



Pain Levels after Third Molar Surgical Removal: An Evaluation of Predictive Variables

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ABSTRACT

Aim: The aim of this prospective study was to evaluate the pain course after surgical removal of third molars.

Materials and methods: The sample consisted of 100 consecutive patients. Pain intensity was assessed by means of a visual analog scale (VAS).

Results: At day 1, moderate and severe pain were observed predominantly in patients who had surgery in the mandible ($p < 0.001$) and for patients younger than 24 years ($p = 0.009$), while more patients who weekly consumed mate tea (*Ilex paraguariensis*) showed pain classified as none or light ($p = 0.017$). At day 2, the profile of pain moderate/severe was more prevalent for patients who had surgery in the mandible ($p < 0.001$) with the report of difficult surgery ($p = 0.042$) and with odontotomy performed ($p = 0.033$). In the third postoperative day, severe/moderate pain was associated with surgery in the mandible ($p < 0.001$) and with odontotomy ($p = 0.021$) and ostectomy ($p = 0.028$) performed, with report of long and difficult procedure ($p = 0.023$), surgeries which last more than sixty minutes ($p < 0.026$), and for those patients who developed postoperative inflammatory complications ($p < 0.001$).

Conclusion: Higher pain complains could be expected for patients who have long and difficult mandibular third molar surgery characterized by odontotomy and ostectomy.

Clinical significance: Pain after third molar surgery is a common sequela. It is indispensable for the dentists to be apt in handling and preventing it as far as possible and know possible variables that may influence or increase these pain levels. It can be a clinical advantage. Better understanding the pain characteristics may guide the dentist through preoperative decisions.

Keywords: Third molar, Oral surgery, Pain, *Ilex paraguariensis*.

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INTRODUCTION

Third molar removal is among the most common surgical procedures performed around the world and numerous studies have been devoted to evaluate all aspects of this surgery.^{1,2} This intervention involves trauma to soft and bony tissues and can result in considerable pain, swelling and trismus leading to an overall complication rate around 20%, with most complications occurring postoperatively.²⁻⁴ It has also been shown that patients often experience inadequate analgesia postoperatively, that the pain level varies interindividually and that significantly influences patient quality of life mainly during the first three postoperative days.⁵

Pain after the third molar removal is a routine sequela due to trauma-induced inflammation. Therefore, third molar surgery is one of the most often used intervention to study acute analgesia and numerous studies have been published on this issue,^{6,7} but very few have evaluated factors that may predict the postsurgery pain intensity.⁸⁻¹⁰

The aim of this prospective and exploratory study was to evaluate the postoperative pain intensity in a diverse sample of individuals who had a single third molar removed and check whether some predictive variables could have influence over patients' postoperative pain experience. Better understanding these characteristics of pain may guide the dentist through perioperative decisions or may launch an alert of developing complications which could help the professional to better and faster handle it.

MATERIALS AND METHODS

Surgical removal of a single third molar was performed on one hundred consecutive patients, age range 14 to 62 years (mean and SD 25 ± 7.5 , 63 females and 37 males). Forty-five third molars were removed from the maxilla (male 16;

female 29) and 55 from the mandible (male 21; female 34). The study was carried out under controlled conditions and performed in three similar surgical rooms. All the procedures were performed by undergraduate students with low degree of experience and under direct supervision of two oral and maxillofacial surgeons. All extractions were made at same period of the day, between 17:00 to 20:00, and from March of 2008 to June of 2009. All procedures were performed under the most rigorous hygiene conditions that included sterile surgical apron, sheets and gloves, with dental handpieces and surgical instruments sterilized in autoclave. Sterile saline solution was used for lavage of the alveolus socket and for bur refrigeration when ostectomy was necessary. Before surgery, patients had to rinse for 1 minute with 15 ml of 0.12% chlorhexidine solution.

Due to ethical reasons, analgesics were prescribed to all patients (paracetamol 750 mg, 4 times a day, for 2 days, through oral route). Nonsteroidal anti-inflammatory drugs (NSAIDs—sodium diclofenac 50 mg, 3 times a day, for 2 days, through oral route) were prescribed only to those patients whom the surgical trauma was considered extensive or to those whose pain was not controlled by the prescribed analgesic. However, it was allowed to the patient to discontinue these drugs (paracetamol and/or sodium diclofenac) or even do not take it, if no symptoms were present, but patients were advised to take the analgesic tablet as soon as their pain started. Antibiotics were used in more specific conditions like advanced age, immunocompromised patients, low red or white blood cell count, systemic diseases implied in impairment of healing process or body defense capacity, and performing surgeries in areas classified as dirty and infected or acute inflammatory process present. The postoperative cares and recommendations were similar to all patients and were directed mainly to keep the blood clot in place, avoiding rigorous mouthwash, maintaining a sensible oral hygiene and keep at least 12 hours rest.

The patients were evaluated clinically at the third and seventh day postsurgery or whenever necessary. The diagnostic criteria for third molar surgical wound infection and dry socket have been reviewed by Ren and Malmstrom (2007).¹¹

Data were collected by a trained dentist who was present in all procedures. Anamnestic data were collected by means of a questionnaire together with a panoramic radiograph and routine blood test. Data regarding the surgical procedure were collected immediately after the surgery.

Pain intensity: Patients had to evaluate the pain intensity at the end of the first (day 1), second (day 2) and third (day 3) postoperative day by means of a visual analog scale (VAS) with the anchor points 0 (no pain) and 10 (extreme

pain). They had to grade the most severe pain felt during the day.

This study was submitted by the UNOESC/HUST Ethical Committee for Human Research and informed consent was obtained from all participating patients.

STATISTICAL ANALYSIS

Differences in pain intensity at the three follow-up days were analyzed by means of the Spearman correlation test and Chi-square test (χ^2) as appropriate. For this, last evaluation pain level and age were dichotomized. VAS 0-2: painfree or light pain; VAS 3-10 severe to moderate pain. The age was dichotomized at 24 years (median).

The statistical analysis was performed by means of the BioEstat (version 4.0; Belém/Pará- Brazil). Differences were considered as statistically significant with $p \leq 0.05$.

RESULTS

The reported pain levels for the first postoperative day were significantly higher compared with days 2 and 3 (Fig. 1).

At day 1, moderate and severe pain were observed predominantly in patients who had surgery in the mandible ($p < 0.001$) and for patients younger than 24 years ($p = 0.009$), while more patients who weekly consumed mate tea (*Ilex paraguariensis*) showed pain classified as none or light ($p = 0.017$) (Table 1). At day 2, the profile of pain moderate/severe was more prevalent for patients who had surgery in the mandible ($p < 0.001$) with the report of difficult surgery ($p = 0.042$) and with odontotomy performed ($p = 0.033$) (Table 1). In the third postoperative day, severe/moderate pain was associated with surgery in the mandible ($p < 0.001$) and with odontotomy ($p = 0.021$) and ostectomy ($p = 0.028$) performed, with report of long and difficult procedure ($p = 0.023$), surgeries which last more than sixty

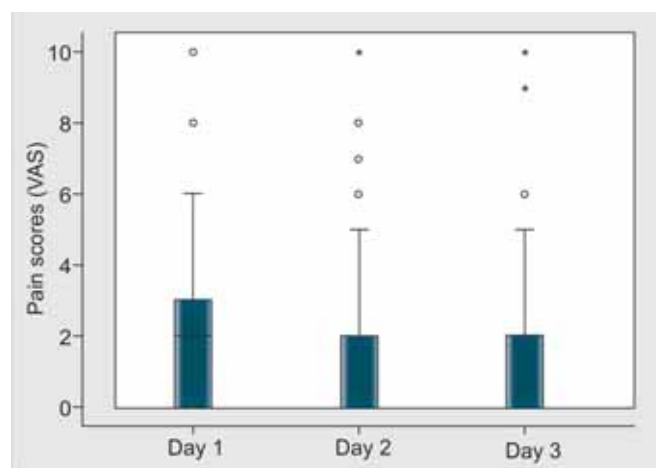


Fig. 1: Mean pain scores for days 1 to 3 after third molar surgery (n = 100)

Table 1: Proportions and Pearson Chi-square test ($p \leq 0.05$, two sided) for some variables of interest and respective association with pain levels dichotomized as none/light (VAS 0-2) and moderate/severe (VAS 3-10) for days 1 to 3, after third molar surgery (n: 100)

Variables	Pain level (day 1)		χ^2 (p-value)	Pain level (day 2)		χ^2 (p-value)	Pain level (day 3)		χ^2 (p-value)
	None/light (0-2)	Moderate/ severe (3-10)		None/light (0-2)	Moderate/ severe (3-10)		None/light (0-2)	Moderate/ severe (3-10)	
Gender	25 Male	12 Female	NS	33 46	4 17	NS	32 48	5 15	NS
Age (median)	29 Up to 24	27 More than 24	0.009	44 35	12 9	NS	47 33	9 11	NS
Tobacco (daily)	12 Yes	5 No	NS	13 66	4 17	NS	13 67	4 16	NS
Alcohol (weekly)	17 Yes	10 No	NS	22 57	5 16	NS	20 60	7 13	NS
Mate tea (weekly)	36 Yes	12 No	0.017	40 39	8 13	NS	38 32	10 10	NS
Oral contraceptive (when applied)	21 Yes	17 No	NS	30 16	8 9	NS	31 17	7 8	NS
Menstrual bleeding days (when applied)	6 Yes	3 No	NS	7 39	2 15	NS	8 40	1 14	NS
Osteotomy	30 Yes	23 No	NS	38 41	15 6	NS	38 42	15 5	0.028
Odontotomy	15 Yes	10 No	NS	16 63	9 12	0.033	16 64	9 11	0.021
Report of difficult surgery	48 Yes	27 No	NS	26 53	12 9	0.042	26 54	12 8	0.023
Surgical accident (root fracture, etc.)	4 Yes	4 No	NS	6 73	2 19	NS	6 74	2 18	NS
Procedures time (median—in minutes)	37 Up to 60	20 More than 60	NS	47 32	10 11	NS	50 30	7 13	0.026
Surgical site	26 Maxilla	17 Mandible	0.001	43 36	2 19	< 0.001	43 37	2 18	< 0.001
Postoperative infection or dry socket	4 Yes	1 No	NS	4 75	1 20	NS	0 80	5 15	< 0.001
Antibiotic prescription	23 Yes	9 No	NS	25 54	7 14	NS	22 58	10 10	NS

NS: non significant

minutes ($p < 0.026$), and for those patients who developed postoperative complications ($p < 0.001$) (Table 1).

The surgery time was weekly and positively correlated (Spearman correlation test) with the pain intensity for the first ($r_s = 0.22$), second ($r_s = 0.21$) and third ($r_s = 0.27$) days.

The anatomical teeth position in the mandible or maxilla and its respective mean pain scores for days 1 to 3 can be seen in Figures 2 and 3.

DISCUSSION

The goal of this study was to analyze how different individuals perceive the pain after a third molar extraction and to identify factors that may predict the postsurgery pain intensity. Besides the limitations of this exploratory study, we are able to raise some interesting questions and compare our results with the current literature.

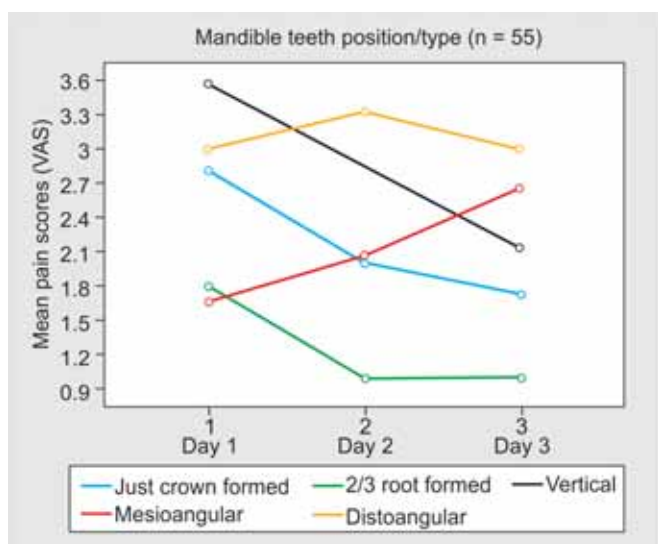


Fig. 2: Mandible mean pain scores for days 1 to 3 according to teeth position (n = 100)

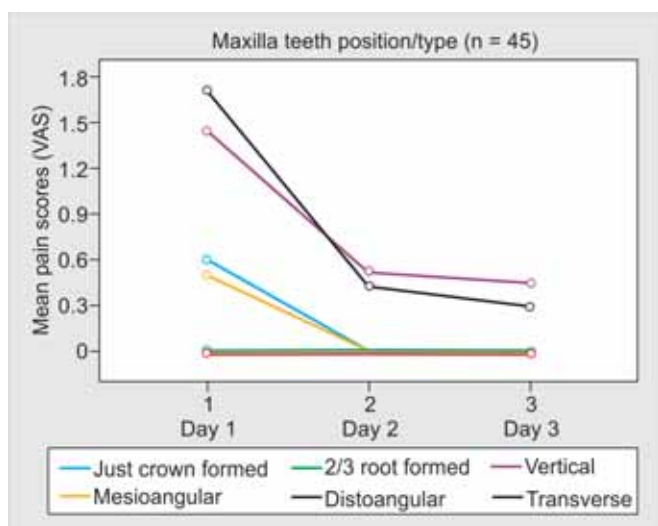


Fig. 3: Maxilla mean pain scores for days 1 to 3 according to teeth position (n = 100)

Interestingly, a regular mate tea (*Ilex paraguariensis*) consumption, especially when taken daily, reduced pain intensity during the first postsurgery day. Mate tea is a hot beverage largely consumed in the southern Brazilian states. This observation is likely explained by an anti-inflammatory and/or analgesic effect of the mate tea. Indeed, it has been demonstrated that *Ilex paraguariensis* could reduce the inflammatory cell influx of macrophages and neutrophils and reduced acute lung inflammation in mice exposed to cigarette smoke.¹² The anti-inflammatory action was related with the decrease in inflammatory cytokine expression, cell influx and cellular metabolic activity and also with promotion of cell survival due to its prevention, interception and repair protection against peroxynitrite, which causes protein nitration, lipid peroxidation, DNA damage and cell death. Nitrosative stress is induced whenever the conditions are favorable for increased superoxide formation, like cellular damage due to trauma.¹³ Fillip et al (2007)¹⁴ suggested that the *Ilex paraguariensis* extracts could be useful in prevention of oral pathologies and are a promising source of natural antioxidants which have a potential chemoprotective action in oral tissues due to its action of promoting an increase of activity of secreted peroxidase. Peroxidase is one of the most important scavenger enzymes of the antioxidant system of the submandibular glands, acting preventing attack of free radicals and protecting oral mucosa from cellular lysis induced by H_2O_2 and hydroxyl radicals. To the best of our knowledge, this is the first study reporting a lower pain intensity after third molar surgical removal in subjects regularly taking mate tea. However, more studies are necessary to evaluate the potential analgesic and/or anti-inflammatory effect of the *Ilex paraguariensis* in oral surgery.

The highest pain levels were recorded during the first 24 hours postsurgery. According to the literature, the pain is more acute during the first day then decrease linearly.⁵ Figure 3 shows a large decrease in pain intensity after extraction of a maxillary tooth from day 1 to day 3, independently of the tooth position. However, the postoperative pain course was more complex after the extraction of a mandibular tooth. Indeed, with a distoangular and a mesioangular tooth position pain increased from day 1 to day 2 and in the latter position also between days 2 and 3 (Fig. 2). This can be explained by the fact that this tooth position required a more complex surgery that therefore, caused a more severe trauma and subsequent increased inflammatory process. On comparing Figures 2 and 3, it is visible that the highest mean pain scores for maxillary teeth were situated at the inferior baseline pain scores for mandibular teeth and, in fact, mandibular teeth were observed to be a more painful surgery for all 3 days recorded.

The use of postoperative antibiotics for the removal of asymptomatic third molars is controversial.¹⁵⁻¹⁹ Ataođlu et al (2008)¹⁵ evaluated the efficacy of antibiotic prophylaxis during removal of impacted third molars and the authors concluded to not recommend routine oral antibiotic prophylaxis in third molar surgery. Arteagoitia et al (2008)¹⁶ assessed the efficacy of amoxicillin/clavulanic acid in preventing infectious and inflammatory complications in third molars surgeries through a double-blind placebo controlled randomized clinical trial and observed that antibiotics are efficacious to prevent complication from a statistical point of view; however, the authors concluded that systematic prescription of preventive antibiotic is not indicated. Poeschl et al (2004)¹⁷ in a prospective study of 528 impacted lower third molars surgeries, concluded that prophylactic antibiotic treatment does not contribute to a better wound healing, less pain or increased mouth opening and could not prevent cases of inflammatory problems after surgery. Lacasa et al (2007)¹⁹ assessed the clinical efficacy of two schedules of amoxicillin/clavulanate versus placebo for mandibular third molar surgery through a randomized, double-blind clinical trial and observed that the antibiotic regimen was superior than placebo to control infection and to reduce pain after surgery. The present study observed that the use of antibiotics did not show a beneficial effect over pain's response, in accordance with the literature.

At days 2 and 3, it becomes more apparent that higher pain levels are related with the increase of surgical trauma in mandibular surgery, with more difficult surgeries implying in ostectomy and odontotomy and, for a low experienced student who conducted the surgery, that means increase in time spent for accomplish the procedure.

Regarding to the period of infection development, our study is in accordance with the results found by Alexander and Thronson (2000)²⁰ which, in a review manuscript, suggested that infection arise usually at the second or mainly at third day postoperative and are related with increase of pain complaint. Similarly, to what was found in the present study, Kim et al (2006)⁹ showed that patients who had deeply impacted teeth which implies in more difficult procedure and larger operation time have significantly higher pain scores compared with short operation times. Baqain et al (2008)²¹ observed that postoperative pain was associated with tooth angulation, bone removal, tooth sectioning, lingual flap retraction and operation time, which was basically very similar to our results, except to lingual flap (not evaluated).

It may be virtually impossible to preview how someone will behave concerning pain after third molar surgery since, pain can have several modulators and that can range from sex, age, psychological status, previous pain experience,

patient's daily medicines and habits, surgical site, health status, the surgery trauma itself and also the postoperative prescriptions. For this sample and with the research method limitations, we can only raise hypothesis, however, by the other hand, extreme control of the variables may not be the real life for a clinician who routinely perform third molar surgery.

CONCLUSION

Not just anatomically and technically different, third molar surgery performed in maxilla and mandible is also unequal concerning pain response. Higher pain complains could be expected for patients who have difficult mandibular surgery and that means increase of trauma and procedure time spent. Regular mate tea consumption may have an anti-inflammatory and/or analgesic effect.

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