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EXTRACTIONS IN ORTHODONTICS: LITERATURE REVIEW

EXTRAÇÕES EM ORTODONTIA: REVISÃO DE LITERATURA

EXTRAÇÕES EM ORTODONTIA: REVISIÓN DE LITERATURA

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ABSTRACT
Tooth extractions for orthodontic purposes has been a topic discussed for over a hundred years and, currently, the criteria that determine the choice of this form of treatment go beyond the analysis of models and the position that the teeth are in the bone base. The aim of this study was to analyze the indications for extractions, which teeth are extracted most frequently, and post-treatment stability. The study was developed from an electronic search in PubMed/Medline and Google Scholar databases. Articles published over a 10-year period were selected that addressed extractions in the treatment plan. Duplicate articles in both databases and those that did not address the topic of Extractions were excluded. 468 articles were found in PubMed and 152 in Google Scholar, 472 were excluded, 153 articles were examined, reaching the selection of 37 articles and, of these, only 12 were used for the development of this work. The extractions are indicated in cases of dental and skeletal discrepancies, protrusion or biprotrusion and ortho-surgical treatments. The main teeth to be extracted are the maxillary premolars due to their location in the arch and post-treatment stability was similar to cases where extractions are not chosen in the treatment plan.

KEYWORDS: Oral Surgery. Malocclusion. Recurrence.

RESUMO
As extrações dentárias para fins ortodônticos compõe um tema debatido há mais de cem anos e, atualmente, os critérios que determinam a escolha dessa forma de tratamento vão além de análise de modelos e da posição que os dentes se encontram na base óssea. O objetivo deste estudo foi analisar as indicações das extrações, quais dentes são extraídos com maior frequência, e a estabilidade pós-tratamento. O estudo foi desenvolvido a partir de uma busca eletrônica nas bases de dados PubMed/Medline e Google Scholar. Foram selecionados artigos publicados no período de 10 anos que tivessem como abordagem as extrações no plano de tratamento. Foram excluídos artigos duplicados em ambas as bases de dados e aqueles que não abordassem o tema Extrações. Foram encontrados 468 artigos no PubMed e 152 no Google Scholar, sendo excluídos 472, examinados 153 artigos, chegando à seleção de 37 artigos e, destes, apenas 12 foram utilizados para o desenvolvimento deste trabalho. As exodontias são indicadas em casos de discrepâncias dentárias e esqueléticas, protrusão ou biprotrusão e tratamentos orto-cirúrgicos. Os principais dentes a serem extraídos são os pré-molares superiores devido à sua localização no arco e a estabilidade pós-tratamento se mostrou semelhante a casos onde não se optam por extrações no plano de tratamento.

PALAVRAS-CHAVE: Exodontia. Maloclusão. Recidiva.

RESUMEN
Las extracciones dentales con fines de ortodoncia han sido un tema debatido durante más de cien años y, en la actualidad, los criterios que determinan la elección de esta forma de tratamiento van más allá del análisis de modelos y la posición que ocupan los dientes en la base ósea. El objetivo de este estudio fue analizar las indicaciones de exodoncia, qué dientes se extraen con mayor frecuencia y la estabilidad postratamiento. El estudio se desarrolló a partir de una búsqueda electrónica en las bases de datos PubMed/Medline y Google Scholar. Se seleccionaron artículos publicados durante un período de 10 años que abordaran las extracciones en el plan de tratamiento. Se excluyeron los artículos duplicados en ambas bases de datos y aquellos que no abordaban el tema de las

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extracciones. Se encontraron 468 artículos en PubMed y 152 en Google Scholar, se excluyeron 472, se examinaron 153 artículos, llegando a la selección de 37 artículos y, de estos, solo 12 fueron utilizados para el desarrollo de este trabajo. Las extracciones están indicadas en casos de discrepancias dentales y esqueléticas, protrusión o biprotrusión y tratamientos ortoquirúrgicos. Los principales dientes a extraer son los premolares superiores debido a su ubicación en la arcada y la estabilidad postratamiento fue similar a los casos en los que no se optó por extracciones en el plan de tratamiento.

PALABRAS CLAVE: Cirugía Bucal. Maloclusión. Recurrencia.

1. INTRODUCTION

At the beginning of the 20th century (between the years 1900-1930), orthodontists were influenced by Angle's concepts regarding the possibility of positioning all permanent teeth on the alveolar bone, considering the extraction of premolars or any other tooth an unacceptable procedure. On the other hand, Calvin Case, through his clinical observations, defended tooth extractions to correct facial deformities (DARDENGO et al., 2016). According to Case, extraction was essential in 3% of the cases that presented Class I malocclusion, in 5% of the Class II cases and almost 0% of the Class III cases. Thus, considering the incidence of these malocclusions, only 6 to 7% of treated cases required extractions (GRABER et al., 2011; SILVA et al., 2022).

In 1930, Charles Tweed, a follower of Angle, evaluated cases previously treated according to Angle's philosophy, without any extraction. After analysis, he noticed that 80% of the cases did not achieve stability, facial esthetics and did not even approach the functional goals. Therefore, Tweed started to defend extractions as a way to achieve facial harmony and avoid recurrences (DARDENGO et al., 2016; VELOSO et al., 2021). These results changed the way orthodontic planning was carried out at the time, and extractions began to play a major role as part of orthodontic treatments. In 1945, Tweed defined his plans based on the patients' facial growth pattern as well as the position of the lower incisors at their apical base (over the mandible). The treatment plans were guided by a table system with a list of problems on one side and indications for extractions on the other. This procedure dominated orthodontics for a quarter of a century.

Between 1950 and 1960, tooth extractions indicated as part of orthodontic treatment became common, being incorporated by orthodontists in their orthodontic planning. At that time, the numbers of extractions reached their peak and from there, they started to decrease considerably (NORMANDO; JANSON, 2017).

The philosophy of tooth extraction for orthodontic purposes has been debated for over a hundred years and, at present, the criteria that determine the choice of this form of treatment go beyond the analysis of models and the position that the teeth are in the bone base. This decision depends on dental, facial and skeletal assessments to obtain an accurate diagnosis with an effective treatment plan (CASO, 1913).

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The factors necessary for decision making involve patient cooperation, facial profile, skeletal age, presence of dental asymmetry, anteroposterior relationships, as well as the presence of pathologies (CASO, 1912; TWEED, 1944; LUCRO, 1994).

In addition to the factors mentioned above, the concern with facial aging is also considered an element that influences orthodontic planning, as treatments that require significant retraction of the upper and lower incisors can accelerate the effect of aging by a proportion of 10 years. However, there are studies that claim that treatment with tooth extraction does not influence changes in the soft tissue profile over time, nor does it change the patient's profile in terms of facial height (SALZMANN, 1965; STRANG; THOMPSON, 1958; RUELLAS et al., 2010).

One of the elements that indicate extraction in orthodontics is the amount of space needed for teeth alignment. In this context, some technical developments, such as direct bonding to replace the need for banding of all teeth, the use of interproximal wear and the great development of expanders, are elements responsible for the decline in the indication of extractions in cases of soft-to-edge crowding. moderate. With the advancement of studies in the field of Orthodontics, as well as the improvement of bonding, the introduction of new techniques allowed the orthodontist to solve the problems listed in his diagnosis in a more conservative way in orthodontic planning, such as interproximal reduction, thermoplastic aligners, functional appliances, self-ligating brackets and temporary anchorage devices (SALZMANN, 1965). Such resources promote expansion and space gain in the arches, however, extractions remain an option in treatment plans that aim to improve facial appearance as well as obtain stable post-treatment results (CASO, 1913; PECK S; PECK H, 1979; RATHOD et al., 2015; WEINTRAUB et al., 1989; GAYA et al., 1999; SCHROEDER et al., 2011).

Premolars are commonly chosen during orthodontic planning to be extracted. The choice of these teeth is justified by their proximity to the anterior and posterior teeth and because they occupy an intermediate position in the arch, which facilitates the correction of crowding, dentoalveolar protrusion and midline deviations (SCHROEDER et al., 2011).

Certainly, when evaluating the results of an orthodontic treatment to classify it as successful or unsuccessful, we must have stability as a determining factor. Thus, after performing a thorough diagnosis, it is important to choose the treatment plan that is more likely to provide stable results, in addition to pleasant aesthetics and ideal function. In this way, the objective the purpose of this study was to analyze in the literature the indications for extractions, which teeth are extracted most frequently, and post-treatment stability.

2. METHODOLOGY

As a search strategy used in all the databases used for the development of this work, the following descriptors were adopted: orthodontic extractions, malocclusion correction, malocclusion treatment, relapse of orthodontic treatment. The electronic search was performed in the following databases in the Health Sciences area: PubMed/Medline and Google Scholar. Full articles published in the last ten years (2012, January to 2022, January) were selected and studies that addressed

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orthodontic treatment in their treatment plan, published over a 10-year period, were selected. Duplicate articles in both databases and those that did not involve extractions for orthodontic purposes were excluded. After the initial selection, the full reading of the articles was carried out, excluding those that were not available in full and the studies duplicated between the databases. Finally, the extraction of data from the selected studies was carried out with the aid of a table, seeking to reduce errors in the transcription of information, finally proceeding to the analysis of the selected articles. In the initial search, 468 articles were found on PubMed and 152 articles on Google Scholar. 472 duplicate articles were excluded and the titles of the remaining 153 articles were analyzed. After reading their titles, 37 met the criteria and were selected to read the abstract. Reading the abstracts made it possible to select 12 articles for full reading, as they addressed the proposed topic and selection criteria. After a complete reading of the articles, the 12 were included in this review, as shown in the flowchart shown in Figure 1.

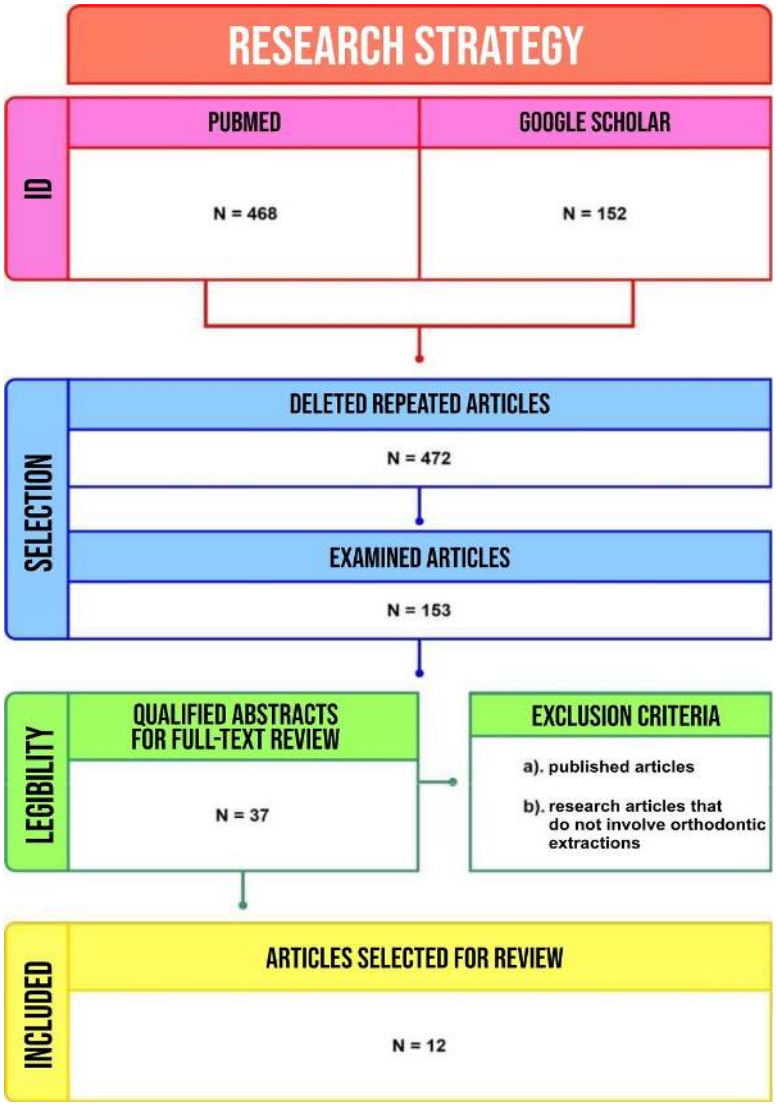

FIGURE 1. Flowchart of article selection.
Source: Author

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3. RESULTS

Extractions are indicated in cases of discrepancy between tooth size and arch size, profile discrepancies, in cases of patients who present dentoalveolar protrusion or biprotrusion. In cases of primary skeletal errors, such as Class II or III, where there is a need for compensatory treatment, extractions also appear as an alternative for correction. In addition, extractions can also be used in ortho-surgical treatment plans. The Orthodontist would work by removing dental compensations for subsequent surgical correction.

According to the literature, regarding the extraction frequency in relation to the Angle classification, no significant differences were found between the classes. Treatment of patients with Class I malocclusion has a lower frequency of extraction, while the highest frequency is observed in patients with Class II malocclusion. The choice of teeth to be extracted must consider their position in the arch, in addition to other factors such as caries, developmental changes, endodontic treatment, extensive or poor-quality restorations, and ectopic location (SALZMANN, 1965; RUELLAS et al., 2010). Among the treatment modalities performed with extractions, compared according to the Angle classification, extraction of the four first premolars (14, 24, 34, 44) is the most frequent combination, followed by extraction of only the first premolars. superiors (14 and 24). The location of these teeth favors the correction of midline deviations and space problems in the incisor region, in addition to their position and size, which are compatible with most types of discrepancies in cases that require retraction of anterior teeth (WEINTRAUB et al., 1989; GAYA et al., 1999).

Molars can also be indicated for extractions, especially in cases of adult patients, where it is common to find some degree of involvement, or even the absence, of one or more molars. In cases where there is a lack of space for teeth alignment, dental protrusion or intra-arch asymmetries, in which the extraction of permanent teeth is indicated, compromised molars can become the first option for extraction when the premolars are in better condition. conditions (SALZMANN, 1965).

The extraction of first permanent molars for orthodontic purposes is indicated in the presence of molars that are excessively extruded, endodontically treated, with caries and/or extensive restorations, with accentuated periodontal involvement and in orthodontic retreatments that present Class II malocclusion with absence of the four pre-dental teeth. molars. Molar extractions are also indicated in severe crowding, in patients who have a high mandibular plane and a convex profile, as the mesial movement of the posterior teeth helps to obtain an anti-clockwise rotation of the mandible and in cases with a previous absence of one of the teeth. molars (DARDENGO et al., 2016; VELOSO et al., 2021). The extraction of second molars is a viable alternative to be considered when these teeth are severely damaged or malpositioned and when there is crowding in the posterior region, but it should not be considered as an alternative that replaces the extraction of premolars in cases of dental crowding. in the anterior region or, still, of severe protrusion of the incisors (SALZMANN, 1967; RIVER; TULLOCH, 1983; RICHARDSON; MILLS, 1990; MEZOMO et al., 1998). In the case of third molars, the average age for eruption of these teeth is around 20 years of age, although the eruption can continue until 25 years of age (MOFFIT, 1998; ARTUN et al., 2005). The maxillary third molars

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assume a distal tipping during the early stages of development, with mesial tipping being rarely observed (ARTUN et al., 2005). The lower third molar begins to form angled horizontally and, with its development and growth of the mandible, the angulation changes from horizontal to mesioangular and, finally, to vertical (PETERSON et al., 2015). The ideal time to remove third molars is when these teeth are more than 1/3 root formed, usually between 17 and 20 years of age. Currently, with the use of skeletal anchorage devices, it is possible to recommend the extraction of third molars to obtain space, aiming at the correction of Class II through the distalization of the maxillary molars (ARTESE, 2006).

The extraction of lower incisors (41, 31, 42, 32) is indicated when the eruption of another tooth is altered by its presence, when it interferes with aesthetics or orthodontic treatment, when associated with a pathology, or even when it is causing resorption in adjacent roots. Plans must be individualized, but decisions can be facilitated in cases where supernumeraries are present. After the decision to extract an incisor, the professional must define which one will be removed (LEONARD; BARBATO, 2004).

After the decision to extract an incisor, the professional must define which one will be removed. The indication depends on the association of the following factors: type of malocclusion, amount of anterior tooth volume discrepancy, length of the arch in the anterior region, conditions of dental health and supporting tissues and relationship of the upper and lower dental midline (GAYA, 1999; FRANÇA; OLIVEIRA, 2017).

When comparing the stability of dental relationships in treatments involving extractions and treatments that do not have extractions in their planning, there is a similarity in this regard, leading to the conclusion that post-treatment stability depends on other factors that must be analyzed during planning. orthodontic treatment such as age, patient motivation in relation to treatment, use of retainer, degree of skeletal and dental discrepancy. The option for extractions does not significantly influence the stability of the occlusion (NORMANDO; JANSON, 2017).

4. DISCUSSION

Crowding is a common feature in malocclusions caused by lack of arch space, that is, a discrepancy between tooth size and arch size. Correction of this disorder can occur in three ways: distalizing or proclining teeth, taking into account the patient's facial profile; increasing the size of the arch, in cases of atretic arches or reducing tooth size, from interproximal wear and extractions. Dentoalveolar and labial protrusion are characterized by being a profile discrepancy where treatment with extractions can be used to correct it. When extracting the teeth, a retraction of the profile occurs, leading to a change in the facial outline. In cases of primary skeletal errors, such as Class II or III, where there is a need for compensatory treatment, extractions also appear as an alternative for correction. In a skeletal class II, where the maxilla and mandible are disproportionate, a compensatory treatment is used, in which the teeth are moved to disguise the differences between the arches. The bite is corrected, but the profile is still the same. When this correction is made surgically, an ortho-

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surgical treatment is started. In these cases, the Oral and Maxillofacial Surgeon requests the removal of dental compensations to the Orthodontist and the extraction would increase the error so that it can be surgically compensated (TWEED, 1944; SALZMANN, 1965; STRANG; THOMPSON, 1968).

The choice of teeth to be extracted must consider their position in the arch, in addition to other factors, such as caries, developmental changes, endodontic treatment, extensive restorations and/or poor-quality restorations and ectopic location (PECK S; PECK H, 1979).

Based on these precepts, premolars are preferably chosen. It is believed that this finding is due to the location of these elements in the dental arch, which favors the correction of midline deviations, space problems in the incisor region and, because its size is compatible for the correction of most discrepancies. Currently, premolar extractions, the most common being the four maxillary first premolars (14, 24, 15, 25) and maxillary first premolars (14, 24), are indicated in the treatment of malocclusions that present crowding. moderate to severe and, in patients who have facial biprotrusion, in order to obtain space for the good positioning of the teeth and provide an improvement in the aesthetics of the profile (JANSON et al., 2004).

The stability of dental relationships is an important factor to be considered in orthodontic planning, as relapse is explicit in the clinical evaluation performed by the dental surgeon or by the patients themselves, causing their dissatisfaction with the treatment. Changes in skeletal characteristics are of secondary importance, and should also be targeted, because their changes may reflect changes in tooth positions. It is also important to highlight the existence of great individual variability in stability, since there are numerous factors independent of the treatment that are related to it, such as craniofacial growth, patient collaboration during the use of the retainer, among others. However, when evaluating studies in the literature that compare both treatment protocols, those with and without extraction, a similar pattern of stability of the dental relationships between them was observed, and this helps the orthodontist when choosing one of these protocols, since that leaves you free to decide, considering factors other than stability. In view of this, the decision for a treatment plan without extraction or with extraction will be based on factors such as the patient's age and their degree of motivation with the treatment, the cost/benefit ratio of the treatment, the technical facility and the professional's preference (MASSAHUD; TOTTI, 1004; ARAÚJO; CALDAS, 2014).

5. CONCLUSION

The main indications of extractions are to treat cases of crowding, protrusion of incisors or biprotrusion, to compensate for skeletal malocclusions, and in ortho-surgical treatments. The most extracted teeth are the four first premolars, followed by the option of extracting only the maxillary first premolars. It is concluded that there is no difference in the stability of the correction of malocclusion dental relationships when the treatment is performed without extraction or with extraction and that other factors must also be carefully evaluated when opting for the extraction protocol. A good planning and execution of the technique are key principles for the success of an orthodontic treatment.

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