Knowledge, Attitude and Clinical Practice of Dentists about Extraction of First Permanent Molars

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Purpose: *The extraction of permanent first molar (PFM) teeth with poor prognosis allows the build of a new-and-ideal occlusion with the spontaneous movement of the healthy second and third molars by taking advantage of the patient's development. This study aimed to evaluate dentists' knowledge level about controlled tooth extractions and determine their information needs.*

Study design*: The survey, consisting of 9 questions about balance and compensation extractions, was prepared on Google Forms and sent via email to dentists.*

Results: *The questionnaire was sent to 3137 dentists and 472 (15.04%) of them answered. While deciding on PFM extraction, the rate of those who checked the presence of permanent 3rd molar tooth was found to be 64.4%. Although 79% of pedodontists stated that they knew about balance extractions, only 60.9% of them apply it in the clinic. After maxillary PFM extraction, the rate of oral and maxillofacial surgeons who think that "mandibular PFM over-erupt" was 92.8%, and the rate of orthodontists was 68.7%. 87.1% of the participants stated that they needed more information about controlled extractions.*

Clinical Significance: *It is possible to raise awareness, encourage the common and follow-up of correct clinical practices, and avoid complications; by adding controlled extractions to the undergraduate education program.*

Keywords: *First permanent molar, Tooth Extraction; Pediatric Dentistry; Surveys and Questionnaires.*

INTRODUCTION

Permanent first molar (PFM) teeth which are the most important teeth functionally/developmentally, are one of the adult teeth to erupt around the age of 6 to 7 and play a key role in the formation of a balanced occlusion[1-3]. They also becomes more susceptible to caries due to its anatomical structure, its position toward the back of the mouth and being most affected tooth by congenital mineralization defects such as molar-incisor hypomineralization (MIH)[1,4]. It is very difficult for dentists and patients to treat these teeth that decay at an early age and before they complete root development[5,6] Since insufficient root length and thickness in immature permanent teeth negatively affect the prognosis of the tooth[7], keeping these teeth in the mouth with root canal treatment will be a temporary solution, which leads to a dilemma in the dentists[5]. In PFM teeth with deep caries, extraction is a saving treatment option when restoration becomes impossible[5,8]. The contralateral PFM extractions of the PFM tooth in the opposite and / or the same arch are called 'controlled tooth extractions. Controlled extraction of PFM teeth is reasonable when appropriate conditions are provided and at the accurate timing. The target in controlled extraction is to move the PSM to the mesial parallelly and to place in the distal of the second premolar[4]. The ideal time for extraction of a PFM

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is the begining of furcation calcification of the PSM teeth[1,9-11]. It corresponds to the 6th and 7th stage in the Nolla classification and to the E stage in the Demirjian classification. Radiographically, this calcification can be detected in the 8-10 age range[1,9-11].

Controlled tooth extractions are examined in two groups as compensation and balance extractions. Balance extraction is controlled extraction of the contralateral PFM tooth located in the same arch with the extracted PFM tooth, is to prevent midline deviation and to preserve the arch symmetry[1,6,8,11-13]. As a general approach, in order to prevent midline deviation, the occlusion type and face type of the patient are should also be evaluated. If there is 4-6 mm moderate crowding in Angle class I patients[14], in the maxilla and mandible, in case of extraction of PFM teeth in one side of the arch, balance extraction of PFM teeth (even if healthy) can be considered suitable[12,13] in order to provide enough space on the other side of the arch.

Compensation extraction means controlled extraction of the PFM tooth located on the opposite arc of the extracted PFM tooth. The purpose of compensation extraction is to minimize the occlusal interferences and to preserve the occlusal relations between the upper and lower teeth[15]. Especially after PFM extraction in the lower jaw, the upper PFM will most likely to be overeruption. This overeruption will prevent mesial drift of the lower PSM, which is the desired target, into the drafting cavity and blocked the spontaneous space closure[4,8,12].

It is obvious that controlled extraction will contribute to the patient, dentists and country economy in the most cost-effective and shortest way. This treatment approach allows the patient and the dentist to get rid of the treatment processes lasting sessions with the extraction of PFM teeth with poor prognosis in a single session. With the advantage of the patient being in the growth and development period, a new and ideal occlusion will be provided with healthy PSM and third molars. Thus, it will save the patient from the "root canal treatment-implant-prosthesis" cycle that lasts for years and from being sentenced to the dentist from a young age, and the country from the treatment costs that last a lifetime. Despite these advantages and necessity, it is seen that;

- There is no prospective and evidence-based information on this subject in the literature,
- The subject has not yet entered textbooks in our country, does not appear to be properly involved in other countries either.
- It is not incorporated in undergraduate courses as it is not included in the Core Education Program in our country. Such an important issue is still based just on clinical experience and expert opinion[4]. It is also known that, it is given in undergraduate or postgraduate education in some faculties.

Occasionally, in balance and compensation extraction, healthy and non-decayed teeth can be also extracted. But it is not always easy to give and accept this indication, both for orthodontists involved in correcting future occlusion problems, as well as for oral and maxillofacial surgeons who will perform the extraction. Because, after extraction of PFM teeth; it has been reported that the anterior teeth may be upright, increasing interincisal angle, increasing overbite, decreasing lower face height and retrusion/lingual tipping in mandibular anterior teeth[16]. All dentists, especially orthodontists, pedodontists and oral and maxillofacial surgeons, should have information that can make decisions without hesitancy. Firstly, awareness and knowledge on this issue should be evaluated and supported by training for needs. But the number of studies on this issue in the literature is quite small. For this reason, the aim of this survey study is to evaluate the level of knowledge of dentists about controlled tooth extraction through a survey and to determine their need for information. This survey study will be of great benefit both in terms of teaching a basic and protective procedure after evaluation and in terms of contributing to the economy of developing countries in the developing world.

MATERIALS AND METHOD

In the current study, a short questionnaire was designed to examine dentists' knowledge levels and decisions about controlled extractions of PFM teeth. The study was approved by the Health Sciences Non-Invasive Clinical Research Ethics Committee.

The survey questions prepared by a professor, an assistant professor and a specialist student who have completed their expertise in the field of pedodontics were checked by a biostatistician. The survey was designed with a completion time of approximately 4 minutes to optimize the response rate. A link was prepared using the Google survey application. First of all, the physicians' age, gender, professional experience, and institution information were asked. After the demographic questions, participants were asked through 9 questions about their routine PFM extraction decisions, their level of knowledge about controlled PFM extraction, the factors affecting their extraction indications, whether they applied it in their clinics and whether they wanted more information on this subject. Survey questions are given in Table 1.

Although the current survey covers all dentists; especially pedodontists, orthodontists, oral and maxillofacial surgeons and general dentists were chosen as the target audience. The official professional organizations of Turkish "Dentistry", "Pediatric Dentistry", "Orthodontics" and "Oral and Maxillofacial Surgery" were contacted. The questionnaire was sent to the 3137 members of 4 different official associations via e-mail. The responses are given within a period of 15 days on 10-25 July 2019 were evaluated.

RESULTS

This questionnaire was sent to 3137 people by e-mail in total and the number of people answering all questions is 472 and the participation rate is 15.04%. A total of 472 dentists, including 217 general dentists, 105 Pediatric Dentists, 96 Orthodontists, 42 Oral and Maxillofacial Surgeons and 12 from other specialties, participated in the current study. 56.9% of the participants work in a university hospital, 26% in a private dental health hospital/polyclinic, 8.7% in a state dental health hospital, and 10% as a single dentist in the office. The survey results are given in table 2.

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Table 1: Survey Questions

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Demographic Information

Age: Gender:

Graduation year from dental faculty:

Graduation year from specialization/PhD: Department: □ Specialty training continues

Current establishment:
□ Private dental clinic(single dentist)
□ Private dental health hospital/polyclinic
□ State dental health hospital
□ University Hospital

Survey Questions

1. Which properties of the patient affect your choice when deciding on extraction or root canal treatment of PFM teeth?

□ Age □ Yes □ No
□ Cooperation □ Yes □ No
□ Socioeconomic status □ Yes □ No
□ Oral hygiene and DMFT □ Yes □ No
□ Tooth alignment or the presence of crowding □ Yes □ No
□ Planned orthodontic treatment □ Yes □ No

2. Which do you consider when deciding on the extraction of permanent molar teeth?(multiple selections are allowed)

□ Eruption direction/angle of permanent 2nd molar tooth
□ Presence of permanent 2nd molar tooth and its root development stage
□ Presence of permanent 3rd molar tooth and its root development stage
□ Presence of permanent 2nd premolar tooth and its root development stage

3. Do you know about spontaneous space closure after the extraction of permanent 1st molar teeth?

□Yes □ No

If yes, do you know the ideal age range for extraction?.....

4. Do you have any idea about balance extraction? □Yes □ No

If yes, how did you get this information?.....……

Do you apply in the clinic? □Yes □ No

Is there any patient you apply and follow the result? □Yes □ No

5. Do you have any idea about compensation extraction? □Yes □ No

If yes, how did you get this information?.....

Do you apply in the clinic? □Yes □ No

Is there any patient you perform and follow the result? □Yes □ No

6. Which of the following is effective in the decision of compensation extraction of PFM teeth?

□ Hypodivergent face type □ Hyperdivergent face type □ None □ Both

7. Which of the following is effective in the decision of balance extraction of PFM teeth?

□ Hypodivergent face type □ Hyperdivergent face type □ None □ Both

8. The unilateral extraction of permanent first molar teeth could cause…

… midline shift? □Yes □ No

… overeruption of opposite maxillar PFM teeth □Yes □ No

… overeruption of opposite mandibular PFM teeth □Yes □ No

9. I need more information about the compensation and balance extractions of PFM teeth.

□Yes □ No

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Table 2: Answers to the Survey (Percentage of "Yes" answers are given)

Questions		PED	ORTH	SURG	GP/S	TOTAL
Question 1: Which properties of the patient affect your choice when deciding on extraction or root canal treatment of PFM teeth?	Age	%99	%92.7	%90.4	%94.4	%93.7
	Cooperation	%94.2	%79.1	%83.3	%87.5	%84.9
	Socioeconomic status	%86.6	%69.7	%83.3	%75	%75.6
	Oral hygiene and DMFT	%92.3	%93.7	%80.9	%87	%88.4
	Tooth alignment or the presence of crowding	%97.1	%91.6	%83.3	%82	%86.6
	Planned orthodontic treatment	%98	%95.8	%92.8	%91.7	%94.5
	Eruption direction/angle of PSM tooth	%70.4	%90.6	%66.6	%68.6	%74
Question 2: Which do you consider when deciding on the extraction of permanent molar teeth?	Presence of permanent PSM tooth and its root development stage	%97.1	%91.6	%85.7	%86.1	%91
	Presence of permanent 3rd molar tooth, root development stage	%68.5	%76	%57.1	%56.6	%64.4
	Presence of permanent 2nd premolar tooth, root development stage	%61.9	%64.5	%45.2	%40.5	%51
Question 3:	Do you know about spontaneous space closure after extraction of PFM teeth?	%93.3	%91.6	%88	%77.5	%86.6
	Do you have any idea about balance extraction?	%79	%69.7	%45.2	%37.7	%55.6
Question 4:	Do you apply in the clinic?	%60.9	%56.2	%21.4	%21.1	%39.9
	Is there any patient you apply and follow the result?	%76.5	%85.1	%55.5	%45.6	%65.6
	Do you have any idea about compensation extraction?	%76	%77	%42.8	%38.2	%56.1
Question 5:	Do you apply in the clinic?	%58	%52	%23.8	%20.7	%38.6
	Is there any patient you apply and follow the result?	%80.3	%94	%50	%51.1	%68.8
Question 6: Which of the following is effective in the decision of compensation extraction of PFM teeth?	Hypodivergent face type	%4.7	%2	%4.7	%8.2	%4.9
	Hyperdivergent face type	%6.6	%29.1	%16.6	%12.9	%16.3
	Both	%47.6	%42,7	%26	%32.2	%37.1
	None	%9.5	%9,3	%7	%11.2	%9.2
Question 7: Which of the following is effective in the decision of balance extraction of PFM teeth?	Hypodivergent face type	%6.6	%5.2	-	%3.6	%3.8
	Hyperdivergent face type	%0.9	%9.3	%16.6	%10.1	%9.2
	Both	%45.7	%46.8	%26	%32.2	%37.8
	None	%17.1	%18.7	%9.5	%15.2	%15.1
Question 8: The unilateral extraction of PFM teeth could cause…	…midline shift?	%83.8	%86.4	%73.8	%82	%81.5
	…overeruption of opposite maxillar PFM teeth?	%89.5	%97.9	%100	%96.7	%96
	…overeruption of opposite mandibular PFM teeth?	%55.7	%68.7	%92.8	%76.9	%73.5
Question 9:	I need more information about the compensation and balance extraction of PFM teeth.	%81.9	%76	%95.2	%95.3	%87.1

PED: Pediatric Dentist **ORTH:**Orthodontist **SURG:** Oral and Maxillofacial Surgeon **GP/S:** General Practitioner or Student

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DISCUSSION

While the current approach advises being conservative; in controlled extractions, from time to time, extraction decisions can be made for teeth that have no decays. This causes hesitation in dentists. Since it is not possible to reach expert consultation for every dentist in the daily clinical routine, all dentists should be able to make an extraction decision without hesitation[8]. However, the data accumulation on this subject in the literature is based on retrospective studies and prospective studies are needed because today the final decision is based only on expert opinion[4]. Therefore, the study was aimed to reach especially pedodontists, orthodontists, and oral and maxillofacial surgeons as well as dentists. Pedodontists and orthodontists are related in this age group as a patient population and have received the most comprehensive specialty training in the growth and development of the oral maxillofacial structure. Pedodontists and orthodontists, as the last authority; must have the most accurate information and make the right extraction planning. Oral and maxillofacial surgeons as clinicians performing extractions; must clearly understand the indications and planning of PFM extractions and controlled extractions in order to avoid incorrect practice. Today, the number of specialist dental practitioners in many regions is very low and general dentists should be aware of these indications if they cannot provide consultation. Based on this need, this study was prepared by taking the conditions that should be met in the extraction of PFM teeth and the problems that may occur when these conditions are not met.

With an only extraction, the dentist can direct the growth and development of the child patient and ensure using their own natural teeth for a lifetime. Firstly, when we focus on which jaw PFM teeth will give more successful results, we see that maxillary extractions generally provide an acceptable occlusion[1]. A study, it was determined that there was a significant difference between the upper and lower FPM extractions, 92 percent of the maxillary extractions resulted in ideal space closure regardless of timing, while only 66 percent of the mandibular FPMs producing favorable results despite the extraction at the 'ideal time'[17]. Another study found that space closure in the maxillary jaw was more successful than in the mandible, with a 100% success rate[18]. The results of early and late PFM extractions may become more complicated due to the biological structure of the bone tissue in the mandible and the direction of eruption of the permanent second molars. Canpolat *et al* reported that since rotations in adjacent teeth occur regardless of the extractions timing, the cases should be followed-up and intervened if necessary[19]. The most important condition for this spontaneous space closure is to extract the PFM at the right time[1,4,6]. Based on this information, in our first question, we added the "age" factor to the question of "What have you pay attention to when determining root canal treatment or extraction indication for PFM teeth". 93.7% of the dentists who participated in the survey stated that the age of the patient will affect the choice of treatment. This result is satisfactory as the majority gave the correct answer. It is also available in the literature that timing is an important factor in terms of age[2]. Because, when the mandibular PFM teeth extracted before the age of 8 years; the extraction space creates a less resistant eruption path for the germ of the neighboring second premolar tooth, and the second premolar tooth can rotate, drift, and tipping towards this space[12,20]. In addition; early contact of the condyles, during growth and development following mandibular PFM loss, causes horizontal displacement and asymmetric growth of the mandible[3]. Early extraction of maxillary PFM teeth can cause posterior cross-bite and mesialization/rotation of posterior teeth[3] and skeletal/dental asymmetries[2] in grow-up children.

However, extractions after the eruption of the permanent second molar (PSM) tooth, called late extractions, results in an unsatisfactory closure[21]. Poor contact interferences are formed between the PSM and the second premolars when the PSM tooth is drifted towards mesiolingually and the second premolars drifted distally. This poor contact causes posterior cross-bite, non-working side interferences, periodontal diseases, and alveolar bone atrophy[12,21]. Occlusal interferences that occur as a result of the overeruption of the maxillary PFM tooth can block the mesial movement of the PSM tooth in the mandible and create a predisposing factor for temporomandibular joint (TMJ) dysfunction[21]. The PSM tooth may be drifting into the mesial, or even tipping, causing mesiopalatinal rotation around the palatinal root[12,21] as a result of delayed extractions if in the maxilla.

In another option of the same question, 97.1% of the pedodontists stated that "the patient's tooth alignment and the presence of crowding changed the choice of treatment", although this rate was 91.6% for orthodontists, 83.3% for oral and maxillofacial surgeons, and 82% for general dentists. However, when the literature was examined, PFM extraction decisions and timings depend on the patient's dental malocclusion, the severity of intra-arch crowding, the amount of anterior overjet and overbite, skeletal and dental buccal segment relationships, and posterior occlusion[13,20,22,23]. Before the decision of extraction, the existing occlusion, the severity of crowding, the positions of the other teeth, and the occlusion should be evaluated[11,21]. In cases that prevent spontaneous space closure or cause deterioration of the existing occlusion, midline deviations, or malocclusion development/exacerbation; there may be situations in which the PFM teeth should be left in the mouth, even if the prognosis is very poor. Malocclusion is aggravated in mandibular PFM teeth extraction in the Angle Class II cases, and in maxillar PFM tooth extraction in Class III cases[6,12,13,21]. It has been determined that 16.7% of oral and maxillofacial surgeons and 18% of general dentists have wrong information on this question.

While deciding to extract or root canal treatment, the effect of PFM extractions on maxillofacial tissues in young patients should also be taken into account[24]. Many studies are investigating the effects of PFM extraction on occlusion, skeletal and dental tissues, and even on third molar development[2,20,22]. Studies in the literature have evidence that the presence of a permanent 3rd molar tooth and the direction and angle of the eruption of the PSM tooth are stronger indicators of spontaneous space closure than the PSM development stage[17]. Researchers; found a positive relationship between the root development level and eruption direction of the PSM tooth, the presence/angle of the permanent 3rd molar and premolar tooth, and the skeletal structure of the child and spontaneous occlusion[1]. For this reason, in our survey, we questioned whether the participants evaluated these criteria in the PFM tooth extraction decision. However, in our survey, when deciding on the extraction of the PFM teeth, while 91% of the participants took PSM into consideration, only 64.4% of the participants took "the presence/root development of the third molar tooth" into consideration. 51% of participants found "the presence at the second premolar/root development"

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important, in pre-extraction evaluation. It has been determined that pedodontists, orthodontists, and oral and maxillofacial surgeons do not take into account the presence of the third molar tooth/root development and the presence of the second premolar/root development and the perception is low. Only 34% of the participants gave the correct answer by stating that all options are important when making the decision to extract. The fact that only 37% of pedodontists state that all options are important is sad proof that there is a very serious lack of information. Especially in the presence of an underlying malocclusion, it is necessary to make a comprehensive assessment of the developing occlusion and pay attention to the results of the extraction of the PFM tooth[12]. Extraction of PFMs may cause tipping of adjacent teeth towards the extraction area, extrusion of the opposite teeth, asymmetric chewing habits, alveolar bone atrophy in the extraction cavity, and periodontal problems[25,26]. The severity of these complications requires especially the pedodontists, orthodontists, and oral and maxillofacial surgeons to have sufficient knowledge on this subject.

86.6% of the dentists participating in the survey stated that they had information about spontaneous space closure after PFM extraction. This rate was even higher in specialists (93.3% of pedodontists, 91.6% of orthodontists). We think that the relatively high level of knowledge of all dentists on spontaneous space closure is due to the fact that most of the studies on PFM extraction in the literature are about this subject[1,27,28]. 55.6% of our participants stated that they have an idea about compensation and 56.1% of them have an idea about balancing extractions. However 89.7% of them stated that they need more information on this subject. The purpose of asking this question was to measure how confident dentists were of what they knew and its usability. Even pedodontists need 81.9% more information on controlled extraction; we think that this result is because they cannot predict possible consequences and complications. Especially in general dentists (37.7% and 38.2%) and oral and maxillofacial surgeons (45.2% and 42.8%) knowledge about balancing and compensation extraction is very low and it was determined that pedodontists and orthodontists have ideas, but do not practice them. This may be due to the information not being settled. Dentists may have coincidentally answered their questions correctly or do not know how to use their knowledge. The fact that there are very few sources on this subject in the literature and that different applications are suggested supports this view. Williams and Gowans recommend both balancing and compensation extractions in the lower and upper jaws[6]. There are also studies supporting this view[4,13,28]. The more common view is that compensation extractions should be done in mandibular PFM extractions, but there is no need for compensation extraction for the mandibular PFM, after the maxillar PFM extraction[8]. However, there are also studies that find the risk of upper PFMs over-eruption low as a result of lower PFM extraction, this evidence is generally based on retrospective cohort studies with very small subgroups[28]. Likewise, there is confusion of information in balancing extractions. While some studies suggest balance extractions to preserve arch symmetry[6,13], retrospective cohort studies suggest that unilateral PFM absence may be associated with the development of both skeletal and dental arch asymmetry. According to some studies, it is unlikely that the midline is affected neither in the lower nor the upper jaw[28]. Based on the data in the literature, balance extraction is not recommended to maintain the midline only[6,13,21]. The decision and time of extractions may vary depending on the occlusion type of the patient, and the severity of crowding in the buccal and labial segments. Therefore, it is possible to make a healthy extraction decision after evaluating the patient's occlusion type and the amount of space required in dental arches for proper alignment of permanent teeth[12]. Besides, in each PFM extraction, whether the patient needs balance or compensation extraction should be evaluated to prevent midline shift or overeruption[5].

There is a common view that defends the compensation extraction of the upper PFM when the lower PFM extraction is planned. The reason for this is that the upper PFM is likely to overerupt after the lower PFM extraction, preventing the lower PSM's mesial movement[4]. Williams and Gowans recommend extracting the tooth in the upper jaw to prevent the overeruption of the opposite tooth. Moreover, it is recommended to remove the contralateral tooth as well as the molar of the lower jaw in preventing the midline slippage[6]. However, there are very few data in the literature to support the extraction of the lower molar for compensation[4]. The number of clinical studies not only on balance-compensation extraction but also on PFM extraction and outcomes in pediatric patients is quite low. For this reason, considering that dentists may lack information on this subject, we asked about "the complications that may occur after unilateral PFM extractions". 81.5% of general participants, 83.8% of pedodontists, 86.4% of orthodontists, and 82% of general practitioners and research assistants answered as the extractions can cause "deviations from the midline". However, in practice, the rate of those who make balance extraction is only 39.9%. We concluded that dentists were hesitant and did not put their knowledge into practice. Less than a quarter of general dentists(21.1%) and oral and maxillofacial surgeons(21.4%) practice balance extractions in the clinic. The low number of evidence-based clinical data and the lack of consensus in the literature that suggest or oppose balancing and compensation extraction caused indecision among dentists[8,27]. In the literature, it has been reported that even pedodontists and orthodontists have hesitancy in the decision to extract PFM teeth[5]. For the same reason, the number of dentists practiced in the clinic(compensation 38.6%, balance 39.9%) was quite low compared to those who stated that they knew. The number of people who extract and follow is even less.

In hypodivergent or hyperdivergent face types, PFM extraction may aggravate the malocclusion[6,12,21]. Extraction should not be performed, as this will result in more dramatic problems such as a decrease in lower face height[23] and retrusion or lingual tipping of the mandibular anterior teeth. If extraction is inevitable, extraction can be done in consultation with the orthodontist in order not to spoil the existing profile. The vertical morphology of the face, that is, the patient has a hyperdivergent or hypodivergent face type, directly reflects the direction of growth and development. PFM extractions during growth and development have a significant effect on arch integrity and chewing[5]. As a general rule in patients with hyperdivergent face type, extraction of mandibular teeth should be avoided as much as possible as it exacerbates malocclusion. It has been stated that in patients with hypodivergent facial type, compensation and balance extractions should be performed in the ideal time with first molars with poor prognosis[6,12,13]. Based on the importance of this information, when asked about the effect of face type in the

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decision of compensation and balance extraction of PFM teeth, even the pedodontists and orthodontists who responded correctly with the highest rate remained below 50%. In the decision of compensation extraction of PFM teeth, the patient's hypodivergent or hyperdivergent face type; that is, the rate of participants who thought both were important was 37.1%, while the rate of those who chose neither option was 9.2%. In the balance extraction decision of PFM teeth, the patient's hypodivergent or hyperdivergent face type; that is, the rate of participants who thought both were important was 37.8%, while the rate of those who chose neither option was 15.1%. However, the low knowledge level of the pedodontists and the orthodontists, who will make the decision, is thought-provoking. General dentists (32.2%) and oral and maxillofacial surgeons (26%) were very inadequate in this regard. There are few studies examining the effect of early loss of PFMs on occlusion in different occlusions and different face types[5]. Prospective randomized controlled clinical studies are necessary for dentists to make the right decision[5,29]. Wrong answers given to very critical questions suggest that the existing correct answers may also be random.

In order to learn how dentists' knowledge of the results of controlled extractions, we asked "Do maxillary teeth undergo overeruption during extractions in the mandible?". 97.9% of orthodontists, 96.7% of general practitioners and residents, and 89.5% of pedodontists answered "Yes" to the question. This result is consistent with the common view in the literature[4,6,8,13,28]. In a study in which the opposite molars were followed for 10 years after the extraction of 84 mandibular PFM teeth in adult patients; It has been reported that 58% of the cases develop overeruption up to 2 mm and in 24% more than 2 mm, only 18% of them do not[30]. In another study, it was recommended that the patient should be informed and this risk should be taken into account in any general decision regarding the extraction pattern, and later withdrawal if necessary[31].

The ratio of the participants who think that the mandibular PFM will undergo overeruption in maxillary PFM extraction is 73.5%. The common view in the literature is the opposite[8,12]. The fact that the dentists recommend compensation extraction of mandibular PFM at a high rate shows that they do not follow up-to-date information on this issue. It is an important result that 92.8% of oral and maxillofacial surgeons, 76.9% of general dentists, 68.7% of orthodontists, and almost half of pedodontists (55.7%) think about mandibular PFM overeruption, which may cause an unnecessary decision to extract healthy teeth. As a general rule especially for Angle Class II Div 2 cases, extraction of the mandibular teeth should be avoided as much as possible as it will aggravate the malocclusion. This causes to collapse profile more dramatically in patients with Class II occlusion[6,12,13,21]. In order to determine the source and accuracy of the information, when the question asked "where did you get the information about the balance and compensation extraction", 29.7% of the total participants and 59% of the pedodontists stated that they learned in their specialty training. This means that the remaining dentists are deprived of the knowledge they need to get during their specialization or they are individually dependent on the information confusion in the literature. The fact that pedodontists and orthodontists, who need to take this information during their residency training, have inadequate knowledge about controlled extraction of PFM teeth, and need more information can be solved by joint conferences, congresses, and seminars. The problem of oral and maxillofacial surgeons showing more reservations about this issue, although there are clinicians who make PFM teeth extractions, can be solved by adding it to the basic curriculum in undergraduate education. All dentists must have qualified information to make the right decision without hesitation and prejudice. teaching controlled extraction in the undergraduate education programs, adding the subject to textbooks, and focusing on clinical prospective studies can resolve the confusion on this issue.

It is predicted that the clinical practice information observed in this study may contribute to the limited literature on achieving ideal occlusion after the extraction of PFM teeth. With the data we obtained from this study; It has been determined that even pediatric dentists, orthodontists, and oral and maxillofacial surgeons, who need to know and apply this issue best, have incomplete and even false information. Dentists are also aware of this situation and stated that they would like to learn more. There is no definite consensus in the literature especially on balancing and compensation extraction and an increase in clinical prospective studies is needed. Because each child's own dentition and jaw development is unique and requires special evaluation. Long-term clinical follow-ups with large patient groups are needed in this regard. Only in this way, a reliable and precise evidence-based template can be created and certain indications can be placed on similar patient groups. It will be beneficial to organize seminars, conferences, and training on this subject for dentists to reach the correct information they desire. Including the subject in the textbooks and even taking it into the core education program is necessary for the dentist to grow up from the ground up. By providing more comprehensive information to dentists about balancing and compensation extraction; with the widespread use of correct clinical practices, it is possible to encourage follow-up and prevent complications. It is predicted that dentists' ability to make the right decision without hesitation in such cases will provide a much better clinical practice.

CONCLUSION

There is no definite consensus in the literature especially on balancing and compensation extraction and an increase in clinical prospective studies is needed. Because each child's own dentition and jaw development is unique and requires special evaluation. Long-term clinical follow-ups with large patient groups are needed in this regard. Only in this way, a reliable and precise evidence-based template can be created and certain indications can be placed on similar patient groups. It will be beneficial to organize seminars, conferences, and training on this subject for dentists to reach the correct information they desire. Including the subject in the textbooks and even taking it into the core education program is necessary for the dentist to grow up from the ground up. By providing more comprehensive information to dentists about balancing and compensation extraction; with the widespread use of correct clinical practices, it is possible to encourage follow-up and prevent complications. It is predicted that dentists' ability to make the right decision without hesitation in such cases will provide a much better clinical practice.

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The investigation was approved by the Health Sciences Non-Invasive Clinical Research Ethics Committee of Inonu University (Decision No: 2019/341).The corresponding author had send the documentation of compliance with ethical standards.

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