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Psychological impact of third molar surgery: a one month prospective study

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Key words: oral surgery; third molar surgery; dental anxiety; psychological trauma; post traumatic stress

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Abstract

Purpose: To prospectively examine the psychological impact of surgical third molar removal, and to identify possible psychological risk factors for the development of dental anxiety and symptoms of psychological trauma.

Patients and Methods: Patients (n=71) scheduled for surgical mandibular third molar removal were assessed regarding operative and psychological variables, postoperatively, and at 1 week and 1 month follow-up.

Results: The emotional impact of the surgical procedure appeared to be modest. Only a small proportion responded with a significant increase of dental anxiety or post traumatic stress (4.3%) at 1 month follow-up.

Conclusions: The results suggest that surgical removal of a third molar using local anesthesia, without sedation or general anesthesia, has minimal impact on the development of dental anxiety or symptoms of psychological trauma. Replication of the findings in samples with higher preoperative anxiety levels, and with other types of surgical procedures, is warranted.

A tooth extraction, or even just the idea of having a tooth “pulled out”, puts many people ill at ease. This is in agreement with research indicating that an extraction is considered to be highly distressing, and that it belongs to the top-5 most fear-evoking treatment procedures of the dental situation ¹⁻³. Studies investigating the onset of long standing negative psychological responses to dental treatment demonstrate that severity of peoples’ current level of dental anxiety is significantly associated with the extent to which they experienced their past treatments as painful or otherwise traumatic ⁴. This emphasizes the importance of prospectively examining the emotional impact of third molar removal, the most common potentially distressing surgical procedure practiced in oral and maxillofacial surgery. In a recent study, in which patients were monitored until four weeks following their third molar removal, post-operative levels of dental anxiety were found to be significantly associated with level of emotional distress (i.e., pain, anxiety or emotional disturbance) experienced during treatment ⁵. The results further suggest that whether or not a third molar removal results in a long-lasting heightened level of anxiety largely depends on the magnitude of past exposure to aversive dental situations. The combination of frequency of previous exposure to distressing dental events, and preoperative anxiety level, appeared to significantly predict the level of anxiety four weeks following treatment, accounting for 71% of the variance. Two patients (8%) developed symptoms indicative of posttraumatic stress disorder (PTSD), which are generally seen in response to typical life-threatening events such as witnessing or being the victim of rape, assault, or being exposed to a disaster ⁶. PTSD symptom severity assessed four weeks after third molar removal was significantly associated with pain scores during treatment which suggests that the experience of pain has the potential of increasing such risk ⁵. Thus, distressing or traumatic experiences are likely

to make people vulnerable, thereby increasing the risk for developing long-standing dental anxiety and trauma related symptoms in response to a distressing event.

As far as we are aware, until now only one study has examined possible risk factors of the development of anxiety and PTSD symptomatology following third molar removal⁵. Given the relatively small sample of 34 patients that was evaluated, and that only one oral and maxillofacial surgeon carried out all operations, replication in another sample was warranted. Therefore, the aim of the present study was to determine the emotional impact of surgical removal of a third molar, and to identify possible psychological risk factors for the development of dental anxiety, and post traumatic stress reactions in the first post-operative month. As pain and anxiety are strongly related to gender, male and female patients were compared on all outcome measures.

Materials and Methods

Patients

Subjects were consecutive patients, referred by local dentists and scheduled for removal of impacted mandibular third molars at the Department of Oral and Maxillofacial Surgery of the Academic Medical Center in Amsterdam. All patients were informed about the study, invited to participate and signed an informed consent form to confirm their voluntary participation. The protocol and informed consent form had been approved by the local ethics committee. A total of 78 patients agreed to participate. Five patients failed to show up for wound evaluation meetings (one week/month postoperatively), another two patients had too many missing values in the questionnaires and were left out of the analysis. This

resulted in a total sample of 71 patients consisting of 36 men (mean age=27.4, SD=6.8) and 35 women (mean age=24.3, SD=4.6).

Psychological distress and operative variables

Data regarding operative and post-operative psychological distress (i.e., pain, anxiety and emotional disturbance during and immediately following treatment) were obtained using five separate visual analogue scales (VAS), ranging from 0 ('not at all painful/anxious/disturbing') to 100 ('extremely painful/anxious/disturbing').

Other operative variables that were examined as potential correlates of increased levels of anxiety and trauma-related symptoms were treatment duration in minutes, number of anaesthetic injections, and extent of surgery as indexed by the surgeon's judgment about the technical difficulty of the operation on a scale from 0 to 100.

Dental anxiety

Severity of dental anxiety was measured using the S-DAI, the short version of the Dental Anxiety Inventory ⁷, which has shown to be a reliable and valid index of dental trait anxiety ⁸. An example of one of the 9 items is 'I become nervous when the dentist invites me to sit down into the chair'. The answers are scored on a 5-point scale. The total score ranges from 5-45. Cronbach's alpha in the present study was 0.92 (averaged over four measurements).

Level of exposure to negative dental experiences

Precipitating level of trauma exposure was assessed by the Level of Exposure-Dental Experiences Questionnaire (LOE-DEQ), a self-report checklist inquiring about potentially distressing events ⁹. The format of this inventory allows for calculating separate trauma

presence scores with respect to 20 potential traumatic dental events (i.e., events involving the experience of extreme pain such as root canal treatments, injections, extractions, or severe distress, for example, embarrassment, helplessness, nausea), and 8 general types of traumatic life events (e.g., serious accidents, natural disasters, sexual assaults). An example of an item of the first category is: “Have you ever been exposed to an event during which you had a tooth drilled which caused extreme pain or other severe distress, an example of the latter: “Have you ever been exposed to an event during which you witnessed someone being seriously injured or killed?” Participants are requested to indicate, using a yes/no response format, whether they had ‘ever’ (1) or ‘never’ (0) experienced any of these events. Items are scored and summed to give an overall frequency score ranging from 0 to 20 for dental experiences and 0 to 8 for general traumatic experiences. Cronbach’s alpha of the total scale in the current study was 0.65.

Trauma-related symptomatology

To assess the intensity of post-traumatic stress-related phenomena the Dutch version of the Impact of Event Scale-Revised (IES-R; ¹⁰) was used. An example of one of the 22 items is: “I thought about it when I didn’t mean to”. Subjects are asked to indicate how frequently the symptoms have been present during the past 7 days. The frequency of each symptom is scored on a five-point scale, ranging from score 4). The scores are summed to produce a total IES-R score (range 0–88) with higher scores on the IES-R being indicative of more trauma-related phenomena. Cronbach’s alpha in the present study was 0.90 (averaged over three measurements).

Procedure

The present study was based on a prospective design with four assessment points. On the day of their appointment patients were approached in the waiting room and requested to participate. Written informed consent was obtained from all patients who agreed to participate following explanation of procedures and possible side effects. Next, patients filled out the S-DAI, the IES-R, and the LOE-DEQ. Local anesthesia (2% Lidocaine with 1:100,000 epinephrine) was administered by local tissue infiltration and inferior alveolar nerve block injection). In all patients, three cartridges (3 times 1.7 cc) were used, and not more than one impacted third molar was removed. All molars were removed using a standard technique in which access was created via a buccal muco-periosteal flap, bone removal with a round bur, splitting of the tooth and removal in parts, wound irrigation and placement of sutures. Patients received ibuprofen 600 mg medication for pain control. No postoperative antibiotics were prescribed. Out of 71 molars removed, 2 molars required splitting, 9 molars required bone removal, and the remaining molars (n=60) required both splitting and bone removal.

Directly after surgery, patients filled out the VASs concerning experienced operative and post-operative psychological distress (i.e., pain, anxiety and emotional disturbance during and immediately following treatment), and the S-DAI for the second time. The form with procedural variables was also filled out at this point, which was done by the oral and maxillofacial surgeon. After one week patients returned to the hospital and filled out both the S-DAI (third time) and the IES-R (second time). After the one month follow-up appointment patients were requested to filled out the IES-R (third time) and the S-DAI (fourth time) again.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 14.0. Group differences in categorical variables were calculated using Chi-square tests. Potential covariates and univariate associations between independent variables and outcome measures were examined using bi-variate Pearson product moment correlation analyses, while differences between means were analyzed using independent-samples t-tests and Mann-Whitney U tests, depending on distribution of scores. Repeated measures ANOVA, and the non-parametric Friedman test, was used to test differences between repeated measurements. To determine which variables, if any, independently predicted IES-R scores, variables that emerged as statistically significant in univariate analyses were entered as predictor variables into a multiple stepwise regression analysis. A reliable change (RC) index was calculated to determine whose IES-R and s-DAI score changed beyond a level that could be attributed to measurement error alone ¹¹. For this purpose the Standard Error (SE) of measurement of the difference was used which takes account of the two measurements. The formula is: $SE_{diff} = SD_1 \sqrt{2} \sqrt{1-\alpha}$, where SD_1 is the standard deviation of the baseline observations and α the reliability of the measure (Cronbach's coefficient alpha). It is assumed that change that exceeds 1.96 times this SE (i.e. the RC index) is unlikely to occur more than 5% of the time by unreliability of the measure alone (11). The level of significance was set at $\alpha = 0.05$.

Results

Descriptive statistics

Table 1 presents mean scores of the main variables for total sample and gender separately. Male and female patients were compared on all variables presented in Table 1. On the S-DAI measurements, female patients scored significantly higher than male patients (p-values range 0.013-0.030). No differences could be detected regarding IES-R and LOE-DEQ scores. Given the somewhat skewed distribution on the S-DAI and the non-normal distributed IES-R and the LOE-DEQ scores, these analyses were repeated using the Mann-Whitney U test. This analysis yielded the same outcome, and an additional significant difference on the LOE-DEQ emotional reactions subscale, resulting from a higher score for female patients.

Table 1 about here

Emotional impact

Removal of the molars took between 8 and 50 minutes (M=17.5; SD=6.8). With respect to operative and post-operative psychological distress mean scores and standard deviations are presented in Table 2. Again, male and female patients were compared on mean scores. Both the independent-samples t-test as the Mann-Whitney U test only showed a significant difference for the level of anxiety felt during treatment, which was the result of significantly higher scores of female patients. For disturbance ratings regarding treatment the t-test resulted in a marginal significant p-value (0.057). However, the Mann-Whitney showed no significance (p=0.10).

Table 2 about here

Dental trait anxiety

The four S-DAI measurements were compared using an ANOVA for repeated measures. Mean scores can be found in Table 1. Results showed a significant main effect for time [$F(3, 207) = 10.92, p < 0.001$]. Subsequent analysis showed that dental anxiety was significantly higher preoperatively than immediately postoperatively. Dental anxiety levels were significantly lower at one week and one month postoperatively (these latter two did not differ). Using gender as a between-subjects factor no significant interaction emerged. As can be seen in Table 1, females reported more anxiety on each occasion.

Trauma-related symptomatology

Given the non-normal distribution, the three IES-R measurements were compared using ANOVA for repeated measures, and with the Friedman test. Both analyses yielded a significant difference between the three measurements, $F(2,138)=6.87, p < 0.001$ (Friedman: $X^2(2)=35.7, p < 0.001$). Subsequent univariate analysis showed that the one-month-postoperative score was significantly lower than the preoperative and one-week-postoperative score. Although the means do show an absolute increase (see Table 1) one week after treatment, this difference did not reach significance.

The relation between previous exposure to distressing events and dental trait anxiety

In order to examine whether a higher level to past exposure to potential negative events would be associated with (an increase in) dental trait anxiety, a number of different procedures were carried out. First, total LOE-DEQ scores were dichotomised using the median score (= 3). Also, two groups were made, based on having had negative (both dental and general distressing) events (LOE-DEQ > 0) or not (LOE-DEQ = 0). Next, the

group scoring low and high on distressing events, and the groups with or without negative experiences were compared with respect to severity of dental anxiety and distress during the extraction. The results are presented in Table 3, and show that patients with a background of relatively many negative (dental) experiences reported a significantly higher level of (state) anxiety experienced during treatment, and on all four measurements of dental (trait) anxiety (preoperatively, postoperatively, at one week post treatment and at one month post treatment). Comparing the two groups, based on having ever experienced any negative experience or not, shows the same outcome, yet somewhat stronger.

Table 3 about here

These results suggest that a higher frequency of prior negative dental experiences is associated with a higher level of both anxiety experienced during treatment, and dental trait anxiety. To examine whether patients with a background of relatively many distressing dental events would show an increase in dental anxiety as a result of the third molar extraction, a repeated measure ANOVA was performed, on the four measurements of dental anxiety, with low or high LOE-DEQ as a between subject factor. The interaction effect was not significant [$F(3, 204)=0.98, p=0.41$], implying that the profile of mean scores over time does not differ between the groups. Repeating this analysis, between patients who did have negative experiences versus those who did not, resulted in the same outcome.

Next, each S-DAI score was subtracted from all others in order to derive a difference score that shows an increase, stable score, or decrease in dental anxiety. Table 4 shows the percentage of patients experiencing a decrease in dental anxiety,

a stable score or an increase in dental anxiety. Although a substantial part of the patients (n=18, 25.4%) reported an increased dental trait anxiety score at t4, as compared to their score at t1, the proportion of patients with a lower score was higher (n=39, 54.9%). However, according to the Reliable Change Index, 14 patients (19.7%) had a significantly lower, while 3 patients (4.3%) had a higher level of dental trait anxiety following treatment.

Next, patients with an increase or decrease in dental trait anxiety were compared on LOE-DEQ (total- and subscale-) scores using a Kruskal-Wallis test. No significant differences could be detected.

Table 4 about here

Prediction of PTSD symptoms

As displayed in Table 5, 10 patients (14.3%) reported higher PTSD symptom scores at t4 in comparison with the level prior to treatment, while 30 patients (42.9%) indicated a decrease in their PTSD symptoms. However, when the RC Index criterion was applied it appeared that 3 patients (4.3%) showed an increased level and 16 patients (22.9%) a decreased symptom level after treatment. To determine whether operative and post-operative psychological distress (anxiety, pain and emotional disturbance) could predict an increase in PTSD symptomatology the difference between pre- and one week postoperative IES-R scores was calculated. Next, a multiple stepwise regression analysis was performed with the IES-R difference scores as the dependent variable and the distress variables, age and gender as the independent variables. Neither the distress variables nor the other variables were able to predict the difference between the two IES-R scores. When trying to predict the one

week postoperative IES-R score, only the duration of the surgical procedure emerged as a significant predictor ($R=0.34$, $F(1, 67)=8.51$, $p<0.005$), explaining a modest 11% of variance. For the one month IES-R score, only age was found to be able to make a modest significant prediction ($R=0.36$, $F(1, 69)=10.11$, $p<0.008$).

Table 5 about here

Discussion

As a surgical procedure per definition poses a potential threat to someone's physical integrity, it is likely that individuals who are exposed to such events are at increased risk of developing dental anxiety and symptoms of psychological trauma following treatment¹³⁻¹⁵. However, the present data show that the immediate emotional impact of surgical removal of a third molar teeth using local anesthesia was relatively modest. Further, the procedure had negligible effects on either the development or the long-term course of dental anxiety and other symptoms of psychological trauma. State anxiety level was much lower than in our previous study (e.g., the average level of anxiety during treatment was 33.6 versus 52.8, on a scale from 0 to 100; ⁵). This difference may be explained by sample characteristics, personal features of the surgeon who performed the procedure, his or her skills and experience, not only regarding the area of oral surgery, but also with regard to communication and anxiety management, as well as the extent to which he or she is capable of establishing a trusting relationship with the patient. Another explanation for the findings relative to those of our previous study is the fact that in the present study the surgeon used a

standard non-steroidal anti-inflammatory drug to reduce the intensity and the duration of postoperative pain. This may have helped to reduce possible discomfort and emotional distress caused by physical post-operative complications (inflammation, swelling, pain and other predictable sequelae following tissue injury) and thus prevented the development of psychological complications following treatment ¹². An even more plausible explanation is that the third molar surgery as performed in the present study was not 'traumatic' enough, was only traumatic for a relatively small portion of patients, or was that only in case certain circumstances were met. There are several indications that support this notion. Firstly, approximately four percent of the patients responded with a significant increase of post traumatic stress symptoms at one month follow-up. Thus, if a common treatment like the removal of a wisdom tooth could create long lasting psychological scars, it would seem that this is only the case within a small part of the population. Secondly, the IES-R score one week after treatment was significantly associated with the duration of the surgical procedure, which suggest that the longer the procedure takes the more distress this creates, and the more likely it is that PTSD symptoms emerge. Thirdly, the participants of the present study were relatively young with almost no history of negative dental events. For example, when comparing mean age and LOE-DEQ scores of highly anxious dental patients treated at a dental fear clinic ⁹ (41.4, and 12.1, respectively) with those of the present sample (26.4, and 3.7, respectively) it is conceivable that patients in the present study may have had little opportunity of past exposure to distressing or horrific dental events in order for them to be sensitized to new potentially negative events. This notion is further supported by the finding that age appeared to be a significant predictor of the IES-R score one month post-treatment.

Although a number of statistical significant differences between male and female patients on dental anxiety were found, the clinical significance of these differences may be limited. For instance, a mean difference on the S-DAI of 4.5 does not necessarily imply the need for a different patient approach. Although it could be argued that the emotional impact of surgical third molar removal can be expected to be higher for female patients, it may well be that female patients answer the questions more honestly than male patients. Conversely, given the relatively low levels of preoperative anxiety found in the present study, one can hypothesize that these differences are inflated in more anxious patients, which may then lead to differences which are clinically significant.

The present findings should be interpreted in light of the strengths and limitations of the study. Particular strengths are the prospective design and the one month follow-up. Several limitations should also be noted. First, there are limitations to any study in which a control group is lacking, and our results should, therefore, be interpreted with caution. Second, the fact that this relatively young sample of patients had undergone few distressing dental or oral events prior to the removal of one of their third molars may have kept them relatively resilient to the effects of the treatment procedure. Therefore, replication of the findings in samples with higher preoperative anxiety levels, and with other types of surgical procedures is needed.

In conclusion, the present findings suggest that the emotional impact of surgical removal of a mandibular third molar tooth is relatively modest. No indications were found that amount of previous exposure to negative events, or severity of psychological operative distress on the one hand, would lead to elevated levels of post-operative dental trait anxiety or post traumatic stress following third molar removal. To this end, the results argue against a standard approach of performing extractions in the oral and maxillofacial surgery office

using sedation or general anesthesia, particularly when this is based solely on the belief that such a procedure would be too overwhelming or 'traumatic' for the patient. In addition, the use of sedatives does not reduce dental trait anxiety in the longer, and is less likely to have an effect on the levels of state anxiety during treatment than, for instance, a behavioral management approach¹⁶⁻¹⁷.

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Table 1

Mean scores and standard deviation on the dependent measures for total sample and gender separately

Measure	Gender					
	Male		Female		Total	
	n=36		n=35			
	Mean	S.D.	Mean	S.D.	Mean	S.D.
LOE-DEQ total	3.5	3.1	3.9	2.5	3.7	2.8
LOE-DEQ Dental experience	0.9	1.4	1.2	1.4	1.1	1.4
LOE-DEQ Dentist	0.2	0.5	0.2	0.5	0.2	0.5
LOE-DEQ Emotional §	0.1	0.6	0.3	0.5	0.2	0.5
IES-R pre-operatively	3.6	5.1	4.5	8.1	4.0	6.7
IES-R one week	6.3	7.6	3.9	4.3	5.1	6.3
IES-R one month	3.0	6.7	1.1	2.2	2.1	5.1
S-DAI pre. *	16.6	7.0	21.1	9.4	18.8	8.6
S-DAI post. *	15.6	6.6	19.7	9.3	17.6	8.2
S-DAI one week *	14.3	5.9	18.2	8.9	16.2	7.8
S-DAI one month *	14.2	6.4	19.1	9.8	16.6	8.6

* = $p < 0.05$ (independent samples t-test), § = $p < 0.05$ (Mann-Whitney U test)

Table 2

Mean scores and standard deviation for operative and post-operative psychological distress during and immediately following treatment)

Measure	Gender					
	Male		Female		Total	
	(n=36)		(n=35)			
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Anxiety immediately following treatment	15.2	17.1	22.2	26.6	18.7	22.5
Pain immediately following treatment	5.7	7.5	7.5	13.2	6.6	10.7
Anxiety during treatment ^{*,§}	24.7	25.7	42.4	31.1	33.6	29.7
Pain during treatment	9.8	12.5	12.6	19.9	11.2	16.6
Disturbance during treatment	26.8	24.7	39.5	29.8	33.2	27.9

* = $p < 0.05$ (independent samples t-test), § = $p < 0.05$ (Mann-Whitney U test)

Table 3

Mean scores for the operative/ post-operative psychological distress variables and dental anxiety in relation to exposure to both dental and general distressing events

	LOE-DEQ (median)				Negative experiences			
	Low		High		No (=0)		Yes (>0)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Anxiety postoperatively §	14.4	15.2	21.9	26.4	6.3	8.1	22.1	23.9
Pain postoperatively	6.2	7.2	6.9	12.8	4.0	4.7	7.3	11.8
Anxiety during treatment *.§	24.2	21.7	40.6	33.0	14.7	14.6	38.7	30.8
Pain felt during treatment	13.3	18.8	9.6	14.7	7.9	12.7	12.1	17.5
Aversiveness/discomfort §	26.8	24.4	37.9	29.7	12.7	11.8	38.8	28.5
Dental anxiety preoperatively *.§	15.7	6.7	21.1	8.9	13.0	3.9	20.3	8.7
Dental anxiety postoperatively *.§	14.7	5.6	19.9	9.1	12.3	4.2	19.1	8.4
Dental anxiety one week post. *.§	13.3	4.7	18.5	8.8	11.2	2.7	17.7	8.1
Dental anxiety one month post. *.§	14.0	5.8	18.5	9.7	11.7	3.4	17.9	9.0

* p < 0.05 between the low and high group; § = p < 0.05 (Mann-Whitney U test)

Table 4

Percentage of patients experiencing a decrease, stable score or increase in dental anxiety (S-DAI score) according to either their absolute scores or the Reliable Change (RC) Index

	absolute scores		
	decrease	stable	increase
Pre-Post	47.9% (-1 to -13)	23.9%	28.2% (1 to 8)
Post-One week	54.3% (-1 to -9)	27.1%	18.6% (1 to 7)
One week-One month	28.6% (-1 to -14)	38.6%	32.9% (1 to 13)
Pre-One month	54.9% (-1 to -23)	19.7%	25.4% (1 to 10)
	Reliable Change (RC) Index		
	decrease	stable	increase
Pre-Post	8.5% (-7 to -13)	90.1%	1.4% (7 to 8)
Post-One week	4.3% (-7 to -9)	94.3%	1.4% (7 to 7)
One week-One month	2.9% (-7 to -14)	91.4%	5.7% (7 to 13)
Pre-One month	19.7% (-6 to -16)	76.1%	4.2% (6 to 7)

Indicated in parentheses is the range of scores.

Table 5

Percentage of patients experiencing a decrease, stable score or increase in trauma-related symptomatology (IES-score) according to either their absolute scores or the Reliable Change (RC) Index

absolute scores			
	decrease	stable	increase
Pre-One week	25.7% (-1 to -28)	27.1%	47.1% (1 to 24)
Pre-One month	42.9% (-1 to -32)	42.9%	14.3% (1 to 31)
One week – one month	64.8% (-1 to -18)	29.6%	5.6% (1 to 23)
Reliable Change (RC) Index			
	decrease	stable	increase
Pre-One week	7.1% (-6 to -28)	75.7%	17.1% (6 to 24)
Pre-One month	22.9% (-6 to -32)	72.9%	4.3% (6 to 31)
One week – One month	19.7% (-7 to -18)	78.9%	1.4% (7 to 23)

Indicated in parentheses is the range of scores.