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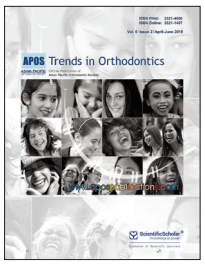

Original Article

Preferences for orthodontic treatment and orthognathic surgery in Class III malocclusion cases: A questionnaire study

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Received: 01 October 2024
Accepted: 24 December 2024
EPub Ahead of Print: 14 February 2025
Published:

DOI
10.25259/APOS_258_2024

Quick Response Code:

Supplementary data available at:
https://dx.doi.org/10.25259/APOS_258_2024

ABSTRACT

Objectives: This study aims to evaluate treatment strategies preferred by orthodontists for correcting Class III malocclusion.

Material and Methods: A survey comprising 19 questions was administered to 1904 members of the Turkish Orthodontic Society, with 200 orthodontists responding. Data were analyzed using descriptive statistical methods, and comparisons based on demographic variables were performed using the Pearson Chi-square test. Statistical significance was set at $P < 0.05$.

Results: Orthodontists expressed diverse views on treatment strategies for Class III malocclusion. Facial mask therapy was the most frequently employed method in early interventions, with most orthodontists recommending its initiation between the ages of 9 and 11. A significant proportion of respondents indicated that orthognathic surgery provided the lowest relapse rates. Public institution orthodontists cited insufficient physical infrastructure as the primary barrier to performing orthognathic surgery, while clinic owners refrained from surgery due to concerns about complications. Furthermore, professional experience was significantly associated with longer post-treatment follow-up periods ($P < 0.01$).

Conclusion: The findings indicate that orthodontists' clinical approaches are influenced by contextual factors, including the workplace environment, years of professional experience, and professional status. These factors significantly impact treatment strategies, appliance preferences, and mechanical techniques.

Keywords: Class III malocclusions, Survey, Orthognathic surgery, Relapse

INTRODUCTION

Skeletal Class III malocclusions are considered one of the most challenging malocclusions by orthodontists due to the complexity of their treatment and high relapse rates. The prevalence of Class III malocclusions varies depending on race, ethnic group, and geographical region. In addition to genetic factors, mouth breathing, harmful habits, and premature contact play a significant role in the development of this malocclusion.[1]

In the management of Class III malocclusions, treatment approaches are selected based on the patient's growth phase and the severity of the malocclusion. During the growth phase, orthopedic treatments are commonly employed, while orthognathic surgery or camouflage treatments are indicated after growth completion.[2] In the early treatment of Class III malocclusions, chin cups, functional appliances, and face masks can be used for growth modification.[1] The general

view is that when the maxilla is the primary etiological factor, the success of maxillary advancement will increase with early intervention.[3,4] However, in individuals with late mandibular growth, the likelihood of relapse after treatment is significantly high. In cases where genetic factors play a dominant role in the etiology, it is advisable to wait until mandibular growth has been completed. Following this, depending on the severity of the sagittal discrepancy, camouflage treatment or orthognathic surgery should be considered, rather than early intervention.[5]

Orthognathic surgery is a multidisciplinary approach used in the treatment of severe malocclusions and skeletal deformities, aimed at improving both function and esthetics.[6] However, in the treatment of Class III malocclusions, orthodontists and surgeons often express concerns when recommending orthognathic surgery. These concerns arise from factors such as the potential for surgical complications and risks, the high cost of the procedure, challenges in coordinating the surgical team, and patients' apprehensions regarding the surgery.[7,8]

The aim of the present study is to investigate the orthodontic treatment and orthognathic surgery preferences of orthodontists in Türkiye for skeletal Class III malocclusion cases.

MATERIAL AND METHODS

The experimental protocols of this study were approved (ID=2022/40) by the Clinical Research Ethics Committee of (Ordu University). Based on the parameters of the study, the total sample size was calculated as 122 using the G*Power 3.1 program (version 3.19.2; Franz Faul, Christian-Albrechts-Universität, Kiel, Germany) with a 30% response distribution rate, an 80% confidence level, and a 5% alpha error. A survey consisting of 19 questions, entirely voluntary to answer, was prepared through Google Forms [Appendix 1]. In the first section, participants were asked for demographic information such as title, professional experience, and workplace. The second section, consisting of 15 questions, focused on the participants' approaches to the treatment of individuals with skeletal Class III malocclusion. The survey was sent through email by the Turkish Orthodontics Society to 1904 members, and a total of 200 participants responded.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 24 (SPSS Inc.; Chicago, IL, USA). Descriptive statistical methods (Frequency, Ratio) were used, and the Pearson Chi-square test was employed to compare data according to demographic characteristics. Statistical significance was set at $P < 0.05$.

RESULTS

About 34% of the participants were male, and 66% were female. The age distribution was as follows: 44.5% were between 21 and 30 years, 35.5% were between 31 and 40 years, and 20% were 41 years or older. Of the participants, 64% were orthodontists working in public institutions (OWPI), 11.5% were clinic owner orthodontists (COO), and 24.5% were orthodontists working in private clinic (OWPC) practices. In terms of academic titles, 41.5% were research assistants, 24.5% were faculty members (assistant professors, associate professors, or full professors), and 34% were dental specialists. The distribution of professional experience was as follows: 45% had been practicing for 0–5 years, 25% for 6–10 years, and 30% for 11 years or more [Table 1].

Orthodontists reported that face mask therapy was the most commonly used treatment in their clinics, and it was most frequently applied in patients aged 9–11 years. A majority of clinicians (85%) sought support from otolaryngologists when treating individuals with mouth breathing. More than half of the orthodontists also reported using the alternate rapid maxillary expansion and constriction (Alt-RAMEC) procedure during face mask therapy [Table 2]. The rate of Alt-RAMEC procedure implementation among dental specialists was found to be significantly lower compared to research assistants and faculty members ($P < 0.01$) [Table 3].

Table 1: Sociodemographic characteristics of orthodontists (n=200).

	n	%
Gender		
Male	68	34
Female	132	66
Age groups		
21-30 years	89	44.5
31-40 years	71	35.5
40 years or more	40	20
Workplace		
OWPI	128	64
COO	23	11.5
OWPC	49	24.5
Title		
Research assistant	83	41.5
Faculty members	49	24.5
Specialist dentist	68	34
Experience		
0–5 years	90	45
6–10 years	50	25
11 years or more	60	30

%: Percentage, Sample (n=200). COO: Clinic owner orthodontists, OWPC: Orthodontists working in private clinic, OWPI: Orthodontists working in public institution

Table 2: Comparison of orthodontists' approaches to the treatment of skeletal Class III malocclusions according to the workplace.

	Workplace						[a]*P*
	COO		OWPC		OWPI		
	n	%	*n*	%	*n*	%	
Do you apply the Alt-RAMEC procedure on patients you treat with a face mask?							
Yes	7	33.3	24	52.2	83	66.4	*$P = 0.017$
No	14	66.7	22	47.8	42	33.6	
How many years do you follow-up the patients you treat with skeletal Class III malocclusion after the end of treatment?							
1 year or less	2	8.7	7	14.3	11	8.6	*$P = 0.002$
1-2 years	3	13	22	44.9	69	53.9	
3-5 years	12	52.2	15	30.6	42	32.8	
5 years or more	6	26.1	5	10.2	6	4.7	
If you do not apply orthognathic surgery in the treatment of skeletal Class III malocclusions, what is the most important reason?							
Unsuitable physical conditions required to perform the surgery	0	0	5	25	16	48.5	*$P = 0.008$
Lack of a surgical team to perform surgery	1	11.1	4	20	3	9.1	
Patients' concerns about orthognathic surgery	2	22.2	3	15	0	0	
The high incidence of complications and risks associated with orthognathic surgical procedures	3	33.3	2	10	0	0	
Lack of theoretical knowledge and practical experience	3	33.3	5	25	13	39.4	

[a]Pearson Chi-square test, *Statistically significant, Alt-RAMEC: Alternate rapid maxillary expansion and constriction, COO: Clinic owner orthodontists, OWPC: Orthodontists working in private clinic, OWPI: Orthodontists working in public institution.

One-third of the orthodontists reported using a removable or fixed appliance to support the lower incisors in individuals undergoing face mask or chin cup therapy. During face mask therapy, orthodontists most frequently applied unilateral forces ranging from 300 to 500 g. The majority of clinicians recommended face mask use for 6–8 months, for <16 h per day. In the retention phase of face mask therapy, 60% of orthodontists reported using additional appliance support. There were significant differences in the duration of post-treatment follow-up for patients with skeletal Class III malocclusion. Most patients were followed for 1–2 years. A follow-up period of 5 years or more was significantly more common among orthodontists with 11 or more years of professional experience ($P < 0.01$) [Table 4]. Orthodontists who own their clinics tend to provide longer post-treatment follow-up for their patients during the retention phase [Table 2]. The academic title of the orthodontist did not have a statistically significant effect on the post-treatment follow-up duration ($P > 0.05$) [Table 3].

About 65% of orthodontists reported waiting until the growth and development phase is complete before performing orthognathic surgery in patients with relapse. In addition, 23% of the participants referred their patients to public or private dental healthcare institutions. The participants indicated that orthognathic surgery yielded the lowest relapse rates in the treatment of Class III malocclusion. However, 31% of the participants stated that they do not perform orthognathic surgery. The OWPI group cited inadequate physical conditions as the reason for not performing orthognathic surgery, while the COO group expressed reluctance due to the associated risks and complications ($P < 0.01$) [Table 2].

Table 3: Comparison of orthodontists' approaches to the treatment of skeletal Class III malocclusions according to the title.

	Title						[a]*P*
	Research assistant		Faculty members		Specialist dentist		
	n	%	*n*	%	*n*	%	
Do you apply the Alt-RAMEC procedure on patients you treat with a face mask?							
Yes	55	67.9	33	67.3	26	41.9	*$P = 0.001$
No	26	32.1	16	32.7	36	58.1	
How many years do you follow-up the patients you treat with skeletal Class III malocclusion after the end of treatment?							
1 year or less	8	9.6	5	10.2	7	10.3	$P = 0.448$ NS
1-2 years	45	54.2	20	40.8	29	42.6	
3-5 years	27	32.5	18	36.7	24	35.3	
5 years or more	3	3.6	6	12.2	8	11.8	
Do you consult patients who are mouth breathers with skeletal Class III malocclusion to an otolaryngologist?							
Yes	70	84.3	45	91.8	56	82.4	$P = 0.329$
No	13	15.7	4	8.2	12	17.6	NS

[a]Pearson Chi-square test, *Statistically significant, NS: Not statistically significant, Alt-RAMEC: Alternate rapid maxillary expansion and constriction.

DISCUSSION

Skeletal Class III malocclusions can result from a range of morphological conditions, including maxillary retrusion, mandibular protrusion, or a combination of both.[9] The

Table 4: Comparison of orthodontists' approaches to the treatment of skeletal Class III malocclusions according to the experience.

	Experience						[a]*P*
	0–5 years		6–10 years		11 years or more		
	n	%	*n*	%	*n*	%	
Do you apply the Alt-RAMEC procedure on patients you treat with a face mask?							
Yes	59	67.8	24	51.1	31	53.4	*P* = 0.244
No	28	32.2	23	48.9	27	46.6	NS
How many years do you follow-up the patients you treat with skeletal Class III malocclusion after the end of treatment?							
1 year or less	8	8.9	2	4	10	16.7	*P = 0.007
1-2 years	49	54.4	28	56	17	28.3	
3-5 years	30	33.3	15	30	24	40	
5 years or more	3	3.3	5	10	9	15	
Do you consult patients who are mouth breathers with skeletal Class III malocclusion to an otolaryngologist?							
Yes	76	84.4	41	82	54	90	*P* = 0.48
No	14	15.6	9	18	6	10	NS

[a]Pearson Chi-square test, *Statistically significant, NS: Not statistically significant, Alt-RAMEC: Alternate rapid maxillary expansion and constriction.

prevalence of this malocclusion type varies across different populations. In Türkiye, the reported prevalence of Class III malocclusions ranges from 10% to 19%.[1] Achieving and maintaining successful outcomes in the treatment of skeletal Class III malocclusions requires the accurate identification of underlying etiological factors. The etiology is multifactorial, with genetic factors playing a predominant role. Respiratory issues, such as septal deviation, sinusitis, and tonsillar hypertrophy, can also affect treatment success; hence, these factors must be carefully considered during the treatment process.[1,10,11] In this study, the majority of orthodontists reported consulting with otolaryngologists when treating individuals with mouth breathing. This finding aligns with previous research, which underscores the necessity of addressing respiratory-related etiological factors in the management of Class III malocclusions.[12,13]

In individuals with skeletal Class III malocclusion, treatment after the completion of the growth period typically involves either orthognathic surgery or camouflage therapy, depending on the severity of the malocclusion.[2] For patients still in the growth phase, various treatment approaches are employed to capitalize on ongoing growth.[14] However, there is no definitive consensus among orthodontists regarding the optimal timing and method for treating Class III malocclusions.[15] One of the most frequently used appliances in growth modification therapy is the face mask.[1] To maximize the skeletal benefits of face mask therapy by leveraging craniofacial growth, the prevailing view is that treatment should begin early.[16] However, some studies have reported similar treatment outcomes when face mask therapy is initiated at different ages.[3,4]

In this study, orthodontists reported that face mask therapy was most commonly applied between the ages of 9 and 11 years, using unilateral forces of 300–500 g, for a duration of 6–8 months. Early treatment offers several advantages, including faster results, a reduced likelihood of requiring orthognathic surgery in the future, and better patient compliance at younger ages.[17] However, early orthopedic treatment also presents certain disadvantages, such as longer treatment duration, the need to wait for the eruption of anchorage teeth necessary for face mask application, and the challenge of predicting remaining mandibular growth.[18] These factors complicate the prediction of treatment outcomes for skeletal Class III malocclusions.[7] The risk of relapse makes post-treatment follow-up essential. Longer follow-up periods have been associated with increased relapse rates. In the present study, a follow-up period of 5 years or more significantly increased the likelihood of relapse ($P < 0.01$). This finding aligns with studies by Hagg and Wells, which emphasize the correlation between extended follow-up durations and higher relapse rates.[7,19] In addition, the results of the present study indicate that the majority of orthodontists conduct patient follow-up for 1–2 years. The predominance of participants who are still research assistants in training, coupled with the 4-year specialty training program in Türkiye, accounts for the observed patient follow-up duration. Furthermore, the present study observed that the duration of patient follow-up also increased with the duration of professional experience ($P < 0.01$).

Relapses during the post-treatment period often prompt orthodontists to implement a second round of treatment. Therefore, patients who receive early treatment should be informed of the possibility of compensatory retreatment in the event of a relapse.[20] Some authors argue that waiting until growth is complete and then performing orthognathic surgery in individuals with Class III malocclusion yields more definitive results.[21]

Orthognathic surgery is associated with a range of complications, including bleeding, dental and soft tissue trauma, nerve damage, condylar resorption, the development of an open bite, infection, relapse, septal deviation, sinusitis, hearing impairment, and improper or non-union of bone fractures.[22] Surgeons may opt for more conservative treatments to mitigate legal issues arising from the high risk of surgical complications and malpractice rates. On the other hand, orthodontists may hesitate to recommend surgical interventions due to the significant responsibilities involved in performing such procedures and the challenges associated with the limited availability of surgeons at the

same location.[23] This is due to the fact that orthognathic surgical treatments necessitate close cooperation between the surgeon and the orthodontist at every phase of the treatment, from pre-operative planning to the finalization of occlusion.[24] About 39% of orthodontists in Türkiye have indicated that their educational programs lacked an official curriculum for interdisciplinary patient treatment, which consequently prevented them from conducting orthognathic surgical procedures.[25] The number of research assistants who responded to the present study constitutes 41.5% of all orthodontists. It is considered that their approaches to clinical practices may not yet be fully developed due to factors such as being engaged in an ongoing educational process and not having had the opportunity to participate in multidisciplinary work. This situation explains the inability to perform orthognathic surgical treatments due to a lack of theoretical knowledge and practical experience. During the period of our study, the percentage of research assistants among orthodontists in Türkiye was approximately 37%. This aligns with the participant data obtained in our study and accurately reflects the current demographic distribution within the field of orthodontics. This is attributed to the recent increase in the number of residency training positions. Nevertheless, improvements in the physical infrastructure of faculties have not kept pace with the increase in residency slots. Successful implementation of orthognathic surgery requires competent surgeons, experienced anesthesia teams, and well-equipped operating rooms.[26] In the present study, orthodontists in public institutions indicated that orthognathic surgical treatments could not be performed due to inadequate physical facilities ($P < 0.01$). In this context, to address the issue of inadequate physical infrastructure in public institutions, improving health policies and increasing the number of multidisciplinary centers capable of performing orthognathic surgical procedures will facilitate treatment processes by enabling more effective coordination of technical equipment and surgical teams.[27] Furthermore, effectively limiting surgical complications and managing them efficiently when they arise will reduce concerns related to these complications. To achieve this, increasing access to both virtual and simulation-based training that can enhance clinicians' practical skills, as well as encouraging participation in advanced surgical courses and seminars, will improve clinicians' competencies and increase the rates of orthognathic surgery implementation.[28] Implementing these recommendations may help overcome existing challenges at both public and private sector levels. Consequently, orthognathic surgical treatments may be performed more widely and safely.

This study has several limitations. First, the survey questions did not include patient case records, which hinders the direct correlation of the collected data with clinical practices and restricts the depth of analysis that can be performed. Future research should incorporate case samples from a broader range of age groups and conduct comprehensive surveys involving clinicians. These approaches would contextualize the study's findings within a wider framework and provide a more detailed understanding of their potential applications in clinical practice. In addition, the present study is limited by the reduction of the survey to 19 questions and a relatively small sample size. Out of 1904 members of the Turkish Orthodontic Association, only 200 participated, with 41.5% of them still serving as research assistants in training. Although this demographic distribution reflects the orthodontist population in Türkiye, it may not fully represent the preferences of more experienced orthodontists, potentially introducing bias into the study's results. Future studies should employ a variety of data collection methods and aim to increase both the diversity and size of the sample. These measures would enhance the generalizability of the findings and facilitate a more comprehensive evaluation of their applicability in clinical settings.

CONCLUSION

- Face mask therapy is typically administered by orthodontists with unilateral forces of 300–500 g for <16 h per day, most commonly over a period of 6–8 months.
- The length of professional experience and work environment of orthodontists directly influence their treatment approaches for skeletal Class III malocclusion. As professional experience increases, the duration of post-treatment follow-up tends to extend.
- Orthodontists who own their clinics tend to provide longer post-treatment follow-up for their patients during the retention phase.
- The physical conditions in public institutions affect the rates of orthognathic surgery treatments.

Ethical approval: The research/study was approved by the Institutional Review Board at the Clinical Research Ethics Committee of Ordu University, number No. 2022/40, dated February 11, 2022.
Declaration of patient consent: Patient's consent was not required as there are no patients in this study.
Financial support and sponsorship: Nil.
Conflicts of interest: There are no conflicts of interest.
Use of artificial intelligence (AI)-assisted technology for manuscript preparation: The authors confirm that there was no use of artificial ıntelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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How to cite this article: Akpinar M, Özkan S. Preferences for orthodontic treatment and orthognathic surgery in Class III malocclusion cases: A questionnaire study. APOS Trends Orthod. doi: 10.25259/APOS_258_2024