ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

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Evaluation of Postoperative Symptom Findings of the Patients According to the Positions of the Mandibular Third Molars

Mandibular Üçüncü Molar Dişlerin Pozisyonlarına Göre Hastaların Ameliyat Sonrası Semptom Bulgularının Değerlendirilmesi

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ABSTRACT Objective: This study aims to investigate the effects of position and difficulty index scores of impacted third molars on post-operative symptoms severity and oral health. **Material and Methods:** This study designed as prospective cohort and conducted in Marmara University Faculty of Dentistry between February-May 2024. The sample group consisted of patients who applied to the university's maxillofacial surgery department for mandibular third molar extraction. Data of the population and teeth collected in operation day with The Oral Health Impact Profile-14 (OHIP-14) scores. And seven days after, post-operative scores of the OHIP-14 and The Post-operative Symptom Severity (PoSSe) Scale scores were recorded. Descriptive statistics were calculated for the study variables and The Wilcoxon, The Mann-Whitney U tests were done. In the findings, a p-value of <0.05 was considered statistically significant. **Results:** The study included a total of 57 patients. The median pre-operative OHIP-14 score was 12.00, post-operative was 19.00. An increase in scores indicates a deterioration in oral health-related quality of life. Gender and age differences in OHIP-14 scores showed no significant difference (p>0.999, p=0.677). No significant relationship was found between OHIP-14 score differences and the Pederson index (p=0.681). The PoSSe Scale was only found to be a significant predictor (p=0.003), indicating a positive relationship with OHIP-14 difference. **Conclusion:** The impaction position and difficulty index of the third molar tooth alone are insufficient to comment on the patients' post-operative subjective findings.

Keywords: Third molar; impacted tooth; classification; tooth extraction; postoperative period

ÖZET Amaç: Bu çalışmanın amacı, gömülü üçüncü molar dişlerin pozisyon ve zorluk indeksi skorlarının ameliyat sonrası semptom şiddeti ve ağız sağlığı üzerindeki etkilerini araştırmaktır. **Gereç ve Yöntemler:** Bu çalışma, prospektif kohort olarak tasarlanmış ve Şubat-Mayıs 2024 tarihleri arasında Marmara Üniversitesi Diş Hekimliği Fakültesinde yürütülmüştür. Örneklem grubu, üniversitenin çene cerrahisi bölümüne gömülü mandibular üçüncü dişlerin çekimi için başvuran hastalardan oluşmuştur. Popülasyona ve dişlere ait veriler operasyon günü Oral Sağlık Etki Profili-14 [Oral Health Impact Profile-14 (OHIP-14)] skorları ile toplanmıştır. Operasyondan 7 gün sonra ise OHIP-14 ve Postoperatif Semptom Şiddeti (PoSSe) Skalası skorları kaydedilmiştir. Çalışma değişkenleri için tanımlayıcı istatistikler hesaplanmış ve Wilcoxon, Mann-Whitney-U testleri yapılmıştır. Bulgularda p değerinin <0,05 olması istatistiksel olarak anlamlı kabul edilmiştir. **Bulgular:** Çalışmaya toplam 57 hasta dâhil edilmiştir. Ameliyat öncesi ortalama OHIP-14 skoru 12,00, ameliyat sonrası ise 19,00 bulunmuştur. Skorlardaki artış, operasyon sonrası ağız sağlığı ile ilgili yaşam kalitesinde kötüleşmeye işaret etmektedir. OHIP-14 skorlarında cinsiyet ve yaş farklılıkları anlamlı bir fark göstermemiştir (p>0,999, p=0,677). OHIP-14 puan farkları ile Pederson indeksi arasında anlamlı bir ilişki bulunmamıştır (p=0,681). OHIP-14 skorlarındaki değişimde, yaş, cinsiyet, dişin zorluk derecesi arasından yalnızca PoSSe anlamlı bulunmuştur (p=0,003) ve OHIP-14 farkı ile pozitif bir ilişki olduğunu göstermiştir. **Sonuç:** Üçüncü molar dişin gömülülük pozisyonu ve zorluk indeksi, hastaların ameliyat sonrası subjektif bulguları hakkında yorum yapmak için tek başına yetersizdir.

Anahtar Kelimeler: Üçüncü molar; gömülü dişler; sınıflandırma; diş çekimi; postoperatif dönem

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Impacted teeth extractions are one of the most common operations in the field of oral, dental and maxillofacial surgery.[1] The most frequently impacted teeth are mandibular third molars, which erupt the latest and have the most irregular eruption pattern.[2,3] Third molar extractions can be difficult procedures depending on a number of variables. The anatomical condition of the tooth plays a crucial role in determining how the extraction of these teeth should be performed.

There are a number of classifications created by academics that can be used to understand and categorize third molar positions, such as the Pell and Gregory, Winter, Archer and Kruger classifications. Among these, the Pell and Gregory classification has been the most frequently used classification in the literature. This classification places the affected mandibular third molars in relation to the adjacent 2nd molar and ascending ramus.[4] There is a difficulty rating scale called Pederson difficulty index developed with the help of this scale.[5] The Pederson index, a modification of the Pell and Gregory classification, uses pre-operative radiographic images. The angular relationship of the teeth in these images, their level with the occlusal plane and their relationship with the ramus form the basis of the score calculation in the index. Teeth are classified as very difficult when the highest score is between 8-10, moderate difficulty when the score is between 5-7, and mild difficulty between 3-4 points.[6]

There are many opinions in the literature that these indices have low reliability in difficulty assessments. These indices are only radiographic assessments, they lack a lot of information that can affect the difficulty of the operation such as bone density, flexibility of the cheek, mouth opening, number and shape of the roots.[5-8]

While these categories improve our ability to ascertain the procedure and technique of the surgery, the post-operative history of patients differs for a variety of reasons that might differ from person to person. A patient's pre-operative quality of life, age, gender, systemic conditions, usage of oral contraceptives, smoking status, and other individual-specific characteristics can all influence their post-operative history. This study's primary goal was to examine how the anatomical locations of the teeth during mandibular third molar extractions affected the surgical procedure and the patients' quality of life throughout the recovery phase. The research will look at how anatomical placements impact surgical intervention techniques and how this affects the healing process after surgery.

MATERIAL AND METHODS

The study ethical permission obtained from The Non-Interventional Clinical Studies Ethics Committee of Marmara University's Faculty of Health Sciences (date: January 12, 2024; no: 125). The study was developed in accordance with the principles of the Declaration of Helsinki 2008.

Patients who applied to Marmara University Faculty of Dentistry and who were to undergo surgical extraction of impacted mandibular third molars were invited to participate in the study between February-May 2024. A voluntary consent form was obtained from the patients before surgical extraction. In our study, which was designed as a pilot study, 57 people were reached as the sample size. The study included patients aged between 18 and 65 years who underwent mandibular third molar surgery, who are in the classification of the American Society of Anesthesiology (ASA) I and II, were able to give informed consent and communicate in the local language. Operation managed by at least 2-year experienced surgeons. Patients who speak other native language than Turkish, has undergone another impacted third molar surgery or any other surgery at the same time and who do not consent to the study protocol excluded from the study.

Patients who fit the inclusion criteria were clinically and radiologically examined pre-operatively and categorized according to the position of impacted teeth, which was the main theme of the study. Panoramic radiographs taken at Marmara University Faculty of Dentistry, Department of Oral and Maxillofacial Radiology were used for radiologic examination. The clinical examination of the patients was performed in the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Marmara University.

The patients impacted mandibular third molars to be operated on were categorized radiologically using the Pell and Gregory classification and the Pederson index.

STATISTICAL ANALYSIS

Descriptive statistics were calculated for the study variables, including age, gender, smoking status, systemic status, Pederson difficulty index, and The Oral Health Impact Profile-14 (OHIP-14) scores. Since age and Pederson difficulty index did not follow a normal distribution, medians and 95% confidence intervals (CI) were used to summarize these variables.

For inferential statistics, various non-parametric tests were employed. The Wilcoxon matched-pairs signed rank test was used to compare pre-operative and post-operative OHIP-14 scores, assessing the significance of changes within individuals. The Mann-Whitney U test was used to compare differences in OHIP-14 score changes and The Post-operative Symptom Severity (PoSSe) Scale scores between male and female patients. Spearman's rank correlation coefficient was calculated to evaluate relationships between continuous variables, such as OHIP-14 score differences with age, Pederson difficulty index, and PoSSe Scale scores.

Multiple regression analysis was performed to examine the influence of age, gender, Pell and Gregory classification, Pederson difficulty index, and PoSSe Scale on OHIP-14 differences. A significance level of $p<0.05$ was used for all statistical analyses to determine statistical significance. All statistical analyses were conducted using Prism 10.0 (Graphpad, Boston, USA) software.

RESULTS

The study included a total of 57 patients, consisting of 33 females (57.89%) and 24 males (42.11%). The age distribution of the patients did not follow a normal distribution; thus, the median age was utilized for descriptive purposes. The median age was 24.00 years (95% CI: 21.00, 26.00). Regarding smoking status, 53 (92.98%) patients were non-smokers, while 4 (7.02%) patients were smokers. In terms of systemic status, 56 (98.25%) patients were classified as ASA I, indicating they were healthy individuals without systemic diseases, whereas 1 (1.75%) patient was classified as ASA II.

The Pederson index also did not follow a normal distribution; hence, the median value was used. The median value was 5.00 (95% CI: 5.00, 6.00). The OHIP-14 scores, both pre-operative and post-operative, did not follow a normal distribution, so non-parametric tests were applied. The median pre-operative OHIP-14 score was 12.00 (95% CI: 10.00, 16.00), while the median post-operative OHIP-14 score was 19.00 (95% CI: 16.00, 25.00) (Table 1).

To compare pre-operative and post-operative OHIP-14 scores, the Wilcoxon matched-pairs signed rank test was used, revealing a significant difference between the two ($p<0.001$, exact, two-tailed). The median difference was 6.00, with a Spearman's rank correlation coefficient of 0.613 ($p<0.001$), indicating effective pairing. An increase in OHIP-14 scores indicates a deterioration in oral health-related quality of life (Figure 1).

Gender differences in OHIP-14 score changes were assessed using the Mann-Whitney test, which showed no significant difference ($p>0.999$, exact, two-tailed). The median difference for females was

TABLE 1: Demographic and clinical characteristics of the study population.

	95% CI of median				
	Median	**Lower**	**Upper**	**n**	**%**
Gender					
Female				33	57.89
Male				24	42.11
Age	24.00	21.00	26.00		
Smoking status					
Absent				53	92.98
Present				4	7.02
Systemic status					
ASA I				56	98.25
ASA II				1	1.75
Pederson difficulty index	5.00	5.00	6.00		
OHIP-14 scores					
Pre-op	12	10	16		
Post-op	19	16	25		

CI: Confidence index; ASA: American Society of Anesthesiology; OHIP-14: The Oral Health Impact Profile-14.

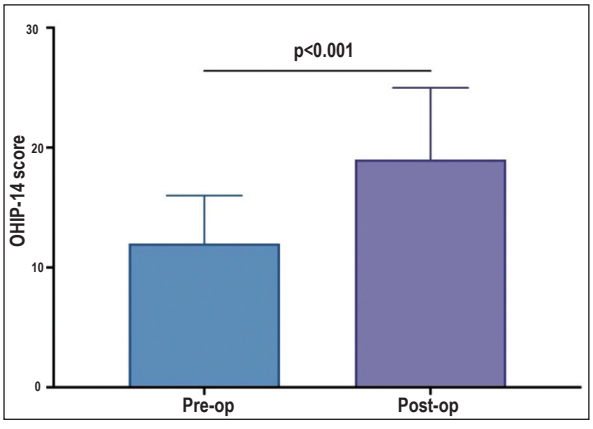

FIGURE 1: Analysis of pre-operative and post-operative OHIP-14 scores. OHIP-14: The Oral Health Impact Profile-14.

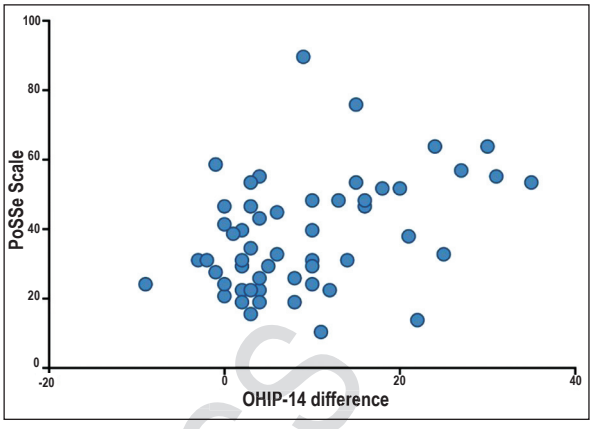

FIGURE 2: Analysis of OHIP-14 score differences and PoSSe scale scores. OHIP-14: The Oral Health Impact Profile-14; PoSSe: The Post-operative Symptom Severity.

6.00 (n=33) and for males was 7.50 (n=24), with an actual difference of 1.50. The relationship between OHIP-14 score differences and age was analyzed using the Spearman correlation test, which showed no significant correlation (r=0.056, 95% CI: -0.21 to 0.32, p=0.677, approximate, two-tailed). Similarly, no significant relationship was found between OHIP-14 score differences and the Pederson difficulty index (r=-0.056, 95% CI: -0.32 to 0.22, p=0.681).

The Spearman correlation test showed no significant relationship between OHIP-14 score differences and the Pederson difficulty index (r=-0.056, 95% CI: -0.32 to 0.22, p=0.681). This indicates no correlation between the change in OHIP-14 score difference and the Pederson difficulty index.

A significant relationship was found between OHIP-14 score differences and PoSSe Scale scores (r=0.40, 95% CI: 0.14 to 0.60, p=0.002), indicating a moderate positive correlation. The Mann-Whitney test showed no significant difference in PoSSe Scale scores between males and females (p=0.199, two-tailed), with median PoSSe scores of 39.7 for females (n=33) and 31.0 for males (n=24) (Figure 2).

The Mann-Whitney test showed no significant difference in PoSSe Scale scores between males and females (p=0.199, two-tailed). The median PoSSe score for females was 39.7 (n=33) and for males was 31.0 (n=24), with an actual difference of -8.62. The Spearman correlation test also showed no significant relationship between PoSSe Scale scores and age (r=0.054, 95% CI: -0.22 to 0.32, p=0.690, two-tailed).

A multiple regression analysis was conducted to examine the influence of age, gender, Pell and Gregory classification, Pederson difficulty index, and PoSSe Scale on the OHIP-14 difference. The model explained 32.74% of the variance in OHIP-14 difference (R^2=0.3274), and the overall model was significant, F(9, 47)=2.542, p=0.0182. Among the predictors, only the PoSSe Scale was found to be a significant predictor (β=0.2373, standard error=0.07603, p=0.003), indicating a positive relationship with OHIP-14 difference. Other variables, including age, gender, Pell and Gregory classification, and Pederson difficulty index, did not significantly predict OHIP-14 difference. Normality tests for the residuals (D'Agostino-Pearson omnibus, Anderson-Darling, Shapiro-Wilk, and Kolmogorov-Smirnov) confirmed that the residuals were normally distributed. This suggests that the PoSSe Scale is a key factor in explaining changes in OHIP-14 scores post-operatively.

DISCUSSION

When the data of 57 patients who were admitted to Marmara University Faculty of Dentistry between February and May for extraction of impacted mandibular third molars were analyzed, it was seen that the most common impacted position according to Pell and Gregory classification was class 2 with a rate of 70.17%. This incidence is similar to a study

in which the data of 3,000 patients with impacted mandibular third molars in the Central Anatolia region of our country were collected and it was found that the most common position was class 2 with a rate of 46%.[9] Although the results were similar, the higher rate in our study may be explained by the sample size. In the related study, the data of 3,000 patients were analyzed retrospectively, whereas in our study, the data of 57 patients were collected prospectively. Similarly, Quek et al., Susarla and Dodson, and Yuasa and Sugiura, found the rates 85%, 75%, and 72% respectively.[10-12] These rates are similar to our study.

According to Pell and Gregory's position criteria, position B was the most common with 54.38% and position A was the second most common with 28.07%. The least common position was position C burial with 17.54%. Göksu et al. reported that position B burial was the most common with a rate of 46.44 % and position A burial was the second most common with a rate of 35-36%.[9] Our results are similar in this respect. When we look at the literature, there is diversity regarding position rates. Ma'iata and Alwrikat found position A impaction most frequently with a rate of 49.3%, while Susarla and Dodson found position B impaction most frequently with a rate of 48.1%, similar to our study.[12,13]

After determining the position of the teeth, the Pederson index was used to assess the degree of difficulty. Accordingly, 14.03% of the teeth were classified as minimal difficulty, 77.19% as moderate difficulty and 8.77% as very difficult. The correlation between OHIP-14 data and the difficulty of the tooth was examined. However, no correlation was found Multiple regression analysis of increased post-operative PoSSe scores showed no correlation with Pell and Gregory class, Pederson difficulty index score, age and gender. Qiao et al., in their study determining risk factors based on the quality of life scale, found an increased risk based on increased PoSSe scores in female gender, Pell and Gregory Class 2 and Class 3 position teeth, prolonged operation time, and patients with pre-operative symptoms.[14] Grossi et al. found that the distance of the tooth from the ramus made a difference in PoSSe scores, with scores significantly increased in class 3 impacted teeth.[15] In our study, it was observed that tooth positions did not affect PoSSe scores.

The inadequacy of the Pederson scale in determining surgical difficulty is frequently mentioned in the literature.[8,16] Alvira-González et al. in their study, no significant difference found in visual analogue scale scores according to position classes A, B, C, which express the depth of impaction of the tooth.[8] Our results also support these findings. The PoSSe and post-operative OHIP-14 scores reported by the patients did not differ statistically significantly as the difficulty of the tooth increased and the distance and depth of impaction changed. In this respect, the Pell and Gregory classification and Pederson difficulty index calculation may not have yielded significant results due to low intra- and inter-investigator reproducibility.[8,17,18]

In our results, increased OHIP-14 scores after the procedure indicate that patients' quality of life, functional limitations, physical and mental distress after impacted wisdom tooth extractions.

It is shown that OHIP-14 scores are affected under seven main headings: physical disability, social disability, mental disability and handicap. In the literature, it has been reported that OHIP-14 scores show a dramatic increase on the first post-operative day, usually start to decrease after the third day, and approach the baseline level on the sixth day.[19] Our OHIP-14 score evaluation was performed immediately before and at least seven days after the operation. Despite this, the increased scores on the seventh day indicate that our patients could not reach the pre-procedure quality of life in a short period of one week. In the literature, mean OHIP-14 scores after seven days vary between 2.57 and 34.26.[20-23] In our study, the average score on the seventh day was found to be 23.26.

We found that pre-operative OHIP-14 score, age, and gender did not make a significant difference among the factors that determine surgical difficulty. At the same time, these variables did not affect post-operative PoSSe and OHIP-14 scores. In order to determine the surgical difficulty, evaluating the position of the tooth in the mandible only through radiography is insufficient. The number of roots, their mor-

phology, the proximity of the tooth to the inferior alveolar nerve, the patient's anxiety level, the amount of mouth opening, and the patient's weight affect the duration of the operation as well as the severity of post-operative symptoms.[8,24,25] For this reason, evaluating patients only through radiography and determining the difficulty of the operation is insufficient to predict the post-operative symptom severity and quality of life of the patients.

LIMITATIONS AND FUTURE STUDIES

In scientific studies investigating the post-operative effects of a procedure, the fact that all possible variables are constant affects the results of the study positively. In our study, it was assumed that the procedures performed by physicians with at least 2 years of experience who had the same training would have similar effects. However, ideally, operations managed by a single physician and an assistant should have been included. This is a limitation of our study. In future studies, it is recommended that a single physician and assistant should perform procedures under the same physical conditions. And the sample size should be increased in order to distribute the sample more homogeneously.

CONCLUSION

Post-operative processes of patients are affected by the difficulty of the operation. The impaction position and difficulty level of the impacted third molar tooth alone are insufficient to comment on the patients' post-operative subjective findings. Because it is not healthy to make comments alone with these indexes, whose decision method is unreliable. Radiography is very valuable in terms of risk assessment of teeth and informing the patient. However, it should not be forgotten that along with radiography, patient-related factors during the operation also can affect post-operative findings.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Nisa Nur Ayırkan, Ferit Bayram, Cansu Şahin;* ***Design:*** *Nisa Nur Ayırkan, Ferit Bayram, Cansu Şahin;* ***Control/Supervision:*** *Ferit Bayram;* ***Data Collection and/or Processing:*** *Nisa Nur Ayırkan, Cansu Şahin;* ***Analysis and/or Interpretation:*** *Ferit Bayram, Cansu Şahin;* ***Literature Review:*** *Nisa Nur Ayırkan, Ferit Bayram, Cansu Şahin;* ***Writing the Article:*** *Nisa Nur Ayırkan, Ferit Bayram, Cansu Şahin;* ***Critical Review:*** *Ferit Bayram, Cansu Şahin;* ***References and Fundings:*** *Nisa Nur Ayırkan, Ferit Bayram;* ***Materials:*** *Nisa Nur Ayırkan.*

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