

Impacted lower third molars: Can preoperative salivary pH influence postoperative pain?

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ABSTRACT

Aim: The literature focuses little attention on factors that influence third molar post extraction pain (PEP). One factor that may play a role in PEP is saliva. We undertook a study in patients subjected to third molar extraction with the aim of assessing the influence of salivary pH on PEP. **Materials and Methods:** Thirty-one healthy patients with one impacted inferior lower third molar with mean age of 21.02 ± 2.05 years, underwent surgery for similar impactions. The process of pH measuring was carried out without delay after saliva collection, with a combination electrode connected to a PHM 62 pH meter. Pain assessment was done at 4, 8, 12, 18 and 24 hours on the first day. The scale ranged from 0 to 10 in which 0 and 10 denoted 'no pain' and 'maximum pain,' respectively. **Results:** The multivariate analysis suggests that the factors that influence pain are patients' sex ($B = -0.466$) and the saliva pH ($B = -1.093$). According to the findings of our study, PEP intensity is assumed to have a reverse correlation with salivary pH and is also assumed to be greater in females. **Conclusion:** Due to the fact that no previous study has indicated such findings so far, further studies are needed to assess the importance of preoperative pH value and its clinical significance on the level of PEP.

Key words: pH, postoperative pain, saliva, third molar

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INTRODUCTION

Pain as a frequent occurrence after dental procedures concerns patients and has an adverse impact on patient satisfaction.^[1] Third molar post extraction pain (PEP) is one of the most common models successfully used in recent years for assessing the analgesic efficacy of pain-killing drugs.^[2,3]

Pain is a subjective experience influenced by many factors such as patient age, cultural and educational

level, past experiences, pain threshold and tolerance which makes its objective assessment difficult. Despite these limitations, a visual analog scale (VAS) is universally considered to be the most appropriate instrument for pain measurement and is the most widely used means for scoring postoperative pain – and specifically that caused by the surgical extraction of the lower third molar.^[4-6]

The literature has it that many factors are related to PEP (such as patient age, surgical parameters, number of sutures, degree of impaction, etc.). Some have strong supporting evidence Confirming their relationship while some are still mired in controversy. Most of the literature focuses little attention on the patient and surgical factors that influence third molar PEP.^[7] However, one of the most important factors regulating oral health is saliva.^[8] For diagnostic and prognostic purposes, routine dental practice should therefore

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include the measurement of certain important salivary factors such as pH and flow rate, which tend to have a highly significant linear correlation as well. There is also some evidence indicating that low extracellular pH (i.e., tissue acidosis) is frequently seen with inflamed tissue, which results in the activation of nociceptors^[9] and pain fibers.^[10] It has been indicated that environmental stimuli, such as pH, may have clinical significance in the development of dental pain.^[11] We intended to carry out a study in patients subjected to lower third molar extraction, with the aim of analyzing the influence of salivary pH on pain.

MATERIALS AND METHODS

Thirty-one healthy patients with one impacted inferior third molar underwent surgery. The samples comprised of 13 women and 18 men, aged 18 to 24 years, with a mean age of 21.02 ± 2.05 years. They did not have a medical condition or use any sort of medication and were nonsmokers. Written consent was obtained from all the subjects and the study was approved by the ethics committee of our university.

The subjects were asked to avoid eating and drinking from 10 p.m. on the night before surgery, excluding water, coffee and tea without sugar or cream. No advice was given concerning oral hygiene habits. The subjects were given instructions regarding the saliva collection which was performed in a normal sitting position. A rinse with water preceded the collection. Saliva was collected in a graduated receptacle. The pH measuring process was carried out without delay with a combination electrode connected to a PHM 62 pH meter (Radiometer A/S, Copenhagen, Denmark).

In order to eliminate any other influencing factors affecting PEP, factors such as age, surgical parameters, degree of impaction and number of sutures were attempted to be as paralleled and standardized as possible. Each patient's third molar showed the same degree of impaction (fully covered by bone) and needed a similar surgical procedure on occasion (the surgical procedure was standardized by the same surgeon under local anesthesia).

Technique

Each patient underwent lower third molar extraction, (Inf. Alveolar Nerve Block and no sedation), the local anesthetics administered was lidocaine 2% (1 : 80,000 norepinephrine). A full-thickness mucoperiosteal flap was elevated. Osteotomy was performed using a round bur (No.8 carbide) and a low-speed straight handpiece under constant irrigation of cool saline solution. Surgical sites were sutured (4-0 silk) and analgesics were prescribed at six – hour intervals (Ibuprofen Tab. 400 mg).

Pain assessment was made at 4,8,12,18 and 24 hours during the first day. The scale was quantified from 0 to 10 in which 0 and 10 denoted 'no pain' and 'maximum pain,' respectively.

The data was presented as mean \pm standard deviation and for quantitative variables and frequency (percentage) for sex. The Kolmogorov-Smirnov test was used to check the normal distribution of variables. The relationship between pain score, age and pH was assessed via the Pearson's correlation coefficient. Pain scores were also compared between males and females according to the t-test. A multiple linear regression was used to detect variables that could affect the pain score. In this analysis, age (year), sex (male=1, females=0) and pH (Unit) were entered in the model via the stepwise method with 0.05 inclusion and 0.1 for exclusion criteria. The analysis was performed using SPSS 10.0 (SPSS Inc. Chicago I 11) and the level of significance was set at $P \leq 0.05$.

RESULTS

From 31 patients, 18 were male (58.1%) and the mean age (\pm SD) was 21.0 ± 2.0 years.

Regarding the intensity of pain, the mean pain score was 5.72 ± 1.02 . Pain ($p = 0.544$), age ($p = 0.486$) and pH ($p = 0.273$) had normal distributions.

Based on the univariate analysis, no association was observed between saliva pH and age ($P = 0.79$). Age also did not have any effect on postoperative pain ($P = 0.48$). The saliva pH had a significant reverse correlation ($r = -0.654$, $p < 0.001$) with postoperative pain. The multivariate analysis suggested that the factors that influenced pain were patient's sex ($p = 0.041$) and the saliva pH ($p < 0.001$). Adjusted R-square for the model was 0.645 [Figure 1]. Increase in 1 unit of pH suggested a decrease in pain of 1.09 units and males reported 0.466 units lower than females.

DISCUSSION

Postoperative pain is a consequence following surgical extraction of fully impacted lower third molar teeth. The many factors that contribute to these situations are complex, but they originate in an inflammatory process initiated by surgical trauma. Our study has aimed to assess another contributing factor to PEP. We have found that lower salivary pH may lead to higher intensity of pain after extraction of the lower third molars.^[12]

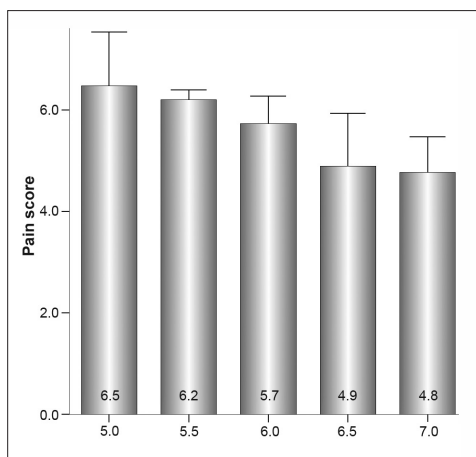


Figure 1: Pain score relative to salivary pH; lower pH relates to increase in pain

Regarding the relationship between patient's age and PEP, many controversial reports have been published thus far; some advocating a relationship^[13,14] and some disapproving such.^[15-19]

Saliva plays a crucial role in maintaining the oral ecosystem^[20-22] and pH is shown to have a reverse correlation, with the growth of lactobacillus and yeast in the oral cavity.^[23] The relationship between chronic craniofacial pain, such as migraine and the salivary flow rate has also been investigated.^[24]

Goodis *et al*, studied tissue pH and temperature regulation of pulpal nociceptors in laboratory rats. Their study indicated that environmental stimuli regulated the activity of capsaicin-sensitive neurons innervating the dental pulp and these factors may be significant clinically in the development of dental pain.^[11]

Foodstuff, stress, surgery and drugs may influence salivary pH and a randomized clinical trial by Duane suggests that the use of high-dose xylitol chewing gum has beneficial effects on plaque pH and *Streptococcus mutans* in children at high risk for caries.^[25] Many antibiotics are secreted in the saliva and may affect salivary pH (which may in turn affect PEP).^[26] However, among these many contributing factors, very little, if any attention has been directed toward the relationship between salivary pH and the intensity of PEP. We failed to find a similar study in the literature search and this was a limitation of our study.

CONCLUSION

In our study, we found salivary pH to affect PEP intensity with a reverse correlation. The more acidic it was the greater was the pain. Due to the fact that no previous study has evaluated such findings so far,

further studies are needed to assess the importance of pH value and its clinical significance on the level of PEP, in light of other confounding factors.

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