



Effects of pain catastrophizing and anxiety on analgesic use after surgical removal of impacted mandibular third molars

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Background: In dentistry, pain is a factor that negatively affects treatments and drug use. The aim of this study was to evaluate the correlations of the postoperative analgesic use with pain catastrophizing and anxiety in patients who underwent removal of an impacted mandibular third molar.

Methods: We recruited 92 patients who underwent the extraction of impacted mandibular third molar. In this study, the Pederson index was used to preoperatively determine the difficulty of surgical extraction. Patients were asked to note the number of analgesics used for 7 postoperative days. Patients were divided into two groups based on the Pain Catastrophizing Scale: low and high score groups. State-Trait Anxiety Inventory-trait and State-Trait Anxiety Inventory-state questionnaires were used to determine the anxiety levels of the patients. The obtained data were examined to evaluate the correlations of pain catastrophizing and anxiety with the postoperative analgesic use.

Results: In this study, 92 patients, including 60 women and 32 men, were recruited. The analgesic use was higher in women than in men but with no significant difference ($P > 0.05$). Pain Catastrophizing Scale scores were higher in women than in men but with no significant difference ($P > 0.05$). The analgesic use was higher in patients with high pain catastrophizing than in those with low pain catastrophizing but with no significant difference ($P > 0.05$). State-Trait Anxiety Inventory-trait scores were higher in women than in men but with no significant difference. However, state-Trait Anxiety Inventory-state scores were significantly higher in women than in men ($P < 0.05$).

Conclusion: The postoperative analgesic use may be higher in patients who catastrophize pain than in others. Knowing the patient's catastrophic characteristics preoperatively would contribute to successful pain management and appropriate drug selection.

Keywords: Analgesics; Dental Anxiety; Impacted Tooth; Pain.

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INTRODUCTION

The third molars are the last teeth to erupt in the oral cavity. The mandibular third molars have the highest rate of impaction among all teeth [1]. Impacted third molars

may cause pathologies, such as pericoronitis, periodontal disease, tooth decay, cystic tumor formation, and severe systemic infections [2,3]. Surgical removal of the third molar for various reasons is a common dentoalveolar procedure in oral and maxillofacial surgery [4].

After extraction of an impacted third molar, the patient

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may develop various complications, including pain, swelling, trismus, bleeding, nerve damage, and mandible fracture. Third molar surgery affects the quality of life of the patient. Typically, adverse effects of third molar surgery are observed in 4–7 postoperative days [5,6].

Pain is a difficult symptom to experience and usually requires management. It is defined as unpleasant sensory and emotional experiences associated with actual or potential tissue damage. The pain after mandibular third molar extraction reaches its peak with elimination of the local anesthetic effect. Pain perception can be altered by numerous mechanisms, including drugs, environmental stimuli, cognitive and emotional processes, and social and cultural conditions. The least intensity of a stimulus at which it evokes pain is different for each individual.

Pain catastrophizing is a marker of pain. It is described as an exaggerated negative response to a painful stimulus. The intensity of pain experienced by an individual plays a major role in the formation of catastrophic thinking. Sullivan et al. [7] developed the Pain Catastrophizing Scale (PCS). PCS is the most common measure of pain-related catastrophic thinking. It is associated with the experience of more severe pain [7,8], severe depression and anxiety [9], increased use of analgesics [10], and tendency for longer hospitalization [11].

The aim of this study was to evaluate the correlations of postoperative analgesic use with pain catastrophizing and anxiety in patients who underwent removal of an impacted mandibular third molar.

MATERIALS AND METHODS

This was a survey performed using an individual identification form to evaluate the demographic characteristics, PCS, State-Trait Anxiety Inventory-trait (STAI-T), and State-Trait Anxiety Inventory-state (STAI-S) scores, and the use of analgesics for post-extraction pain relief. We included 92 patients who were admitted to the Department of Oral and Maxillofacial Surgery at the Faculty of Dentistry of Tokat Gaziosmanpaşa University,

Turkey, and underwent the extraction of impacted mandibular third molar. The study was approved by the Tokat Gaziosmanpaşa University Clinical Research Ethics Board (Project no: 18-KAEK-175). Informed consent was obtained from all participants.

In order to determine the demographic characteristics of the participants, questions on their age, gender, occupation, marital status, educational level, health problems, and use of antidepressants, were posed in the individual recognition form. Patients who were pregnant or nursing, had a systemic disease or allergies to prescription drugs, or developed alveolitis after tooth extraction were excluded from the study.

In this study, the Pederson [12] index was used preoperatively to determine the difficulty of surgical extraction of mandibular third molars based on their anatomical position. This scale uses three variables, i.e., the angulation, depth, and ramus relationship on a panoramic radiograph, to determine the difficulty of surgical extraction, and an impacted tooth is assigned a numerical value based on each variable. The sum of the numerical values yields the total difficulty score of the impacted tooth. Impacted teeth with total difficulty scores of 3 and 4, 5 and 6, and 7–10 were determined to be minimally difficult, moderately difficult, and very difficult for surgical extraction, respectively. Since the analgesic use after tooth extraction was expected to be low in the minimally difficult group, the present study was performed only on moderately difficult and very difficult groups. A single practitioner with 4 years of experience in oral surgery performed all operations. Patients were provided with the standard postoperative instructions and prescribed with 500 mg of amoxicillin, an antibiotic containing 125 mg of clavulanic acid (Augmentin BID 625 mg tablet, Glaxo Smith Kline, Istanbul, Turkey), an analgesic containing 100 mg of flurbiprofen (Majezik 100 mg tablet Sanovel, Istanbul Turkey), and a mouthwash containing chlorhexidine gluconate and benzydamine hydrochloride (Kloroben mouthwash, Drogosan Pharmaceuticals, Ankara, Turkey) to be used twice daily for 7 days. Patients were asked

Table 1. Distribution of qualitative variables

Gender	Difficulty of extraction (Moderately difficult)				Difficulty of extraction (Very difficult)			
	Pain Catastrophizing Scale score				Pain Catastrophizing Scale score			
	Low (Cutoff < 17)		High (Cutoff ≥ 17)		Low (Cutoff < 17)		High (Cutoff ≥ 17)	
	n	%	n	%	n	%	n	%
F	14	15.22	21	22.82	13	14.13	12	13.04
M	13	14.13	8	8.70	6	6.52	5	5.43
Total	27	29.35	29	31.52	19	20.65	17	18.47

to note the number of analgesics they took for 7 postoperative days.

Using PCS [7] patients were asked about their thoughts on the assessment of pain in 13 sentences and to rate their feelings when they had pain. Answers were scored as 0 (not at all), 1 (to a slight degree), 2 (to a moderate degree), 3 (to a great degree), and 4 (all the time). A total score in the range of 0–52 is considered a high score and indicates a high level of pain catastrophizing [13]. In this study, patients were divided into two groups based on the PCS score: low and high PCS score groups.

STAI-T and STAI-S questionnaires developed by Spielberger et al. [14] were used to determine the anxiety level of the patients. Spielberger et al. [14] divided anxiety into state and trait anxieties. State anxiety is the presence of anxiety related to a dangerous, unwanted situation. Trait anxiety is the presence of anxiety without any objective cause or the presence of disproportionately long-term and severe anxiety related to an objective cause. STAI has 20 items each for assessing state and trait anxieties. Each item is rated on a scale of 1 to 4, and the anxiety level is determined by adding the scores for each item. A score in the range of 20–80 is considered a high score and indicates strong anxiety.

The obtained data were examined to evaluate the correlations of pain catastrophizing and anxiety with the postoperative analgesic use.

1. Statistical analysis

Prior to data collection, power analysis was performed with G*Power 3.1.9.2 (Franz Faul, Christian-Albrechts-Universität, Kiel, Germany) to estimate the sample size.

The sample size was calculated at a confidence interval of 80%, a significance level of 0.05, and an effect size of 0.50. Using power analysis, the sample size was determined to be 91.

Data are expressed as mean ± standard deviation or frequency and percentage. The independent sample t-test was used to compare the continuous, normally distributed variables between groups. The chi-square test was used to compare the categorical variables between groups. Categorical variables are expressed as the number and percentage. P values < 0.05 were considered statistically significant. Analyses were performed using SPSS 19 (IBM SPSS Statistics 19, SPSS Inc., IBM Corp., Somers, NY).

RESULTS

We recruited 92 Turkish patients, including 60 women and 32 men, in the study. The age of the patients ranged from 17 to 60 years (mean: 26.27 ± 7.38 years). Based on the Pederson index, 56 impacted teeth were moderately difficult (61%) to extract, and 36 impacted teeth were very difficult (39%) to extract (Table 1). The analgesic use was higher in women than in men but without a significant difference (P = 0.871). The analgesic use was higher in the very difficult group than in the moderately difficult group but without a significant difference (P = 0.397). PCS scores were higher in women than in men but without a significant difference (P = 0.161). STAI-T scores were higher in women than in men but without a significant difference. STAI-S scores were

Table 2. Distribution of variables based on gender and difficulty of extraction

	Gender				P	Difficulty of extraction				P
	F		M			Moderately difficult		Very difficult		
	Mean	Standard deviation	Mean	Standard deviation		Mean	Standard deviation	Mean	Standard deviation	
Analgesics	7.62	6.04	7.35	4.50	0.871	7.00	5.26	8.32	6.01	0.397
PCS	20.14	12.62	14.71	13.90	0.161	18.00	13.57	19.05	12.80	0.777
STAI-S	45.22	9.87	34.29	6.65	<0.001*	40.81	11.09	43.18	9.04	0.410
STAI-T	41.32	8.04	37.06	6.70	0.063	38.47	7.85	42.18	7.46	0.087

*P < 0.05

PCS, Pain Catastrophizing Scale; STAI-S, State-Trait Anxiety Inventory-state; STAI-T, State-Trait Anxiety Inventory-trait

Table 3. Distribution of variables based on the difficulty of extraction and Pain Catastrophizing Scale

	Difficulty of extraction (Moderately difficult)				P	Difficulty of extraction (Very difficult)				P
	Pain Catastrophizing Scale score					Pain Catastrophizing Scale score				
	Low (Cutoff < 17)		High (Cutoff ≥ 17)			Low (Cutoff < 17)		High (Cutoff ≥ 17)		
	Mean	Standard deviation	Mean	Standard deviation		Mean	Standard deviation	Mean	Standard deviation	
Analgesics	6.73	4.99	7.24	5.63	0.793	7.33	5.00	9.50	7.14	0.413
STAI-S	36.73	10.75	44.41	10.38	0.049*	41.25	9.71	45.50	8.05	0.283
STAI-T	36.13	6.38	40.53	8.60	0.115	38.50	7.48	46.60	4.67	0.008*

*P < 0.05

STAI-S, State-Trait Anxiety Inventory-state; STAI-T, State-Trait Anxiety Inventory-trait

significantly higher in women than in men (P < 0.001) (Table 2).

In the moderately difficult group, the analgesic use was higher in patients with high PCS scores than in those with low PCS scores but without a significant difference (P = 0.793). In the very difficult group, the analgesic use was higher in patients with high PCS scores than in those with low PCS scores but without a significant difference (P = 0.413). In the moderately difficult group, STAI-S scores were significantly higher in patients with high PCS scores than in those with low PCS scores (P < 0.05). In the very difficult group, STAI-T scores were significantly higher in patients with high PCS scores than in those with low PCS scores (P < 0.05) (Table 3).

DISCUSSION

Extraction of the third molars is a common surgical procedure in the field of oral and maxillofacial surgery.

Surgical removal of impacted third molars involves traumatic manipulation of the associated bones, muscles, and connective tissues. Successful management of post-operative pain, trismus, and swelling improves the patient's postoperative quality of life. Environmental factors, cognitive and sensory processes, and sociocultural conditions are associated with pain perception. Therefore, pain perception is different for each individual. In a previous study, many patients with a history of third molar extraction experienced high levels of anxiety [15]. In another study, most patients with a scheduled third molar extraction experienced high levels of anxiety [12]. Patients' anxiety can adversely affect the surgeon's performance and significantly increase the duration of the procedure, recovery time, and dose of analgesics [13,14]. Pain catastrophizing is an extremely negative cognitive and emotional response to expected or actual pain [15]. Studies have found significant correlations of pain catastrophizing with anxiety, depression, and fear [16-18]. Preoperative knowledge of the patients' catastrophizing

characteristics contributes to appropriate pain management and drug selection. In the present study, the analgesic use was higher in patients who catastrophize pain more than in those who catastrophize pain less.

In pain studies, catastrophizing has been described as an exaggerated negative response to a painful stimulus. People who catastrophize pain experience more severe pain and emotional restlessness compared to others [7,19]. Excessive focus on the sensation of pain is a mechanism underlying the increase in pain intensity in individuals who catastrophize pain. Several studies reported that dealing with the sense of pain increases the experience of pain [7,20]. Granot et al. [21] reported that the postoperative pain intensity of the patients undergoing elective abdominal surgery can be predicted effectively using the preoperative anxiety and catastrophizing levels. Taenzer et al. [22] reported that anxiety levels correlated with postoperative pain intensity of patients undergoing elective gallbladder surgery. In a study including 59 women who underwent breast cancer surgery, Jacobsen et al. [10] reported that increased pain catastrophizing and decreased use of cognitive coping strategies increased the analgesic use. Kazancıoğlu et al. [14] reported that among the patients who received dental implants, the analgesic use was higher in patients with high levels of anxiety than in those with low levels of anxiety. Consistent with previous studies, this study suggests that pain catastrophizing and anxiety are associated with postoperative pain and analgesic consumption. In this study, the analgesic use was higher in patients with high PCS, STAI-S, and STAI-T scores than in those with low scores.

All factors, such as gender, age, position of the molar in relation to the occlusal plane, and prediction of surgical difficulty faced by the surgeon affect the postoperative recovery time [23]. Opinions differ on the relationship between gender and pain catastrophizing [24-28]. Several studies including adults revealed that women had higher PCS scores compared to men [27,28]. Suren et al. [29] divided adult patients who underwent venipuncture into four groups and compared their PCS scores. They found correlations between gender and PCS scores. Conversely,

some studies reported no gender difference in pain catastrophizing. In a study conducted in Germany including 134 patients, Ruscheweyh et al. [15] detected no correlation between gender and PCS scores. Similarly, in a study including 38 patients who underwent abdominal surgery, Granot et al. [21] observed no significant correlation between gender and PCS scores. In the present study, there was no correlation between gender and PCS scores.

The Pederson index is commonly used to estimate the difficulty of removing the impacted mandibular third molars. Similarly, the Parant scale predicts the difficulty of extraction of the mandibular third molars [30]. Diniz-Freitas et al. [23] reported that the Pederson scale had lower sensitivity than the Parant scale. However, the Parant scale is a postoperative assessment tool. However, the Pederson scale, which allows a preoperative assessment, does not account for relevant factors, such as bone density, buccal flexibility, and buccal gap [31]. Thus, a limitation of this study is that these factors could not be considered in determining the difficulty of extraction. In addition, studies on this subject with a larger sample size can be performed. The study model may be designed to allow analgesics, excluding antibiotics, for only 7 days.

In conclusion, individuals who catastrophize pain have a tendency to exaggerate the sensation of pain and low ability to cope with pain. These characteristics hinder dentists from communicating with the patients and may adversely affect the dental treatment. The postoperative analgesic use in patients who catastrophize pain may be higher compared to others. Knowing the patient's catastrophizing characteristics preoperatively would contribute to successful pain management and the appropriate drug selection.

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Appendix 1. Pain Catastrophizing Scale (PCS)

Pain Catastrophizing Scale (PCS)

Client No: **Age:** **Sex:** M (....) F(....) **Date:**

Pain Catastrophizing Scale (Copyright 1995, 2001, 2004, 2006, 2009 Michael JL Sullivan, PhD)
 Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feeling that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

When I am in pain...	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time
I worry all the time about whether the pain will end	0	1	2	3	4
I feel I can't go on	0	1	2	3	4
It's terrible and I think it's never going to get any better	0	1	2	3	4
It's awful and I feel that it overwhelms me	0	1	2	3	4
I feel I can't stand it anymore	0	1	2	3	4
I become afraid that the pain will get worse	0	1	2	3	4
I keep thinking of other painful events	0	1	2	3	4
I anxiously want the pain to go away	0	1	2	3	4
I can't seem to keep it out of my mind	0	1	2	3	4
I keep thinking about how much it hurts	0	1	2	3	4
I keep thinking about how badly I want the pain to stop	0	1	2	3	4
There's nothing I can do to reduce the intensity of the pain	0	1	2	3	4
I wonder whether something serious may happen	0	1	2	3	4

Total:

Appendix 2. Assessment of State-Trait Anxiety Inventory-State (STAI-S)

Assessment of State-Trait Anxiety Inventory-State (STAI-S)

Client No: **Age:** **Sex:** M (....) F(....) **Date:**

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then write the number in the blank at the end of the statement that indicates how you feel right now, that is at this moment. There is no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Some what	Moderately so	Very much so
I feel calm	1	2	3	4
I feel secure	1	2	3	4
I am tense	1	2	3	4
I am strained	1	2	3	4
I feel at ease	1	2	3	4
I feel upset	1	2	3	4
I am presently worrying	1	2	3	4
I feel satisfied	1	2	3	4
I feel frightened	1	2	3	4
I feel comfortable	1	2	3	4
I feel self-confident	1	2	3	4
I feel nervous	1	2	3	4
I feel jittery	1	2	3	4
I feel indecisive	1	2	3	4
I am relaxed	1	2	3	4
I feel content	1	2	3	4
I am worried	1	2	3	4
I feel confused	1	2	3	4
I feel steady	1	2	3	4
I feel pleasant	1	2	3	4

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Appendix 3. Assessment of State-Trait Anxiety Inventory-Trait (STAI-T)

Assessment of State-Trait Anxiety Inventory-Trait (STAI-T)

Client No:

Age:

Sex: M (....) F(....)

Date:

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then write the number in the blank at the end of the statement that indicates how you feel right now, that is at this moment. There is no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Almost never	Sometimes	Often	Almost always
I feel pleasant	1	2	3	4
I tire nervous and restless	1	2	3	4
I feel satisfied with myself	1	2	3	4
I wish I could be as happy as others seem	1	2	3	4
I feel like a failure	1	2	3	4
I feel rested	1	2	3	4
I am calm, cool, and collected	1	2	3	4
I feel that difficulties are piling...	1	2	3	4
I worry too much over something...	1	2	3	4
I am happy	1	2	3	4
I am inclined to take things hard	1	2	3	4
I lack self-confidence	1	2	3	4
I have disturbing thoughts	1	2	3	4
I make decisions easily	1	2	3	4
I feel inadequate	1	2	3	4
I am content	1	2	3	4
Some unimportant thought runs...	1	2	3	4
I take disappointments so keenly...	1	2	3	4
I am a steady person	1	2	3	4
I get in a state of tension or turmoil...	1	2	3	4

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