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Which Variables Influence Signs and Symptoms after Lower Third Molar Extraction? An Experimental Study

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Abstract

Introduction: Many variables may influence post-operative symptoms after lower third molar extraction.

Objective: To assess which pre and intra-operative variables may influence post-operative signs and symptoms after lower third molar extraction.

Materials and Methods: 17 patients scheduled for lower third molar extraction were included in this study. Patients were pre-operatively asked to perform a cold pressor test and to fill a questionnaire about the expectation of pain. Modified Dental Anxiety Scale (MDAS) was used to assess dental anxiety. Swelling and trismus were assessed before surgery, and two days and seven day after surgery. Postoperative pain was assessed at the end of the surgery and for the subsequent 6 days. Maximum post-operative pain was used as main outcome variable. Pearson correlation was used as statistical analysis ($p < 0.05$).

Results: The only two variables correlated to maximum post-operative pain were the expectation of pain during the first day after surgery ($r= 0.64$, $p= 0.006$) and the duration of cold pressor test ($r= 0.52$, $p= 0.03$). The only variable correlated to trismus and swelling at 2 days was the duration of surgery ($r=-.66$, $p=.007$ and $r= 0.79$, $p < 0.001$, respectively).

Conclusions: Post-operative pain after lower third molar extraction results to be associated to subjective variables as pain expectation and tolerance, instead post-operative signs are found to be associated to the duration of surgery.

Keywords

Third molar; Oral surgery; Pain

Introduction

The surgical extraction of lower third molar, a common event in oral surgery, it is frequently associated with considerable postoperative biological and social impact adverse effects. Among frequent immediate and late complications are a symptom, i.e. pain, and signs, i.e. swelling and trismus [1,2].

It is known that many factors, including both subjective (age, gender, etc.) and surgical variables, can affect post-operative experience after lower third molar extraction, but the impact of each one is different. Good knowledge of each factor could help clinicians in better management of post-operative signs and symptoms, avoiding complications.

Recently, individual pain threshold had been focused as important factor. Individual pain threshold can be easily estimated by a quantitative sensory test (e.g. the cold pressor test 4,15). The maximum post-operative pain after lower third molar was found to be strongly correlated to pre-operative cold pressor test results [3]. These results are very interesting: if pain threshold could be estimated in each patient, post-operative therapy may be tailored [4]. However, the model proposed does not explain completely the post-operative pain. In other words, other variables that may influence post-operative symptoms, e.g. expectation of pain, are present.

The aim of this study was to assess which pre- and intra-operative variables may influence post-operative signs and symptoms after lower third molar extraction.

Materials and Methods

The study has been approved by the Ethical Committee of the District of Ferrara (President Prof. Adalberto Ciaccia, protocol no. 3/2008, approved on 2008, March 27). The study was designed according to the Declaration of Helsinki.

Each patient provided a written informed consent for participation.

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Patients

Among those patients referred to the Dental Clinic and scheduled for lower third molar extraction, 17 medication-free otherwise healthy consecutive patients (14 women and 3 men; mean age, 27.6 ± 10.5 years, age range from 18 to 61 years) were included in this study.

All patients presented complete mucosal inclusion of third molar eligible for extraction. No previous or current inflammation and/or pain in extraction site were reported. Exclusion criteria were age < 18 years, diagnosed psychiatric disorders, diagnosed neurological disease, diagnosed impaired communicative or cognitive abilities, contraindications to nonsteroidal anti-inflammatory drugs (NSAIDs) or Amoxicilline.

Preoperative assessment

Before extraction each patient performed cold pressor test to assess pain tolerance by the time of immersion (in seconds) of the hand into ice water, as previously described [3,5,6]. Before the test, patients were informed that the maximum test duration would be 240 seconds and that withdrawal of the hand because of unbearable pain was allowed at any time. To assess pain tolerance, patients were asked to remove the hand when they could no longer tolerate the pain. Ice cubes and cold water (v:v 1:2; temperature 0±1°C) were blended 15 minutes before testing in an isolated tank, and the mixture was stirred immediately before the test to ensure a uniform temperature distribution within the tank. The nondominant hand was immersed up to the wrist with the patient standing. Patients were instructed to keep the hand with the palm gently resting on the bottom of the tank. It was insured that patients were not distracted and the examiner was positioned so that neither verbal nor nonverbal information was communicated to the patients. The test was conducted by the same investigator for all patients.

In this study, pain tolerance represented the maximum level of pain that a patient could tolerate.

Other qualities of pain considered were algosity and unpleasantness [7]. Algosity is the sensory-discriminative dimension of pain that allows a somatic sensation to be unequivocally identified as noxious. Unpleasantness refers to a nonspecific discrimination, which is not necessarily associated with noxious stimuli. This affective-motivational dimension of pain is based on experienced meanings and is related to the cognitive evaluative dimension of pain. The magnitude of algosity was measured at the end of the cold pressor test by a 100-mm visual analog scale (VAS; 0 = "no pain," 100 = "maximum pain"). Unpleasantness was also recorded at the end of the test by a 100-mm VAS (0 ="no unpleasantness," 100 = "most unpleasantness feeling") [5,8-10]. Patients received an explanation of the difference between the 2 aspects of pain before the test.

Before the test patients were asked to fill a questionnaire about the expectation of pain during the day after surgery and during the first postoperative week (no, light, moderate or severe pain). Then the Italian version of Modified Dental Anxiety Scale (MDAS) was used to assess dental anxiety [11].

Each third molar was classified according to Winter [12].

Surgery and pharmacology

All surgical lower third molar extractions were performed by the same clinician, according to standard surgical and anaesthetic protocols of Dental Clinic. Mepivacaine 2% 1:100,000 adrenaline was administered as the inferior alveolar, buccal, and lingual nerve block. Buccal flaps (gingival incision made from buccal surface of the first molar to the anterior part of the mandibular ramus) were raised, lingual tissues were retracted and protected, buccal and distal bone was removed with burs, tooth section was performed with burs, when necessary. Finally the wound space was thoroughly debrided then closed with interrupted sutures (Vicryl 4-0, Ethicon Spa, Pomezia, Italy), to achieve a primary or secondary closure, as appropriate.

No medications were taken before tooth extraction. The "duration of surgery" was defined as time from flap elevation until the end of suture.

Each patient received same standard postoperative instructions and standard NSAIDs prescription (ketoprofen 80 mg: 1st dose after 2 hours, 2nd after 8 hours then 3 times a day for day 2 and 3. Chlorhexidine 0.12% mouth rinses were prescribed from day 2 until day 7. A post-operative meeting was scheduled for day 3 and day 7, to check swelling and trismus and suture removal. During the second appointment sutures were removed.

Swelling and trismus assessment

Swelling and trismus were assessed by the third examiner before and after surgery, at days 0, 2 and 7. To assess swelling, 5 distances (mm) through 6 facial points (from angle of mandible, tragus, eye outer corner, labial commissure, nasal border and soft pogonion) were measured, then the average percentage value was obtained as previously described [13].

To assess trismus (i.e. represented by maximum intercisal opening (MIO) reduction) the distance between the incisal edges of the upper and lower central incisors was measured (mm) 3 times each day. The differences between initial MIO and 2-days MIO and initial MIO and 7-days MIO were assumed as trismus at days 2 and 7, respectively.

Postoperative pain assessment

Pain assessment was based on self-reported registrations on 100mm-VAS starting at the end of surgery and during the following 7 days at different hours. On the day of the surgery: every hour till the 10th post-operative hour; during the 1st and 2nd day after surgery at 8, 12, 16, 20 h; during the 3rd, 4th, 5th, 6th day after surgery at 20 h.

Patients were instructed to record daily pain assessments and NSAIDs requirement in a specific diary. Maximum post-operative pain was chosen as main outcome variable, as previously reported [9].

Statistical analysis

Statistical analysis was performed with SPSS 22.0 (IBM, Armonk, USA). To assess correlation between variables, Pearson correlation was used. Analisys of variance (ANOVA) was perfomed to check for difference in signs and symptoms according to Winter's classification. $P < 0.05$ was considered statistically significant.

Results

The variables included in the analysis are listed in table 1. Table 2 shows the distribution of the expectations of pain during first day and first week after surgery. Figures 1 and 2 show the distribution of the values of maximum post-operative pain in the different groups according to expectation during first day and first week respectively.

The only two variables correlated to maximum post-operative pain were the expectation of pain during the first day after surgery (r= 0.64, p= 0.006) and the duration of cold pressor test (r= 0.52,

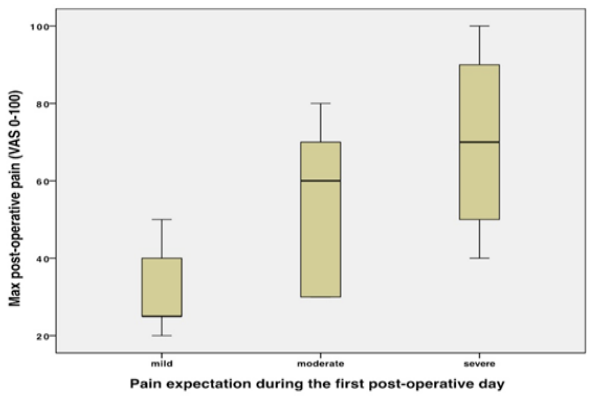

Figure 1: Values of maximum post-operative pain in the different groups according to expectation during first post-operative day

p= 0.03). The only variable correlated to trismus at 2 days was the duration of surgery (r= -.66, p= 0.007). The only variable correlated to swelling at 2 days was the duration of surgery (r= 0.79, p < 0.001). No associations were found for trismus and swelling at 7 days. Figures 3 and 4 show correlations between the duration of surgery and trismus and swelling, respectively.

No difference was found in signs and symptoms according to Winter's classification.

Discussion

The clinical outcomes investigated in the present study were pain, trismus and swelling after lower third molar surgical extraction. These outcomes include post-operative common signs (i.e. trismus and swelling) and symptom (i.e. pain). To consider them separately is very important for both clinical and experimental analysis, because signs are inherently objective and confidently measurable, while pain is subjective in nature and estimable "as patient describe it".

The present study found specific association:

- between duration of surgery and post-operative signs;
- between expectation of pain and post-operative pain;
- between pain tolerance (as estimated performing a pre-operative cold pressor test)and post-operative pain.

It is interesting to underline that post-operative signs appeared to be associated to an objective variable like duration of surgery, while post-operative pain was associated to subjective variables like the expectation of pain during the first day after surgery and pain tolerance assessed by sensory test.These results show partial confirmation from literature. A recent study found an association between duration of surgery and post-operative signs and symptoms, including pain, after third molar surgery [14]. Such an association was not surprising: the longer the duration of tissue injury, the more the amount of inflammatory mediators released, therefore it could be a reflection of the severity of pain, swelling and trismus. However, in the present study the duration of tissue injury appeared to be associated to swelling and trismus, not to pain.

The Winter's classification is usually used to assess the difficulty of removal of lower third molar. In the present study no difference was found in pain or swelling and trismus according to this classification.

Another interesting aspect of the present study is the different interpretation of the results of the cold pressor test and maximum post-operative pain. A previous study found a strong association between pain threshold assessed by cold pressor test and pain after lower third molar extraction. That study showed a model in which unpleasantness (i.e. the affective-motivational dimension of pain) was found able to predict maximum post-operative pain. However, the present study showed that only pain tolerance, as derived from the duration of cold pressor test, predicted maximum post-operative pain. Probably the exact value of cold pressor test in predicting post-operative pain was not yet completely understood. Further studies are needed to discriminate between the real value of each three variables.

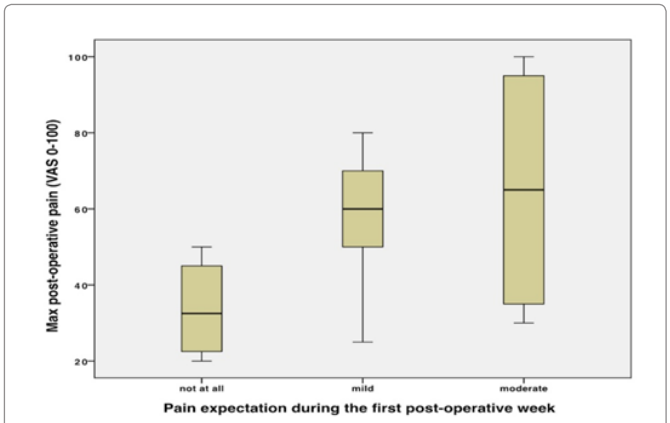

Figure 2: Values of maximum post-operative pain in the different groups according to expectation during first post-operative week

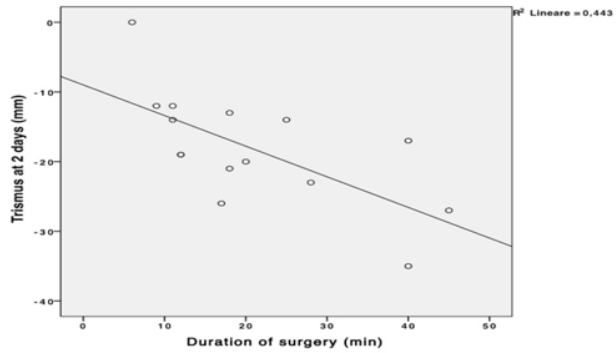

Figure 3: Correlation between the duration of surgery and trismus.

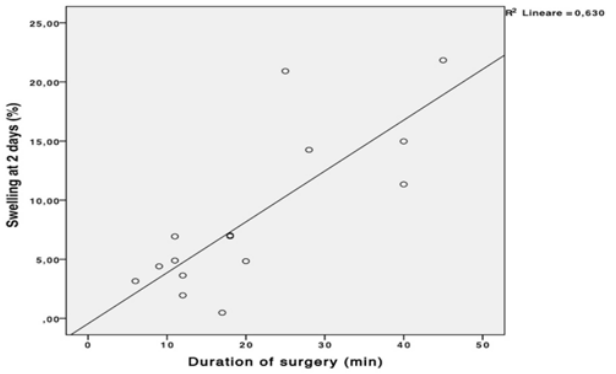

Figure 4: Correlation between the duration of surgery and swelling.

So, in the present study the cold pressor test was confirmed to be a variable associated to post-operative pain after lower third molar extraction, as previously founded. However, pain tolerance was neither the only variable associated to cold pressor test, nor the strongest one. Indeed, the strongest association was found with patient's expectation, as assessed before surgery. Nowadays, no studies investigated the association between pain expectation and effective post-operative pain for oral surgery. For general surgery, some data are available. In orthopedic and open abdominal surgery, the actual pain experience is mainly in accordance with the pre-operative expectations [15]. The expectation of pain before colonoscopy was found to be related to both real-time pain and the evalutation at the recall [16]. However, oral surgery presents some peculiarity that make direct comparison difficult if not impossible. When confirmed from further studies, these findings will probably support the hypothesis that each patient undergoing oral surgery will suffer accordingly to his/her expectation, independently from objective post-operative signs or surgical variables. This aspect needs to be further investigated, due to its crucial effects on post-operative pain management.

MDAS wasn't proven to be correlated to clinical outcomes. Also dental anxiety wasn't correlated to a strongest postoperative pain, as expected by Authors and previously found [9]. The mean value in the study population resulted very close to that previously reported [11].

The present study presented some limits, first of all the small number of included subjects. Another limit was the clear predominance of female subjects, that did not allow to consider gender in statistical correlations. Finally, some considerations are needed on the methods of assessing post-operative signs. Indeed,

Variables included in the analysis		Mean (SD)
Pre-operative	Expectation of pain during first post-op day	3.06 (.83)
	Expectation of pain during first post-op week	2 (.71)
	MDAS (5-25)	10.12 (3.2)
	Duration of cold pressor test (seconds)	48.88 (32.16)
	Pain during cold pressor test (0-100 VAS)	46.47 (29.78)
	Unpleasantness during cold pressor test (0-100 VAS)	59.41 (29.47)
Intra-operative	Duration of surgery (minutes)	20.29 (12.2)
Post-operative	2-days trismus (mm)	18.13 (8.14)
	7-days trismus (mm)	8.24 (8.32)
	2-days swelling (%)	8.51 (6.68)
	7-days swelling (%)	1.81 (2.71)
	Maximum post-operative pain (0-100 VAS)	53.53 (24.48)

Table 1: Variables included in the analysis

Expectation of pain	%
During first post-operative day	
Not at all	0
Mild	29.4
Moderate	35.3
Severe	35.3
During first post-operative week	
Not at all	23.5
Mild	53
Moderate	23.5
Severe	0

Table 2: Distribution of the expectation of pain during first post-operative day and week

while measuring trismus is a quite simple procedure, evaluating post-operative swelling is further more complicated due to the number of measures needed, and may be prone to errors [17]. Further studies are needed also to overcome these limits.

Conclusion

Within the limits of this study, post-operative pain after lower third molar extraction seems to be associated to subjective variables such as pain expectation and tolerance. Objective signs were found to be associated to the duration of surgery. Due to the small sample, further studies are needed to confirm these findings.

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