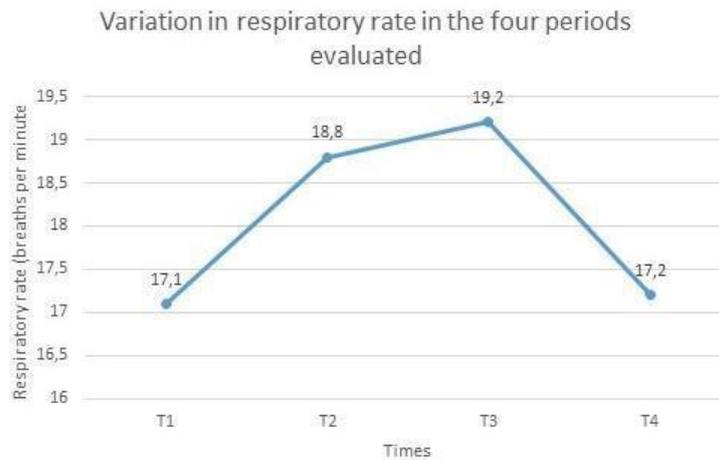
**Figure 1 - Saturation variation in the four evaluated periods.**



Note: The variation of oxygen saturation in the four analyzed times is small, not being considered statistically significant. Source: Authors.

Respiratory rate had the highest mean during T3 (19.27), at the time of high rotation activation (Figure 2). Significant changes were found between T1 and T2, T1 and T3 (Table 1) in both cases mentioned above, there was an increase in the average of respiratory movements per minute when comparing the preoperative period (T1) with the time of anesthesia (T2) and the moment of activation of the high rotation (T3). When comparing T4 with T2 and T4 with T3, there is a decrease in the frequency in the postoperative period (T4). According to this variable, the moment of greatest tension for the patient occurs with the activation of the high rotation, that is in the osteotomy.

**Figure 2 -** Variation in respiratory rate in the four periods evaluated.



Observe that the average at T3 is higher than at the other times analyzed. Source: Authors.

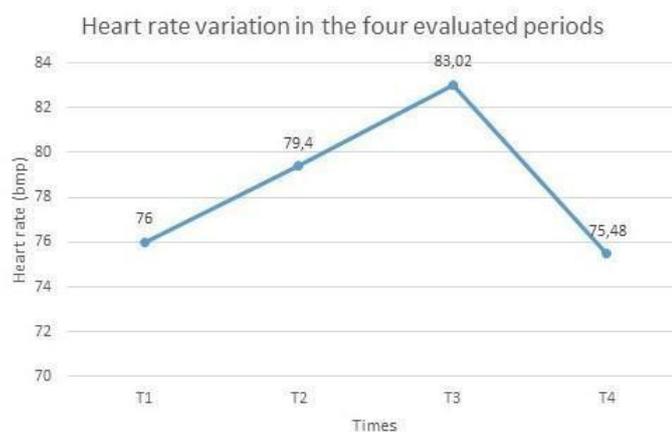
**Table 1 -** Comparison of respiratory rate averages in the four evaluated periods.

| Compared times | Average 1 | Standard deviation 1 | Average 2 | Standard deviation 2 | P     |
|----------------|-----------|----------------------|-----------|----------------------|-------|
| T1-T4          | 17,18     | 2,696                | 17,2      | 2,309                | 1     |
| T1-T2          | 17,18     | 2,696                | 18,86     | 2,492                | 0,044 |
| T1-T3          | 17,18     | 2,696                | 19,27     | 2,6                  | 0,001 |
| T4-T2          | 17,2      | 2,309                | 18,86     | 2,492                | 0,049 |
| T4-T3          | 17,2      | 2,309                | 19,27     | 2,6                  | 0,001 |
| T2-T3          | 18,86     | 2,492                | 19,27     | 2,6                  | 1     |

Note that only between T1-T2; T1- T3, T4-T2 and T4- T3 was the p-value less than 0.05. Source: Authors.

Heart rate had the highest mean during T3 (83.02). There were significant variations between T1 and T3, T2 and T3, T4 and T3 (Table 2) where the number of beats per minute increased during osteotomy. Showing that in the postoperative period there was a decrease compared to the osteotomy time (Figure 3). This variable indicates that the activation of high rotation results in greater tension for the patient.

**Figure 3 -** Heart rate variation in the four evaluated period.



Note the elevation of the heart rate during osteotomy (T3). Source: Authors.

**Table 2** - Comparison of heart rate averages in the four periods evaluated.

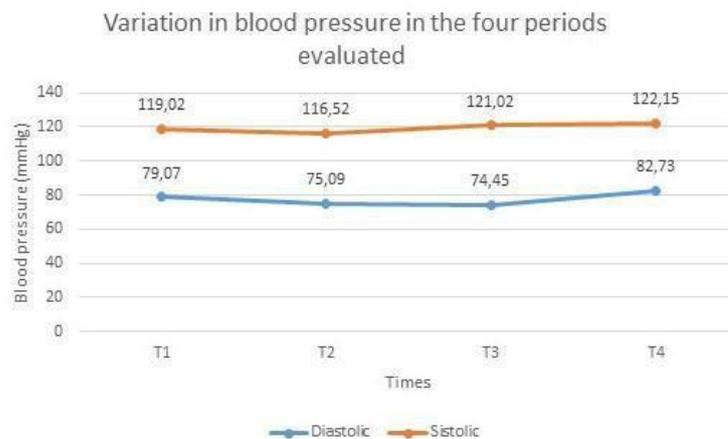
| Compared times | Average 1 | Standard deviation 1 | Average 2 | Standard deviation 2 | P     |
|----------------|-----------|----------------------|-----------|----------------------|-------|
| T4-T1          | 75,48     | 13,023               | 76,02     | 14,161               | 1     |
| T4-T2          | 75,48     | 13,023               | 79,48     | 19,457               | 0,891 |
| T4-T3          | 75,48     | 13,023               | 83,02     | 15,763               | 0     |
| T1-T2          | 76,02     | 14,161               | 79,48     | 19,457               | 1     |
| T1-T3          | 76,02     | 14,161               | 83,02     | 15,763               | 0     |
| T2-T3          | 79,48     | 19,457               | 83,02     | 15,763               | 0,018 |

Note that  $p < 0.05$  only between T4-T3, T1-T3 and T2-T3. Source: Authors.

Systolic blood pressure showed a significant increase between T2 and T4 (Table 3). At the time of anesthesia (T2) the lowest mean was found (116.52), while the highest value was obtained at T4 in the postoperative period (122.16).(Fig 4).

On the other hand, diastolic blood pressure showed a statistically significant variation between T3 with a mean of 74.45 and T1 with a mean of 79.07, at the time of osteotomy the lowest value was found, in other words, there was a decrease in diastolic BP from the preoperative period to diastolic BP during high rotation activation. While at T3 (74.45) and T4 (82.73), there was an increase in this value in the postoperative period and at T2(75.09) and T4(82.73) (Table 4). We can conclude that there is an increase in the values in the postoperative period when compared to the time of anesthesia, indicating that, during the procedure, blood pressure has a slight reduction and that in the postoperative period, with the patient under less tension and anxiety, the value tends to return to the averages considered normal (120x80mmHg) (Figure 4).

**Figure 4** - Variation in blood pressure in the four periods evaluated.



Note that at T4 the values are higher than when compared to the other times. Source: Authors.

**Table 3** - Comparison of means of systolic blood pressure in the four periods evaluated.

| Compared times | Average 1 | Standard deviation 1 | Average 2 | Standard deviation 2 | P     |
|----------------|-----------|----------------------|-----------|----------------------|-------|
| T2-T1          | 116,52    | 10,728               | 119,02    | 11,827               | 1     |
| T2-T3          | 116,52    | 10,728               | 121,022   | 12,892               | 0,139 |
| T2-T4          | 116,52    | 10,728               | 122,159   | 9,358                | 0,03  |
| T1-T3          | 119,02    | 11,827               | 121,022   | 12,892               | 1     |
| T1-T4          | 119,02    | 11,827               | 122,159   | 9,358                | 0,644 |
| T3-T4          | 121,022   | 12,892               | 122,159   | 9,358                | 1     |

Note that  $p < 0.05$  only between T2 and T4. Source: Authors.

**Table 4** - Comparison of diastolic blood pressure means in the four periods evaluated.

| Compared times | Average 1 | Standard deviation 1 | Average 2 | Standard deviation 2 | P     |
|----------------|-----------|----------------------|-----------|----------------------|-------|
| T3-T1          | 74,45     | 9,651                | 79,07     | 7,531                | 1     |
| T3-T2          | 74,45     | 9,651                | 75,09     | 10,288               | 0,044 |
| T3-T4          | 74,45     | 9,651                | 82,73     | 19,067               | 0,003 |
| T2-T1          | 75,09     | 10,288               | 79,07     | 7,531                | 0,1   |
| T2-T4          | 75,09     | 10,288               | 82,73     | 19,067               | 0,009 |
| T1-T4          | 79,07     | 7,531                | 82,73     | 19,067               | 1     |

Note that there was a statistically significant difference between the times: T3-T2, T3-T4 and T2-T4. Source: Authors.

#### 4. Discussion

With a complete anamnesis is possible to identify, mainly, cardiovascular diseases such as ischemic heart disease, systemic arterial hypertension, dysrhythmia and haematological disorders, that are the most recurrent in the population (Gaetti-Jardim et al., 2008; Hollander et al., 2016). These systemic diseases can favour syncopes, faintings, seizures and alteration of the vital signs, such as elevated blood pressure and heart and/or respiratory rate. All these intercorrences can occur during dental extractions (Gaetti-Jardim et al., 2008; Hollander et al., 2016).

Physiological alterations are frequent during impacted third molar surgery (Dereci et al., 2021). Blood pressure elevation is common when there is vasoconstriction during the use of anaesthetics with epinephrine, associated with exacerbated anxiety (Koçer et al., 2014). According to Balasubramanivan N et al. (2016) hypertensive patients with stress caused by anxiety also show significant cardiovascular changes. Patients with severe preoperative anxiety were associated with higher numbers of heart rate, systolic and diastolic blood pressure and oxygen saturation, moreover all values showed an increase after administration of the local anaesthetic (Balasubramanivan et al., 2016).

Lowe and Brook (1991) evaluated the variation in oxygen saturation in patients undergoing to removal of third molars and suggested that all of them are at risk of hypoxia, different from what was observed in our study, where oxygen saturation did not show significant variation during extraction at any of the times analysed.

Liau and collaborators (2008) also evaluated anxiety during dental procedures regarding altered cardiovascular response to performing mandibular anaesthetic block. The results showed that women had a significantly higher mean anxiety level when compared to men, and younger patients were associated with a higher score on the Corah anxiety scale (Corah, 1969), in addition, patients with severe preoperative anxiety were related to increased heart rate during anaesthetic administration. High anxiety was also found in reports of previous traumatic dental care (Liau et al., 2008).

Hollander et al. (2016) evaluated anxiety through heart rate during surgery to remove third molars under local anaesthesia in 48 patients and concluded that during osteotomy the heart rate of patients increased and that in the postoperative period the level of anxiety of patients decreased, in agreement with the results found in our study (Hollander et al., 2016).

Tarazona-Álvarez et al. (2019) observed hemodynamic variations and anxiety during the extraction of unerupted 3MI and concluded that the differences in systolic, diastolic blood pressure and heart rate were not statistically significant, disagreeing with the results of our study. In contrast, in the study by Gadve et al. (2018) also found significant changes in systolic and diastolic blood pressure during 3MI extraction.

According to the results obtained, osteotomy was one of the moments that resulted in greater anxiety for the patients. The study by Kirli Topcu et al. (2018) compared conventional osteotomy techniques with piezoelectric osteotomy during 3MI unerupted surgery, assessing anxiety and pain during surgery and concluded that although piezoelectric provides an accurate

and less aggressive osteotomy compared to conventional rotational techniques did not significantly reduce intraoperative pain and anxiety.

## 5. Conclusion

It is concluded that anxiety, fear and stress can influence systemic factors such as respiratory rate, heart rate and blood pressure during the surgical procedure. While for the saturation values, no significant changes were found that could be related to these moments.

In addition, it is evident that the moment of greatest nervousness for the patient is associated with the activation of the high-speed pen, which can generate an increase in heart and respiratory rates, used as indicators of nervousness in the research. It shows the importance of careful anamnesis and the knowledge of patient systemic diseases before starting any surgery to prevent risks or complications. New studies should be conducted to find alternatives that make the surgical moment less stressful for the patient.

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