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RESEARCH ARTICLE

The Knowledge and Awareness Level of The Turkish Dentists on Bisphosphonate-Related Osteonecrosis of The Jaws: A Survey Study

Türk Diş Hekimlerinin Bifosfonata Bağlı Çenelerin Osteonekrozu Hakkında Bilgi ve Farkındalık Düzeyi: Anket Çalışması

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ABSTRACT

Objective: This study aimed to evaluate the knowledge and awareness levels of general dentists (GDs) and specialist dentists (SDs) in Turkey regarding bisphosphonate-related osteonecrosis of the jaws (BRONJ).

Materials and Methods: A web-based survey was conducted from December 2014 to June 2015 among members of the Turkish Dental Association. The survey consisted of two sections: demographic information and questions about knowledge and awareness of BRONJ, such as awareness of its clinical importance, stages, treatment experience, and disorders where BPs can be used.

Results: A total of 945 responses were received, of which 897 (94.9%) were complete and included in the study. Of the respondents, 72.2% were GDs, and 27.8% were SDs. Only 38.1% of SDs and 30% of GDs reported good knowledge of BRONJ. A significant number of SDs (74.6%) asked about BP usage during medical history taking compared to 59.8% of GDs ($p<0.001$). Furthermore, 86% of GDs had never diagnosed a BRONJ case themselves.

Conclusion: While Turkish dentists are generally aware of BRONJ, there is a need for improved knowledge and diagnostic skills, especially among GDs. Enhanced education and training, including post-graduation courses and seminars, are recommended to improve understanding and management of BRONJ among dental professionals in Turkey.

Keyword: Bisphosphonate-Related Osteonecrosis of The Jaws; Dentist; Survey; Knowledge

ÖZ

Amaç: Bu çalışmanın amacı, Türkiye'deki genel diş hekimleri (GD) ve uzman diş hekimlerinin (SD) bisfosfonat ile ilişkili çene osteonekrozu (BRONJ) hakkındaki bilgi ve farkındalık düzeylerini değerlendirmektir. BRONJ, ilk olarak 2003 yılında tanımlanmış olup, osteoporoz ve metastatik malignitelerde kemik rezorpsiyonunu önlemek için kullanılan bisfosfonatlar (BP'ler) nedeniyle ortaya çıkmaktadır.

Gereç ve Yöntemler: Aralık 2014 - Haziran 2015 tarihleri arasında Türk Diş Hekimleri Birliği üyeleri arasında web tabanlı bir anket yapılmıştır. Anket iki bölümden oluşmuştur: demografik bilgiler ve BRONJ hakkında bilgi ve farkındalıkla ilgili sorular, klinik önemi, evreleri, tedavi deneyimi ve BP'lerin kullanılabileceği hastalıklar gibi konuları içermektedir.

Bulgular: Toplam 945 yanıt alınmış ve bu yanıtların 897'si (%94,9) eksiksiz olup çalışmaya dahil edilmiştir. Katılımcıların %72,2'si GD, %27,8'i ise SD idi. SD'lerin sadece %38,1'i ve GD'lerin %30'u BRONJ hakkında iyi bilgiye sahip olduklarını bildirmiştir. SD'lerin önemli bir kısmı (%74,6), GD'lere kıyasla (%59,8) tıbbi öykü alırken BP kullanımını sormaktadır ($p<0,001$). Ayrıca, GD'lerin %86'sı kendi başlarına hiç BRONJ vakası teşhis etmemiştir, bu da klinik deneyim ve bilgi eksikliğine işaret etmektedir. Çalışma, son mezunların, diş hekimliği müfredatındaki değişiklikler nedeniyle daha iyi farkındalığa sahip olduğunu ortaya koymuştur.

Sonuç: Türkiye'deki diş hekimleri genel olarak BRONJ konusunda farkındalığa sahip olsa da, özellikle GD'ler arasında bilgi ve tanı becerilerinin geliştirilmesi gerekmektedir. Türkiye'deki diş hekimlerinin BRONJ'u daha iyi anlamaları ve yönetmeleri için mezuniyet sonrası kurslar ve seminerler gibi eğitimlerin artırılması önerilmektedir.

Anahtar Kelimeler: Bifosfonata bağlı çenelerin osteonekrozu; diş hekimi; anket; bilgi

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INTRODUCTION

Bisphosphonate related osteonecrosis of the jaws (BRONJ) was first presented by Marx at 20031 and several papers[1-3] were published which demonstrate the relationship between bisphosphonates (BPs) and necrosis of the jaws (ONJ). However, the possible mechanism is still unclear how BPs are responsible on BRONJ.[4]

BPs have been using on patients with osteoporosis and metastatic malignancies to eliminate bone resorption.[3] Within years, usage of the BPs have been increasing due to increasing numbers of the cancer or metabolic bone disease patients. American Association of Oral and Maxillofacial Surgeons (AAOMS) presented a guideline in 2009 and classified patients due to risk of ONJ and categorized ONJ into stages (Stage 0, 1, 2, 3) and defined treatment strategies for each stage.[5]

Also, recent cases of ONJ, beside BPs, such as; denasumab (an antiresorptive drug), bevacizumad and sunitinib (antiangiogenic drugs) were reported.[6] After realization of that ONJ can occur due to other medications beside BPs, AAOMS published an updated guideline in 2014 and renamed BRONJ to medication-related osteonecrosis of the jaws (MRONJ).[7]

Studies have revealed that a significant number of dentists lack the necessary knowledge to perform invasive procedures (such as tooth extraction) on patients undergoing bisphosphonate therapy.[8-9]

In cases that MRONJ diagnosis is delayed, or the right treatment cannot done properly, the clinical situation can worsen from asymptomatic bone exposure to the resection of the affected bone. Hence, delayed treatment can cause to increase morbidity and cost.

Beside the researches that focused on the mechanism or treatment of MRONJ, several survey studies were published which evaluate the knowledge and awareness level of dentists.[2,4,10]

The aim of this survey-based study was to evaluate knowledge and awareness level of dentists on BRONJ in Turkey.

MATERIALS AND METHODS

This study was consisting of a web-based survey from Dec 2014 to June 2015, which participants involved the survey voluntarily. A link of the survey was sent via e-mail to the general (GD) and specialist dentists (SD) who are the members of the Turkish Dental Association. A total of 945 surveys were filled and 897 (94, 9%) were evaluated. Incomplete surveys (n: 48, 5, 1%) were excluded from the study.

SURVEY CONTENT

First part of the survey was consisted of demographic questions about year of graduation, type of clinic and field of specialty (if exist).

Second part of the survey was consisted of the questions about knowledge and awareness on BRONJ, such as; awareness of the clinical importance of BRONJ, awareness of the clinic stages of the BRONJ, experience on the treatment of a patient with BRONJ, clinical diagnosis of BRONJ and the disorders that BPs can be used in.

Statistical Analysis

Statistical analyses were carried out using IBM SPSS Statistics for Windows, Version 22.0 (Armonk, NY, USA: IBM Corp) statistical software package. Normal distribution was evaluated with the Shapiro-Wilk test. Parametric results were analyzed using ANOVA, and non-parametric results were obtained using the Kruskal-Wallis test. Tukey HSD was used to determine the statistical differences among groups. $p \leftarrow 0,05$ was considered statistically significant.

RESULTS

648 (72, 2%) of the participants were GDs and 249 (27, 8%) were SDs. had specialty on one of the fields of dentistry.

Result of the SDs'

Most of the SDs graduated (n: 89, 35. 7%) after 2009, while 69 (27, 7%) had been continuing to PhD education. Table 1 shows the numbers and the fields of the SDs.

38, 1% of the SDs selected 5 (very good) as their knowledge level about the clinical importance of the BRONJ, while 20 (8%) selected 1 (no idea). SDs concluded that they had been mainly

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Table 1. Distrubition of the participants in terms of specialty or Ph.D

		n	%
Do you have a specialty or Ph.D?	Yes	249	27,9
	No	645	72,1
If yes, please state the department	Oral and Maxillofacial Surgery	69	27,7
	Periodontology	36	14,5
	Prosthodontics	54	21,7
	Orthodontics	21	8,4
	Prosthetic dental treatment	14	5,6
	Pedodontics	25	10,0
	Oral and maxillofacial radiology	7	2,8
	Endodontics	18	7,2
	Implantology	5	2,0

obtained information about BRONJ in the PhD education (37, 7%) and from journal articles (25, 7%). Comparison of the difference between graduation year and knowledge level showed statistically significant difference. Recently graduated (2009 and after) SDs had higher knowledge level (Knowledge level 1, 3 and 4) when compared with former graduates. (p←0,001). The increase in the knowledge level of physicians according to the year they graduated is shown in Table 2.

181 (72, 6%) of the SDs are asking BP usage in history taking, while 68 (27, 4%) did not. Also, 186 (74, 6%) of the SDs faced with BP taking patient, while 63 (25, 4%) did not.

106 (42, 5%) of the SDs were diagnosed the BRONJ by themselves, however 143 (57, 5%) did not. 77 (72, 6%) of the 106 participants that diagnosed BRONJ are Oral and Maxillofacial Surgeons and Periodontologists. Statistical analysis showed that the SDs with surgical notion are more prone to BRONJ diagnosis. Also, statistical analysis showed significant difference between SDs and GDs that SDs had a higher rate on diagnosis of the BRONJ. (p←0,001)

Only 73 (29, 3%) of the SDs were correctly selected the right indication (prostate cancer, breast cancer, multiple myeloma and osteoporosis) that BP can be used. 64 (25, 7%) were only selected osteoporosis as the indication for BP. However, 6 (2, 4%) of the SDs selected "none of them", and half of the SDs (n: 121, 48, 6%) were unaware of the clinical stages of the BRONJ.

Result of the GDs

254 (39, 2%) of the GDs indicated that they mainly obtained information about BRONJ from the post-graduation courses or seminars, and 241 (37, 2%) in the dentistry education.

181 (30%) of the GDs had knowledge about the clinical stages of BRONJ, while 70% of them had not.

One-third of the GDs (33, 1%) concluded that they had moderate knowledge about the clinical importance of the BRONJ, while 86 (13, 5%) had no idea.

387 (59, 8%) of the GDs concluded that they had been asking BP usage in medical history, while 261 (40, 2%) did not. Comparison between SDs and GDs showed statistically significant difference favor to SDs. (p←0,001)

More than half of the GDs (53, 6%) had faced with BP taking patient, however, 557 (86%) of the GDs concluded that they didn't diagnosed a BRONJ patient by themselves. Statistical analysis showed significant difference that SDs have high diagnosis rate when compared with GDs. (p←0,001)

Table 2. Comparison of the knowledge level with graduation year

		Graduation Year			p
		2002 and before N (%)	2008 -2003	2009 and later	
		N (%)	N (%)	N (%)	
Could you please rate your knowledge of the clinical significance of BRONJ on a scale of 1 to 5?	I don't know	60(14,1)a	36(19,4)a	10(3,6)b	≤0,001
	Partially	56(13,1)a	26(14)a	24(8,5)a	
	Middle	121(28,3)ab	45(24,2)b	101(35,9)a	
	Good	94(22)a	36(19,4)a	90(32)b	
	Very good	96(22,5)a	43(23,1)a	56(19,9)a	

Kruskall-Wallis

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88 (13, 5%) of the GDs were correctly selected the right indication (prostate cancer, breast cancer, multiple myeloma and osteoporosis) that BPs can be used. 229 (35, 3%) of the GDs were only indicated osteoporosis for BP use. However, 20 (4%) of the GDs selected "none of them". Comparison of two groups showed statistically significant difference that SDs had a higher rate on the right indication. (p≤0,001)

DISCUSSION

It was accepted that, BPs are the main cause of MRONJ. Marx published the first case describing the relation between osteonecrosis of jaws (ONJ) and IV BP usage.[1] ONJ is a challenging clinical situation as an adverse effect of BPs with morbidity. However, the possible mechanism is un-clear.3 It is thought that, as the possible mechanism of the BPs, is inhibiting the osteoclastic activity by inhibiting the osteoclast precursor cells. Also, BPs have impacts on angiogenesis, microenvironment and signal transition between osteoclast and osteoblasts.[4]

Awareness and also knowledge on the BRONJ began to increase in years with the help of the ONJ cases being reported. In present study, number of the participants with "no knowledge" decreased statistically in recent graduates (after 2009) when compared to graduates between 2003 and 2008 (p≤0,001). Also number of the participants with "moderate" and "good" knowledge level increased statistically in recent graduates when compared to graduates between 2003 and 2008 (p≤0,001). Increase of the knowledge level can be linked to place taking of BPs in the dentistry curriculum of Turkey after 2008.

BPs are indicated in bone disorders or skeletal complications which occurs due to metastatic malignancies or osteoporosis.[1] Metastatic and bone malignancies, especially prostate CA, breast cancer and multiple myeloma and metabolic bone disorders, such as osteoporosis are main indications of BPs and are commonly used for supportive therapy of the suffered patients. In present study, 29, 3% of SDs and only 13,5% of GDs selected the right indication for BP usage. Usually, patients, especially older patients, had difficulties to remember the name of the drugs that they use routinely but, they know disorders that they have been using the medications for. Therefore, practitioner must be aware of disorders that BPs can be used and thus, practitioner can prevent possible complications related with BPs.

Dougall et al. reported that medical history taking is an important stage that should not be skipped out to reduce the possibility of complications especially for medically compromised patients.[11] Results of present study showed that a total of 568 (63,3%) dentists are asking BP usage in history taking.

Osta et al.'s survey study revealed that the majority of participants were unaware of the clinical stages of BRONJ.[12] Similarly, in our survey study, 30% (n: 181) of general dentists (GDs) were knowledgeable about the clinical stages of BRONJ, while 70% lacked this knowledge. Additionally, 86% (n: 557) of GDs had never diagnosed BRONJ themselves. The failure to detect BRONJ in its asymptomatic early stages can lead to disease progression to more severe stages that are more difficult to treat.

Yoo et al. published the results of survey about awareness on BRONJ and reported that the awareness of the severity of BRONJ was highest among the oral and maxillofacial surgeons.[10] Similar to Yoo et al.[10] and due to results of present study, 57 of 137 (41, 6%) specialized dentists that selected "good" and "very good" are oral and maxillofacial surgeons or residents.

In a society where the prevalence of osteoporosis is increasing and more patients are taking bisphosphonates and related medications, it will be critically important for dentists and doctors to improve their current knowledge and confidence. To bridge the communication gap in the future, there is a need to enhance the knowledge of physicians and dentists about MRONJ. This will ultimately improve patient care.[13]

Results of present study showed that most participants composed of GDs of this survey commonly obtain information about BRONJ from post-graduation courses and seminars. In addition, GDs have information about clinical stages and importance of BRONJ but not sufficient. It is recommended that, it can be useful to organize local post-graduation courses and seminars that contain topics about BRONJ and disorders that BPs can be used to increase the number of the educated dentists.

In present study, last source of the knowledge of GDs was journal articles. It is hypothesized that this may be related to the predominance of English, as a significant portion of the literature is in English, making it challenging for dentists

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whose first language is not English to access scientific knowledge. Also, it is recommended to dental associations of the countries to translate the up-to-date guidelines, such as AAOMS' BRONJ Guideline, to national languages and let the members be aware of the actual developments on BRONJ.

Various reports have been published in Türkiye, and the number of BP prescriptions is increasing in parallel with the aging population. As suggested in the literature[14-17], we also believe that conducting similar studies targeting general practitioners and specialist doctors who prescribe these medications is important to assess their knowledge in this area and ensure that they adequately warn their patients about the risks concerning the oral cavity.

CONCLUSION

The results of this study showed that dentists in Türkiye are aware of BRONJ, but their level of knowledge is not sufficient for accurate diagnosis and treatment, similar to what is reported in the literature. The literature clearly shows a lack of knowledge about BRONJ among healthcare professionals, including both physicians and dentists. Further studies on BRONJ awareness are needed. Also, update on recent dentistry curriculum and motivating the dentists to attend courses or seminars are recommended.

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RESEARCH ARTICLE

Perspectives on Temporomandibular Disorder Classification Systems: A Preliminary Study Among Oral and Maxillofacial Surgeons in Turkey

Temporomandibular Bozukluk Sınıflandırma Sistemlerine Yönelik Bakış Açıları: Türkiye'deki Ağız, Diş ve Çene Cerrahları Arasında Bir Ön Çalışma

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ABSTRACT

Purpose: Temporomandibular disorders (TMDs) represent a diverse spectrum of musculoskeletal conditions characterized by pain in the temporomandibular joint (TMJ), masticatory muscles, and craniofacial region. The impact of TMDs extends beyond physical discomfort, affecting sleep quality, social interactions, and psychological well-being, thereby reducing overall quality of life. Despite their prevalence, TMDs pose diagnostic challenges due to overlapping symptoms and the absence of a universally accepted diagnostic tool. This study aims to evaluate the perspectives of oral and maxillofacial surgeons in Turkey on TMD classification systems, considering their experience, working conditions, and integration of these tools into clinical practice.

Material and Methods: A survey was conducted among oral and maxillofacial surgeons via Google Forms between September 2023- April 2024.

Results: Preference for the Diagnostic Criteria for TMD (DC/TMD) protocol, though challenges such as time constraints during patient examinations, moderate competence in assessing radiological imaging, and limited awareness of psychological assessment tools were identified.

Conclusion: The study emphasizes the importance of multidisciplinary collaboration in TMD diagnosis and the need for the utilization of a standardized guideline in both classification and treatment modalities to address existing barriers and optimize TMD management strategies.

Keywords: Temporomandibular disorders; DC/TMD; Temporomandibular joint; RDC/TMD

ÖZET

Amaç: Temporomandibular düzensizlikler (TMD), temporomandibular eklem (TME), çiğneme kasları ve kraniofasiyal bölgede ağrı ile karakterize edilen çeşitli musküloskeletal durumları içeren geniş bir spektrumu temsil etmektedir. TMD etkisi fiziksel rahatsızlığın ötesine geçerek uyku kalitesini, sosyal etkileşimleri ve psikolojik iyilik hâlini etkileyerek genel yaşam kalitesini azaltmaktadır. Populasyonda oldukça yaygın olmasına rağmen, örtüşen semptomlar ve evrensel olarak kabul edilen bir tanı aracının olmaması gibi nedenlerle tanısal zorluklar oluşturmaktadır. Bu çalışma, Türkiye'deki ağız, diş ve çene cerrahlarının TMD sınıflandırma sistemleri üzerine bakış açılarını değerlendirmeyi amaçlamaktadır. Bu değerlendirme, katılımcıların deneyimleri, çalışma koşulları ve bu araçların klinik uygulamadaki entegrasyonunu dikkate almaktadır.

Materyal ve Metot: Google Forms üzerinden Eylül 2023 - Nisan 2024 tarihleri arasında ağız ve çene cerrahları arasında bir anket yapılmıştır.

Bulgular: Katılımcılar arasında, sınıflandırma sistemleri arasında Diagnostic Criteria for TMD (DC/TMD) protokolünün daha sık tercih edildiği, ancak hasta muayenesi sırasında zaman kısıtları, radyolojik görüntüleme değerlendirmesinde orta düzeyde yeterlilik, ve psikolojik değerlendirme araçları konusunda sınırlı farkındalık gibi zorluklar belirlenmiştir.

Sonuç: Çalışma, TMD tanısında multidisipliner çalışmanın önemini vurgulamakta ve mevcut engelleri ele almaktadır. Ayrıca sürecin doğru yönetilebilmesi ve stratejileri optimize etmek için hem sınıflandırma hem de tedavi yöntemlerinde standartlaştırılmış kılavuzların kullanılmasının gerekliliğini ortaya koymaktadır.

Anahtar Kelimeler: DC/TMD; Temporomandibulereklem; Temporomandibuler düzensizlikler; RDC/TMD

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INTRODUCTION

Temporomandibular disorders (TMD) consist of heterogenous musculoskeletal disorders, characterized by joint masticatory muscles and craniofacial pain[1], in addition to restricted range of motion and temporomandibular joint (TMJ) noises2. TMD symptoms affect sleep quality, social and physical activities as well as the psychology of the individual, decreasing the quality of life3. Population-based studies showed that the global prevalence of TMD is up to %34 in adults[4].

Many TMDs cause similar symptoms, which can lead to misdiagnosis[5]. Thus, the diagnostic system should provide a complete clinical evaluation including evaluating etiological and risk factors and allowing the planning of special preventive and treatment interventions. For this purpose, many classification systems have been proposed[6,7]. However, there is no consensus on the ideal tool for diagnosing these patients.

Different classification systems have been introduced, Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), published in 1992, was used as the most common diagnostic protocol for the investigation of temporomandibular disorders[8]; until the recommendation of Diagnostic Criteria for TMD (DC/TMD) in 2014, in which a dual axes system is used to diagnose and classify the TMD [9]. While Axis I assigns the physical diagnosis, Axis II evaluates the behavioral and psychological factors for the management of TMD[9]. The DC / TMD protocol is suitable for use in both clinical and research environments and allows the identification of patients presenting simple to complex TMD[9].

In addition, not only different departments among dentistry and maxillofacial surgeons are responsible for the TMJ and TMD diagnosis; physiotherapists also collaborate with them in the diagnosis of musculoskeletal disorders. However, there is no definition of the exact roles of these specialties and at which level of treatment to be included.

This study aims to evaluate the perspective of oral and maxillofacial surgeons in Turkey on TMD classification systems regarding experience and working conditions and identify how they adopt these tools in their clinical practice.

METHODS

Hacettepe University Ethics Committee reviewed and approved the study (GO 23/602). An online survey was conducted between September 2023- April 2024 among oral and maxillofacial surgeons using Google Forms. The survey was distributed via the Oral and Maxillofacial Surgery Association (Ağız, Çene Yüz Cerrahisi Birliği Derneği - AÇBİD) e-mailing list. The survey form consisted of 36 questions; the first part of the questionnaire was about the experience and working conditions. The experience of the participants was grouped as ←5 years, 5-10 years, 10-20 years, and →20 years. Working conditions were asked to evaluate if the participant was working at a university hospital, at a public hospital, or at a private practice and whether the participants were working multidisciplinary or as sole responsible clinicians for patients with TMD. The second part evaluated the participants' attitudes and knowledge of TMD, focusing on clinical, radiological, and psychological evaluation perspectives and choice of tools. Descriptive statistical analysis was performed using Google Forms and Excel. Statistical analyses were conducted using SPSS version 25.0. The normality of the distribution of variables was assessed with the Shapiro-Wilk test. Descriptive analyses were presented using mean ± standard deviation and median (min-max) values. For categorical variables, frequency and percentage values were used. The relationships between categorical variables were examined with the Pearson Chi-Square Test when assumptions were met and with the Freeman-Halton Test (Fisher Exact Test) when assumptions were not met. A p-value of less than 0.05 was considered to be statistically significant.

RESULTS

The survey results from 100 oral and maxillofacial surgeons were analyzed. Among them, 52% have less than five years of experience after graduation, 79 % work in university hospitals, and 85% have had the chance to work multidisciplinary. 81% of the participants think that a classification system would be beneficial for the diagnosis and treatment of TMD. Nearly half (46%) of the surgeons utilize the DC/TMD classification system for categorizing temporomandibular disorders (TMD), with 58% feeling proficient with the DC/TMD tools recognized internationally for classifying TMD.

Participants mostly think that they have adequate knowledge (66%) and experience (50%) regarding the clinical and

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radiological examination of TMD. Additionally, 70% routinely use examination forms during the clinical examination and assessment of TMD patients. Considering the DC/TMD, 35% of the participants think that they have adequate time for the examination of the patients.

Regarding knowledge about TMD conditions, 94% believe they have sufficient knowledge about the clinical findings and diagnostic criteria for disc displacement with reduction, while 93% of those confident in their understanding of disc displacement without reduction are specialists in oral and maxillofacial surgery. 61% of the participants feel confident regarding the clinical findings and diagnostic criteria of osteoarthritis and %69 feel confident in myofascial pain disorder.

97% of the participants think that psychological evaluation is needed for TMD patients, but only 13% are using a form for psychological examination. Awareness of the DC/TMD Axis 2 evaluation tool is at 54%, though 77% have not previously used it.

Lastly, 77% of the participants believe they understand the indications and limitations of cone-beam computed tomography (CBCT) and traditional tomography in diagnosing TMD; however, this proficiency decreases with scintigraphy and MRI, to 46% and 63% respectively. Additionally, 46% of the participants feel the need to evaluate the radiological reports.

DISCUSSION

TMDs present significant clinical challenges both in diagnosis and treatment. Additionally, patients exhibit varying responses to treatment. Therefore, it is very important to define a classification system and treatment protocols that are as easy to use and clinically applicable as possible. This way, clinicians are supported in their practice, and patients can be more easily involved in the process[10]. For a complex clinical condition like TMD, it would be highly beneficial for inexperienced physicians to have opportunities for multidisciplinary collaboration, as this would facilitate better management of the process. In this study, the majorities of participants are working at a university hospital and are within the first 5 years of their careers.

The DC/TMD protocol is currently the most widely utilized by clinicians worldwide. It standardizes the diagnosis process and provides a foundation for objective data comparison. The DC/TMD offers a practical classification of TMD, distinguishing various disorders such as myalgia, local myalgia, myofascial pain with spreading, myofascial pain with referral, arthralgia, headache attributed to TMD, disc displacement with reduction, disc displacement with reduction and limited opening, disc displacement without reduction and with limited opening, degenerative joint disease, and subluxation[11]. DC/TMD protocol is currently the most adaptable and thorough tool for a multidisciplinary approach to diagnosing TMD, incorporating the biopsychosocial model[12]. Regarding the result of the current study, most of the surgeons are familiar with DC/TMD classification system, and nearly half of them are using these criteria during the examination of TMD patients.

Although the DC/TMD is recognized as one of the most suitable and comprehensive classification systems for clinical use, it has been observed that patients may experience a loss of cooperation due to the long application time, which can lead to data loss[13]. Accordingly, most participants in this study believe that they are unable to provide enough time to patients according to the DC/TMD criteria. This may be partly due to the higher participation from university hospitals, which typically demand a relatively more intense work pace.

Literature suggests that newly graduated dentists were insufficient regarding TMD[14,15]. More than half of the participants of this study feel they have adequate knowledge and half of them feel experienced. The results may be attributed to the participation of physicians with clinical experience from different eras and the absence of standardized education and guidelines for dentists in managing TMD.

While disc displacement with and without reduction, can be better differentiated by physicians, it appears that osteoarthritis and Myofascial Dysfunction Syndrome diagnoses are more challenging for clinicians. This difference in diagnostic capability might be due to the more obvious clinical and radiological features associated with disc displacements compared to the more subtle or overlapping multifactorial symptoms of osteoarthritis and myofascial pain disorders[1].

CBCT is extensively utilized across various aspects of oral and maxillofacial surgical practice. Given its broad application, it is reasonable for clinicians to be more familiar with this imaging tool. In contrast, MRI and scintigraphy have more limited applications in this field. The participants in this study expressed a higher level of confidence in using CBCT compared to other imaging modalities, likely due to its prevalent use in clinical practice. Additionally, the literature indicates that there

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is poor inter-examiner reliability with MRI in the diagnosis of TMD, even among experienced practitioners[16].

Although nearly all participants acknowledged the need for psychological assessment for TMD patients, the majority reported not using a specific psychiatric assessment form. The evaluation of disorders related to the psychosocial status and pain of individuals with TMD is conducted using Axis II[9]; nevertheless, this study reveals that most maxillofacial surgeons do not utilize this tool or any other.

In conclusion, the study sheds light on the challenges and practices surrounding TMD diagnosis and classification among oral and maxillofacial surgeons in Turkey. While the DC/TMD protocol emerges as a prominent diagnostic tool, there is a need for a more practical and applicable survey. Regardless of their years of experience, it was found that most surgeons struggle with interpreting MRIs of TMD patients. Additionally, it was determined that physicians face challenges in the clinical diagnosis and treatment of psychosomatic muscular changes, rather than internal derangements as categorized in DC/TMD Axis 2.

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REVIEW ARTICLE

Different Concepts Based on Literature in Acquiring Facial Aesthetics in Hidden Orthognathic Patients

Gizli Ortognatik Hastalarında Yüz Estetiğinin Kazanılmasında Literatüre Dayalı Farklı Kavramlar

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ABSTRACT

Objective: Due to the large number of patients with slight skeletal disorders but without any functional limitations and the fact that these patients resort to achieving a more aesthetic appearance by permanent, simple and less risky methods, it was aimed to evaluate the feasibility and success of different facial shaping surgeries and their current conditions for these types of patients according to the literature.

Materials-Methods: This review was prepared by examining the literature and existing scientific studies, focusing on facial contour reshaping and facial fat pad repositioning surgeries. Surgical techniques, indications, advantages-disadvantages, results and patient satisfaction were evaluated.

Results: To alter the shape of the face, malarplasty (Intraoral bony shaving, Bicoronal I-shape osteotomy, Intraoral I- or L-shape osteotomy, Intraoral and preauricular I- or L-shape osteotomy, Intraoral and preauricular wedge-sections osteotomy, Percutaneous osteotomy, and Transposition of fat pads), mandibular angloplasty (Mandibular lateral outer cortex splitting ostectomy, Mandibular angle ostectomy, V-line ostectomy), as well as Genioplasty may be performed. However, each procedure has its own risks and complications. Therefore, patient selection, presurgical evaluation, and postsurgical follow-up are important. Successful outcomes in face contouring surgeries can be achieved with proper patient selection and appropriate surgical planning.

Conclusion: In achieving facial harmony, facial contour reshaping and fat pad repositioning surgeries have been found to be easier to perform, both in terms of patient satisfaction and because they are less invasive surgeries. These surgeries can also be designed customized for the patient and will be performed in combination

Keywords: Fat pads, Orthognathic; Reshaping

ÖZET

Amaç: Hafif iskeletsel bozukluğu olan ancak fonksiyonel açıdan bir sınırlaması olmayan hasta sayısının fazla olması ve bu hastaların kalıcı, basit ve daha az riskli yöntemlerle daha estetik bir görünüm kazanmaya yönelmeleri nedeniyle, bu tip hastalar için farklı yüz şekillendirme ameliyatlarının uygulanabilirliği, başarısı ve güncel durumlarının literatüre göre değerlendirilmesi amaçlandı.

Gereç-Yöntem: Bu derleme, literatür ve mevcut bilimsel çalışmalar incelenerek, yüz konturunun yeniden şekillendirilmesi ve yüz yağ yastıklarının yeniden konumlandırılması ameliyatlarına odaklanarak hazırlandı. Cerrahi teknikler, endikasyonlar, avantaj-dezavantajlar, sonuçlar ve hasta memnuniyeti değerlendirildi..

Bulgular: Yüz şeklini değiştirmek için, malarplasti (Ağız içi kemik traşı, Bikoronal I-şekilli osteotomi, Ağız içi I- veya L-şekilli osteotomi, Ağız içi ve preauriküler I- veya L-şekilli osteotomi, Ağız içi ve preauriküler wedge-sections osteotomi, Perkütan osteotomi ve yağ yastıklarının transpozisyonu), mandibular angloplasti (Mandibular lateral dış korteks bölme ostektomisi, Mandibular açı ostektomisi, V hattı ostektomisi) ve Genioplasti yapılabilir. Ancak, her prosedürün kendine özgü riskleri ve komplikasyonları vardır. Bu nedenle hasta seçimi, cerrahi öncesi değerlendirme ve cerrahi sonrası takip önemlidir. Doğru hasta seçimi ve uygun cerrahi planlama ile yüz şekillendirme ameliyatlarında başarılı sonuçlar elde edilebilir.

Sonuç: Yüz uyumunun sağlanmasında, yüz konturunun yeniden şekillendirilmesi ve yağ yastığının yeniden konumlandırılması ameliyatlarının hem hasta memnuniyeti açısından hem de daha az invaziv ameliyatlar olması nedeniyle daha kolay uygulanabilir olduğu bulunmuştur. Bu ameliyatlar aynı zamanda hastaya özel olarak tasarlanabilmekte ve kombine olarak uygulanabilmektedir.

Anahtar Kelimeler: Yağ yastıkları; Ortognatik; Yeniden şekillendirme

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INTRODUCTION

In various studies, it has been observed that facial structures differ among different races and that beauty standards vary across different cultures. While surgical correction of facial bones has traditionally been predominantly for functional purposes, it has become dramatically popular in recent years for cosmetic reasons as well[1]. When the bone structure is not in the correct position, the soft tissue also does not align properly[2]. Therefore, alongside facial contouring surgeries, significant changes in soft tissue can also be achieved through techniques such as transposition of fat pads[3,4].

Facial beauty balance can be achieved surgically through the correction of the three main prominences of the face: the nose, the mid-face (malar region), and the jawline. The use of the body's own tissues is a progressive technique to reduce the risk of post-op infection against foreign body, to prevent the negativities brought by repeated fillers and fat injection procedure whose results cannot be predicted[5].

Surgical decisions can vary depending on the perception of the physician and the patient's treatment needs[6].

In the past, surgeons have often focused on reducing the width of the lower face by neglecting the width ratio of the lower and middle thirds of the face in both frontal and lateral views. Therefore, for more balanced facial proportions and optimal results, surgeons should objectively evaluate the facial contour as a whole and prepare a comprehensive treatment plan[7].

In 2014, Ireland et al. developed the Orthognathic Functional Need Index (IOFTN) to objectively evaluate dentofacial deformities, which has shown adaptability across different cultures and populations[6].

Furthermore, Ellenbongen and Karlin defined criteria for the ideal neck appearance from the profile view, stating that a cervicomental angle exceeding 120° would create an aesthetically unfavorable impression[8].

Today, patients tend to prioritize their social profiles over photographic and analytical records, focusing on how they perceive themselves in the mirror[8].

The aim of this study is to explore, in the light of the literature, how we can address patients' increasing aesthetic expectations through alternative and more easily applicable methods such as facial contouring surgeries and transposition of fat pads, beyond the predominantly performed orthognathic surgeries.

I-Malarplasty

The zygoma stands out in the midface, shaping its overall appearance significantly[9]. It's essential to ensure seamless integration with neighboring regions[9]. There are eight different ways to perform malarplasty[3,10,11]. The procedure or procedures to be performed depend on the zygomatic prominence[12]. Procedures aimed at reducing zygomatic prominence include: Intraoral bony shaving, bicoronal I-shape osteotomy, intraoral I- or L-shape osteotomy, intraoral and preauricular I- or L-shape osteotomy, intraoral and preauricular wedge-sections osteotomy, percutaneous osteotomy[7,10,12].

1- Intraoral bony shaving

With a small intraoral incision, the zygomatic bone body and lateral orbital wall are exposed. Following the contouring and refining of the zygomatic body, the incision is sutured[10].

This procedure is typically reserved for cases with mild zygomatic prominence. However, its popularity is relatively low because of limitations such as a high postoperative recurrence rate attributed to hyperosteogeny and periosteal proliferation. Additionally, flattening only the zygomatic body can result in the face appearing wider than desired. Postoperative asymmetry and inadequate correction are also concerns associated with this method[10].

2- Bicoronal I-shape osteotomy

Through a bicoronal incision, the superior zygomatic arch between the deep temporal fascia and the superficial temporal fat pad is exposed. Then, osteotomy lines are adjusted according to the prominence of the malar complex and an I-shaped osteotomy is performed in the inferomedial direction from the frontozygomatic suture along the zygomaticomaxillary suture. The mobilized zygoma is subsequently repositioned superoposteriorly and fixed with mini plates or wires[10].

It provides bilateral symmetry with ease, is precise and predictable, preserves zygomatic contour and curvature, and allows for more accurate positioning of the zygomatic junction. This approach may be suitable for patients with pronounced zygomatic prominence who prefer to avoid noticeable scars on the cheek and who need a facelift. Creates a wide scar on the head as a disadvantage[13]. Different methods have been considered to minimize significant local swelling, promote a prompt healing process, and reduce the risk of damage to vital tissues[10]. As a late complication, after bicoronal reduction

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malarplasty, Giant maxillary mucocele formation has been reported[14].

3- Intraoral I-or L-shape osteotomy

The zygomaticomaxillary complexes are exposed through an intraoral incision. Subsequently, the middle segment is released with an I-shaped osteotomy from the lateral to orbital wall and and L-shaped (2 parallel vertical lines and 1 oblique line) osteotomy from the medial part of the zygomatic body. It is then separated from the posterior zygomatic arch using a long-handled oscillating saw, repositioned medially, and fixed with a miniplate[7,10].

In a meta-analysis examining complications in intraoral approaches, the most common complication after malarplasty performed with only intraoral approach was cheek drooping, which is one of the serious complications that would require revision surgery such as facelift. This was followed by transient sensory deficit, non-union, restriction in mouth opening, facial nerve injury, and bleeding[2]. Additionally, it was observed that the medialized segment damaged the maxillary sinus and caused skin shadowing due to poor fit[10].

4- Intraoral and preauricular I-or L-shape osteotomy

In addition to the method performed only through the intraoral I- or L-shape osteotomy approach, a small incision is additionally made in the preauricular area in order to reduce scar formation and facilitate the fracture of the posterior zygomatic arch with the help of an osteotome[7,10].

In the same meta-analysis examining the complications, the most common complication in the sideburn incision made in addition to the intraoral approach was restriction of mouth opening due to masseter muscle involvement, followed by transient sensory nerve neuropraxia due to excessive traction and dissection, asymmetry, non-union, cheek drop, bleeding and facial nerve injury in the infraorbital and zygomaticofacial nerves[2]. In addition, fixation can be done incorrectly[13]. In another study, it was observed that edema was less and the operation time was shorter compared to malarplasty performed only with the intraoral method[15].

5- Intraoral and preauricular wedge-sections osteotomy

A wedge shape of bone is ostomized from the body of the zygomatic bone through a small incision made in the vestibule between the first molar and the canine teeth. And then, to access the root of the zygoma, complete osteotomy of the zygomatic bone is performed via a preauricular incision. The mobilized bone is repositioned medially and then fixed with a microplate or wire[1,10,12].

Wedge-section osteotomy facilitates better fitting of the infractured malar complex. The small preauricular incision reduces the risk of facial nerve and temporal artery injuries and preserves muscle connections without unnecessary dissection inside the mouth. Consequently, it has been observed that the likelihood of cheek sagging after the operation is reduced. To prevent displacement of the infraction point, the entry angle of the chisel must be inclined. Thus, it has been noted that this method does not offer an adequate solution for patients with extremely square faces and high malar protrusion. However, since fixation is necessary, it has sparked various discussions in the literature regarding the fixation method[10,16]. Bidirectional wedge ostetomy is recommended in patients with protrusion of both the zygomatic body and zygomatic arch[13].

6- Percutaneous osteotomy

A) Double percutaneous incisions method: Two percutaneous preauricular slit incisions are made on the malar prominence. Full and partial thickness oblique osteotomies are performed on the zygomatic body with osteotome. A green stick fracture is created by applying manual pressure to the zygomatic body medially. At the same time, the anterior part of the zygomatic arch transfers medially. In this method, there is no need for a fixation system and the surgery is completed in a very short time[1,12].

It has been observed that it shortens the operation time and eliminates the need for fixation. It can be performed under sedation and local anesthesia. Although there are fewer complications compared to other methods, sagging cheek and hematoma are the most common complications. It is more suitable for patients with mild zygomatic body protrusion and prominent zygomatic arch[12].

B) Single percutaneous incision method: In this method, unlike two preauricular incisions, a single small incision is made in the sideburn area. Initially, the zygomatic body is contoured through shaving.

Subsequently, the zygomatic arch is corticotomized and its cortical components are removed. Finally, a full-thickness osteotomy is performed in the anterior part of the articular tubercle, the zygomatic arch is fractured and reducted medially with finger or palm pressure. The posterior part of

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the osteotomized area is trimmed to prevent step deformity. Fixation is not required[13].

It eliminates the need for intraoral incision in patients with high lateral projection who need only infracture. Thus, cheek sagging due to wide dissection and dietary restriction due to intraoral incision are minimized. It is a minimally invasive procedure thanks to the fact that it can be performed with only local anesthesia, minimal post-op edema, no need for fixation, and low risk of infection[13].

Rare complications after preauricular incision have been reported as a arteriovenous fistula of the superficial temporal artery[17] , busitis after synovial membrane injury[18] , and lateral rectus muscle injury, facial palsy and restricted mouth opening with fracture of the lateral orbital bone due to improper use of the resiprocating saw[19].

Zygomatic prominence can be attained through repositioning of the pedicled malar or buccal fat pads[3,5,11].

7- Malar fat pad repositioning

The malar fat pad, anatomically indistinguishable from the subcutaneous fat of the infraorbital cheek skin, has been described as a superficial structure with less adherence to the superficial musculoaponeurotic system (SMAS) layer[3]. The transposition of the inferiomedially positioned malar fat pad plays a significant role not only in correcting midface ptosis and melolabial prominence but also in conservative lower face lifting[3,20].

Instead of procedures with high morbidity requiring advanced surgeries such as deep- plane dissections, subperiosteal and endoscopic facelifts, transorbital lifts, various methods have been developed that are minimally invasive, with faster recovery potential and invisible incisions[3]. When determining the incision method along with the patient's age, facial integrity, and other procedures to be performed, options such as preauricular, temporal, blepharoplasty, and hidden forehead incisions are considered[3,20,21]. Regardless of the chosen methodology, the main objective is to reposition the freed malar fat pad to a posteriosuperior position and suture it to the fascia in the incision area using a two-vector technique[3,20,21]. The amount of edema and ecchymosis varies depending on the approach chosen and the patient, but no serious complications have been reported[3,20,21].

8- Buccal fat pad repositioning

The buccal fat pad can be transferred in any direction thanks to its pedicle[22]. This method brings the fat pad from a relatively invisible position to a more visible one[11]. Additionally, as a result of the change in the position of the fat pad, the buccal area becomes concave while the malar area becomes more prominent[5]. For this purpose, two different methods are applied, namely intraoral and preauricular, according to the need[5,11].

In the intraoral method, gentle dissection of the buccal fat pad is performed through a limited buccal incision. A subperiosteal pocket is created in the anterior and lateral directions of the malar bone. An absorbable, medium-thickness suture is used to hold the buccal fat pad. The buccal fat pad is then repositioned towards the upper and lateral regions of the pocket. After the needle is percutaneously retrieved, it is redirected through the same entry port to regrasp the buccal fat pad subperiosteally. Finally, the fat pad is secured in the proper position with a triple knot. Any resulting cutaneous concavity is addressed with local massage[5].

Pedicle buccal fat pad transposition via intraoral dissection is a technique that provides minimal morbidity and high patient satisfaction, making it easily applicable in patients with low malar projection. In a study by Hernández-Alfaro F. et al., stable results were shown in a 12-month patient follow-up[5].

While no complications have been reported from transposition surgery performed using the intraoral technique, possible complications include seroma, infection, asymmetry, flap mobility, nerve injury, and damage to the Stensen's duct[5].

Surgical procedures performed extraorally are more frequently preferred in patients desiring facelift surgery, with low malar projection and buccal herniation. Following a wide incision from the preauricular region to the mandibular angle, all zygomatic ligaments and masseteric cutaneous ligaments are released until the SMAS flap is freed, revealing the buccal fat pad. The buccal fat pad is gently removed superiorly to avoid damage to vital tissues. The aim is to secure it to the SMAS with a loop-type suture at the superomedial corner. The vector orientation should be parallel to the lateral border of the zygomaticus major muscle. After the main suturing is secured, several additional sutures are made[11].

In Bitik O.'s study, among the nine patients evaluated, one exhibited temporary paralysis in the marginal mandibular

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branch, and another experienced an early postoperative hematoma. Notably, no asymmetry complaints were reported by any of the patients, and no paralysis was observed in the facial nerve branches within the frontal, zygomatic, or buccal regions[11].

In the study conducted by Lee T.S. and Park S., it was observed that transposition of the buccal fat pad, along with reduction malarplasty, resulted in successful outcomes

without complications in patients with excessive lateral malar projection but less pronounced malar body projection[4].

In another study conducted by Khiabani, K. et al., the buccal fat pad lifting method has been successfully applied without complications in both patients undergoing aesthetic surgery and post-traumatic patients[23].

II-Mandibular Angloplasty

There are various surgical techniques for mandibuloangloplasty. The most commonly used of these are[1];

1- Mandibular lateral outer cortex splitting ostectomy

Deguchi M. and colleagues reported in their study that angle division osteotomy reduces both the mandibular angle and lower facial width[24]. The anatomy of the mandibular outer cortex, performed by a surgeon with appropriate patient profile and good anatomy knowledge, adhering to the plan, gives very successful results[24,25].

Surgical expertise is particularly necessary in cases where the mandibular angle is medially inclined[25]. Additionally, there is always a risk of inferior alveolar nerve damage[25]. Mandibular contouring surgery also allows for the correction of benign masseteric hypertrophy without damaging soft tissue and the masseter muscle[24,25].

Angle division osteotomy is indicated for patients without alveolar arch deformities, with a wide lower face in the frontal view, and a gonial angle of less than 120 degrees in the lateral view[24,26]. Significant gonial asymmetry from the frontal view is not crucial for surgical intervention[24]. It can be combined with other techniques used in mandibuloplasty in some cases, as it may be insufficient alone[26]. The larger the bilateral mandibular protrusions, the more bone pieces are excised[24].

The operation is generally performed under general anesthesia but can also be carried out under sedation and local anesthesia[24]. In this method, which can be performed both intraorally and extraorally, the intraoral approach is usually preferred. A buccal sulcus incision is made from near the Stenon duct to the first premolar tooth. Care is taken to avoid the mental nerve and masseteric artery branch while dissecting the periosteum. The outer cortex is separated using a bur, oscillating saw, and osteotome,

starting approximately 10mm below the sigmoid notch and 10mm behind the mental foramen. Sharp edges are corrected, and any leakage of bone marrow is stopped with pressure dressing[25].

In a study involving 29 patients, complications such as hematoma, infection, overcorrection, undercorrection, and condylar fracture were not observed. However, there is no guide to reduce the risk of inferior alveolar nerve damage[25].

2- Mandibular angle ostectomy

The combination of mandibular angle prominence and masseteric hypertrophy results in square face syndrome. Among its causes, inheritance, bruxism, and prolonged unilateral chewing habits are considered[27].

This surgical procedure is more suitable for patients with excessive posterior angle prominence in the lateral view rather than the frontal view[28].

For patient comfort, this method is generally performed intraorally under general anesthesia but can also be carried out under sedation extraorally (postauricular) with local anesthesia[27,29].

In the intraoral approach, an incision is made from the ramus to the second premolar. After exposing the mandibular angle, mandibular body, and medial-inferior part of the mandible, an osteotomy line is determined for the inferior margin of the mandible from the posterior ramus to the mental region. After the osteotomy line is cut with a reciprocating saw or burr, bone protrusions are corrected with osteotomy to prevent the formation of a second mandibular angle. During this process, medial pterygoid and mylohyoid muscle connections are cut and reattached. The incision line is sutured[1,27].

In the extraoral approach, a post-auricular incision is preferred, which has shown faster healing[29].

Additionally, the occurrence of masseter atrophy in patients with benign masseter hypertrophy also increases the effectiveness of the outcome[27]. Generally, patients, especially

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those not complaining about their frontal appearance, have been satisfied aesthetically with this method[27,28,30].

In intraoral methods, complications such as bleeding due to arterial injury, mental nerve damage, temporary lip paresthesia, and limited mouth opening may occur[27].

A 10-year retrospective review comparing the complications of surgeries performed by intraoral methods showed a complication rate of 5.87%. Serious complications such as condylar fracture, permanent nerve damage, massive bleeding, and significant asymmetry were not observed, but hematoma, severe swelling, infection, and facial sagging were seen in very few cases. Although the complication rate varies with the experience of the surgeon, it has been observed that it can be further reduced with preventive measures[30].

In surgeries performed with the extraoral method, some patients experienced temporary numbness in the postauricular region, but no patient complained of perioral numbness or facial paralysis. While significant bleeding was observed in only 6 out of 175 patients during surgery, saliva leakage was experienced for 2 weeks in one patient. Complications lasted for one week or less in 69.2% of patients, and 94.7% of patients were satisfied with this operation[29].

3- V-line ostectomy

If the cosmetic goal is to have a thinner and more oval-shaped face, resembling a "melon seed" or "goose egg", contouring may be desired not only in the posterior but also in the anterior mandibular margin. In such cases, the V-line osteotomy procedure is preferred. This helps prevent the formation of a second mandibular angle that could occur in mandibular angle osteoectomy, resulting in a steeper, straighter, and more symmetrical inferior margin of the mandible[31].

An incision is made from the ascending ramus to the first or second premolar, and the osteotomy line is determined. The most critical aspect of this procedure is the osteotomy line. For a more natural and ideal outcome, the distance between the gonial angle and the auricular lobule should be approximately 2 cm. The inclination of the osteotomy line is decided based on the position of the mandibular canal, the angle of the mandibular plane, and the mental region. In the anterior aspect, the osteotomy line typically extends 3 mm below the mental foramen, at the apex of the canines, to the corner of the mental region. The excised bone piece is removed, and the incision line is sutured[31,32].

V-line surgery is suitable for patients with a low-angle square jawline with a gonial angle-auricular lobule distance of more than 2 cm[31] . However, for patients with agonial angle-auricular lobule distance of less than 2 cm, it is more appropriate to combine it with genioplasty. If the patient has a jawline that widens outward from the frontal view, mandibular outer cortex splitting osteotomy should be combined[32].

In a study conducted by Hsu Y. et al., no serious complications were observed during the 6 to 24 months of follow-up, although temporary paresthesia in the mental nerve region healed within 4 months[31].

III-Genioplasty

The position of the jaw, which is the most defining feature of the lower third of the face, is crucial from an aesthetic perspective[33]. Genioplasty is a method used to correct the position and contour of the chin, either alone or in conjunction with other orthognathic procedures[33,34]. By moving the chin tip vertically, forward, or backward, it is possible to change its position in three dimensions and correct asymmetries[34,36].

In the mandibular anterior vestibule, between the canines, approximately 5 mm above the buccal sulcus, a full-thickness incision is made, and the soft tissues are carefully dissected to expose the symphysis[34,35]. The midline of the chin is marked as a reference point, and osteotomy lines are designed according to the chin deformity to be corrected. This three- dimensional change can involve alterations in the anterior-posterior, vertical, and transverse directions, including narrowing, widening, and asymmetry correction[35].

Among the fixation options are two tricortical screws, pre-bent genial plates, and bilateral 1.5 mm plates. Tricortical screws are suitable only for advancement procedures, while other fixation methods can be applied to all procedures. Finally, after evaluating the final position of the chin, the muscle tissue is carefully closed, followed by the mucosa. Soft tissue changes depend on the ideal closure of the mucosa. As a final step, a pressure bandage is placed to increase muscle-bone contact, reduce hematoma, and prevent soft tissue ptosis. It is removed three days after the operation[35].

A systematic review examining the long-term stability of isolated advancement genioplasty found it to be a stable procedure, with no more than 2 mm of relapse reported in the studies reviewed. The relationship between the amount of

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relapse and the fixation method and amount of movement was not observed[36].

Another systematic review examining the soft and hard tissue response after isolated genioplasty found that three years after the operation, soft tissue exhibited more relapse in the anteroposterior plane compared to hard tissue. Vertical corrections showed various changes in both soft and hard tissue[33].

In a study of 59 patients, consisting of 38 males and 21 females, infection was observed in 3.4% of patients, hematoma in 8.5%, and temporary paresthesia in 6.8%. Complications are more commonly observed in males; however, as a procedure, they are most frequently seen in cases involving rotation/advancement surgery for chin asymmetry. Although temporary neurosensory disturbance of the inferior alveolar nerve was the most common complication, patients should be informed about this. Nevertheless, due to its lower complication rate compared to other orthognathic procedures, it is considered one of the most successful operations[37].

To minimize complications, it is important to know the specific key points of each procedure. Nerve injuries should be handled with care to avoid potential overcorrection or undercorrection[38].

CONCLUSION

These concepts highlight the array of techniques available, each presenting distinct advantages and limitations. While minimally invasive and innovative approaches offer significant potential for improving aesthetic outcomes, the effectiveness and safety of these methods hinge on meticulous patient selection and the development of individualized treatment plans. Careful consideration of these factors is crucial for achieving optimal results and mitigating associated risks.

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Conflict of Interest

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CASE REPORT

Subcutaneous Emphysema After Arthrocentesis of The Temporomandibular Joint: A Rare Case Report

Temporomandibular Eklem Artrosentezi Sonrasında Oluşan Subkutanöz Amfizem: Nadir Bir Olgu Sunumu

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ABSTRACT

When conservative treatments prove insufficient in alleviating symptoms of temporomandibular disorders (TMD), arthrocentesis may be considered an effective option. Although arthrocentesis generally has a low complication rate, there have been reports of serious complications. This case report presents the development of subcutaneous emphysema in the buccal tissue following temporomandibular joint (TMJ) arthrocentesis. Thorough investigation into potential complications and increased awareness are vital to ensuring patient safety and improving treatment outcomes.

Keywords: TMJ; arthrocentesis; complications; subcutaneous emphysema

ÖZET

Temporomandibular bozuklukların (TMB) tedavisinde konservatif tedaviler semptomları hafifletmede yetersiz kaldığında, artosentez etkili bir seçenek olarak değerlendirilebilir. Artrosentez genellikle düşük komplikasyon oranına sahip olsa da, bildirilmiş ciddi komplikasyonlar da mevcuttur. Bu vaka raporunda TME artrosentezini takiben bukkal dokuda subkutan amfizem gelişimi sunulmaktadır. Potansiyel komplikasyonların daha ayrıntılı bir şekilde araştırılması ve farkındalığın arttırılması, hasta güvenliğini sağlamak ve tedavi sonuçlarını iyileştirmek için hayati öneme sahiptir.

Anahtar Kelimeler: TME; artrosentez; komplikasyon; subkutanöz amfizem

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INTRODUCTION

Temporomandibular disorders (TMD) are a group of disorders affecting the temporomandibular joint (TMJ) itself, masticatory muscles, and associated structures.[1] Among intra-articular disorders of the TMJ, disc displacements (with or without reduction), degenerative joint diseases, and subluxation are commonly encountered.[2] Disc displacement is the predominant intra-articular cause of TMD, which may end in severe degeneration of the joint structures.[3]

Temporomandibular disorders are typically managed through two main types of therapy: non-invasive (conservative) and invasive approaches. Conservative treatment includes counseling, occlusal splints, pharmacotherapy, physical therapy modalities and low-level laser therapy. Invasive treatment can be divided into surgical and minimally invasive approaches, including arthrocentesis.[4, 5]

Arthrocentesis is an effective, minimally invasive treatment method when conservative treatment fails to improve symptoms. Typically, arthrocentesis targets the superior joint cavity for irrigation due to its accessibility, aiming to reduce inflammation and facilitate disc release by removing fibrous tissues within the joint cavity.[6, 7] While the complication rate of TMJ arthrocentesis is generally low, there are documented instances of complications that require attention.[8]

Subcutaneous emphysema (SE) is known to be caused by the invasion of gas into the subcutaneous tissue. SE in dentistry often results from the use of air turbines, air syringes, carbon dioxide lasers, and irrigation with hydrogen peroxide solution during root canal procedures.[9] SE is typically identifiable through palpable crepitus, snowball crepitation, and rapid swelling. To our knowledge there has been no report in the literature about SE occurring after TMJ arthrocentesis. The aim of this report is to present the management of an SE case that occured after TMJ arthrocentesis.

CASE REPORT

A 43-year-old systemically healthy female patient presented to our clinic with complaints of intense pain in the left preauricular region, rated at 8 on the Visual Analog Scale (VAS).

Clinical examination revealed tenderness in the left preauricular region as well as in the temporal and masseter muscles upon palpation. It was noted that the patient had a mouth opening of 35 mm, with deviation to the left side upon opening. Magnetic Resonance Imaging (MRI) revealed effusion in the upper joint space, with the disc positioned anteriorly in both closed and open-mouth positions. (Figure 1) Based on the clinical and radiological examinations, the patient was diagnosed with left-sided TMJ disc displacement without reduction (DDwoR).

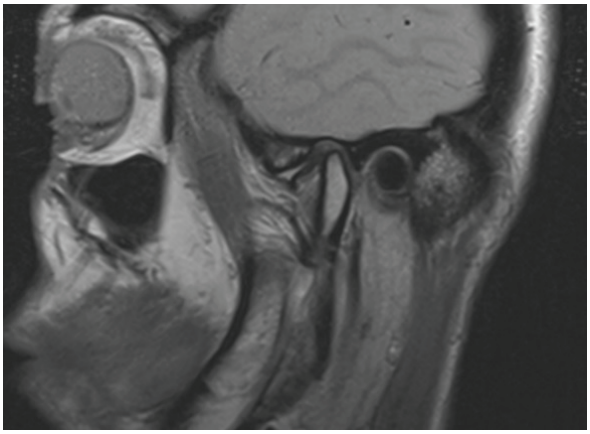

Figure 1. The MRI examination revealed effusion in the upper joint space, with the anterior disc positioned in the closed-mouth position and appearing normal in shape.

The patient was prescribed a non-steroidal anti-inflammatory drug (NSAID) (tenoxicam, 20 mg, 1 tablet orally once daily) for two weeks, along with routine recommendations. At the follow-up appointment, there was no improvement in her symptoms, and arthrocentesis under sedation was planned. The patient provided informed consent.

The procedure was done under IV sedation (Midazolam, 0.03-0.1 mg/kg; Remifentanil, 0.5-1 micrograms/kg/min). The skin surface was disinfected using povidone-iodine (Baticonol, Dermosept, ALG Türkiye). An auriculotemporal nerve block was administered with 2 cc of articaine HCl solution (Ultracain-DS; Hoechst Marion Roussel, Türkiye). The needle placement was performed according to the modification of Laskin D.[10] A line was drawn from the middle of the tragus to the lateral canthus of the eye. Subsequently, the first entry point was marked 10 mm anterior to the tragus along this line and 2 mm below it, while the second entry point was positioned just 3-4 mm anterior to the first needle in the posterior recess. A 20-gauge needle was inserted into the upper joint cavity at the posterior point, and negative pressure was obtained during pumping,

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confirming that the needle was in the correct position. After that, the anterior needle was inserted into the cavity and an outflow was obtained. The joint was lavaged with 50 ml saline solution. No hemorrhagic fluid related to retrodiscal tissue damage or fluid extravasation was observed. Towards the end of the procedure, a subcutaneous swelling was detected on the ipsilateral cheek (Figure 2).

Figure 2. Post-operative subcutaneous emphysema in the buccal region.

Figure 3. Decreased swelling at postoperative 4th hour.

Examination of the sweling revealed crepitus upon palpation. The patient was observed for 6 hours in the hospital after the procedure. 60 mg prednisolone and anti-inflammatory medication (20 mg tenoksikam) were given intravenously. A reduction in the volume of the swelling was observed at the postoperative 4th hour (Figure 3). The swelling completely disappeared by the fourth day after the procedure.

DISCUSSION

TMJ arthrocentesis, pioneered by Nitzan in 1991, stands as a simple and highly effective intervention. Its main goal is to remove inflammatory agents and to loosen adhesions between the disc's surface and the the joint cavity using pressure from a cleaning solution. This procedure represents a pivotal advancement in managing TMD, offering both simplicity and effectiveness in restoring joint function and alleviating associated symptoms. Studies have reported a success rate ranging from 70% to 90% for TMJ arthrocentesis, highlighting its efficacy in managing TMD and improving patient outcomes.[11] This underscores the importance of considering minimally invasive options in the comprehensive management of TMD, particularly when conservative treatments yield suboptimal results.

The complication rate associated with TMJ arthrocentesis is generally considered low; nevertheless, reported complications do exist and warrant attention.[11] Despite being minimally invasive, care should be taken to avoid vascular and nerve injuries, and attention should be paid to the delicate bony lamina separating the upper joint space from the neurocranial structures. Damage to these structures can result in serious complications that necessitate immediate hospitalization for patient monitoring and the initiation of appropriate therapy.[12]

SE manifests as the accumulation of air within the connective tissue amidst the fascial planes. Its origins encompass trauma, iatrogenic factors, or spontaneous onset. Notably, SE in the head and neck region can present as a distinct and potentially life-threatening condition, particularly when a significant volume of air infiltrates the fascial planes. It has the potential to extend beyond the subcutaneous tissues and infiltrate into various spaces such as the retropharyngeal, pleural, mediastinal, and retroperitoneal regions.[13] In the differential diagnosis, allergic reactions, hematoma, angioedema, esophageal rupture, infection, and necrotizing fasciitis should be considered.[14] In this case, the differential diagnosis was

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made with fluid extravasation. Extravasation of irrigation fluid from the TMJ capsule laterally is seen as swelling in the preauricular region, it is a common complication of TMJ arthrocentesis and generally resolves within a day after arthrocentesis. However, in this case, the swelling was in buccal region, and upon palpation, crepitus was noted, unlike extravasation. Extravasation formation typically occurs gradually during arthrocentesis and is usually observed to increase during the procedure. However, in this case, swelling rapidly developed at the end of the procedure and extended beyond the preauricular region, spreading to the cheek.

This report documents a case of SE that occurred during the TMJ arthrocentesis procedure. In the literature, the formation of SE during arthrocentesis has not been reported. The exact cause of the complication in this case remains unclear. Suspicions arose regarding the presence of air in the syringe. However, irrigation was made effectively showing that both needles were in the joint capsule. Additionally, there was no extravasation or capsule perforation. Another consideration was the possibility of introducing air between tissues during anesthesia administration. However, the air in the syringe was checked before local anesthetic administration. In the treatment of SE, mild cases can be managed conservatively, but when there is anxiety, respiratory distress, severe pain, or suspicion of infection, the patient should be hospitalized for observation.[15] This case was considered a mild case, and the patient was managed with IV steroids. A significant reduction in swelling was observed at the end of the postoperative fourth hour.

In conclusion, although arthrocentesis is a safe procedure, it should be noted that various complications may arise during the process. Caution should be exercised at every stage of the procedure, and the patient should be closely monitored.

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