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Idiopathic condylar resorption: Diagnosis, pathophysiology, treatment and orthodontic considerations

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Abstract

Idiopathic condylar resorption of the temporomandibular joint is a challenge at the time of diagnosis and treatment. The aim of this review is to analyze the existing literature about the diagnostic methods, etiology, pathophysiology and treatment of idiopathic condylar resorption and its relationship with orthodontics. Databases such as Pub Med, Cochrane, Scopus, Web of Science and Google Scholar. The best method of diagnosis are images of CBCT to observe the head of the condyle in search of areas of resorption and interruptions of the bone cortex. There are 5 main etiological factors: age, gender, hormonal, systemic factors and orthognathic surgery, with systemic factors being the most relevant. In patients who do not want to be exposed to surgical treatment, conservative orthodontic treatment or a new protocol is recommended. The best treatment in patients who want to recover their aesthetics is orthognathic surgery combined with occlusal guard and pharmacotherapy to avoid more condylar resorption.

Keywords: Condylar resorption, temporomandibular joint, orthodontics

1. Introduction

Idiopathic condylar resorption of the temporomandibular joint is an uncommon aggressive degenerative condition of the joint [1]. The dental importance of this pathology is that it progressively affects the patient both functionally and aesthetically; In addition, its multifactorial etiology is a challenge at the time of diagnosis and treatment. In addition to this, this pathology is relevant because it implies a significant economic expense for the patient in medications, orthodontic treatment and, generally, surgical treatment. The therapeutic effect in orthodontic treatment used in the management of temporomandibular disorders is controversial [2]. There is literature that states that orthodontic treatment can cause reabsorption condylar itself [3] but has also been established that it has been determined that this reabsorption is specifically caused by this treatment [4]. Idiopathic condylar resorption is characterized by a progressive Class II malocclusion, functional, aesthetic and pain changes [5]. It occurs most frequently in Caucasian women with a 9: 1 ratio, between 15 and 35 years [6]. Most cases of idiopathic condylar resorption are reported in the United States and the Netherlands [7]. This diagnosis is granted when all pathologies of the temporomandibular joint have been discarded [8]. Some diseases such as rheumatoid arthritis, juvenile idiopathic arthritis, trauma, among others can cause condylar resorption [9]. It is important not to confuse idiopathic condylar resorption with idiopathic juvenile arthritis [10] for which studies have been carried out on diagnosis, management and or facial consequences [11]. Orthodontic treatment may coincide with idiopathic condylar resorption; however, it has not been demonstrated that this pathology occurs due to active therapy [12]. On the contrary, condylar resorption after orthognathic surgery has been observed [13]. It is important to carry out this bibliographical review with an orthodontic approach since the orthodontist participates actively in the treatment of candidate patients or who have already undergone orthognathic surgery, so he/she must know and comprehend this pathology and its pathogenesis to offer it.

The most appropriate treatment for your patients. The aim of this review is to analyze the existing literature about the diagnostic methods, etiology, pathophysiology and treatment of idiopathic condylar resorption and its relationship with orthodontics.

2. Materials and methods

We analyzed databases such as PubMed, Cochrane, SCOPUS, Web of Science and Google Scholar in search of reviews, articles and case reports in high impact journals published until 2018 with the following key words: idiopathic condylar resorption, progressive condylar resorption, condylar resorption, condylar resorption physiopathology, diagnosis of condylar resorption, identification of condylar resorption, condylar resorption treatment, management of condylar resorption and orthodontics, and condylar resorption. Then the references of these articles were revised in search of more bibliographic material.

3. Results

3.1 Diagnosis

The diagnosis of idiopathic condylar resorption is made through the observation of clinical manifestations and imaging. This pathology manifests clinically in adults with a progressively retrusive mandibular position as the condyles are reabsorbed [5]. The effects on a growing mandible are the decrease in size and growth rate [9], resulting in an abnormal and dysfunctional morphology [14]. In addition to this, class II molar, canine and skeletal accompanied by open bite, excessive overjet and loss of vertical posterior facial dimension [15]. Generally, this pathology occurs bilaterally, in case it happens unilaterally, a pronounced facial asymmetry will be observed [1]. The imaging diagnosis can be through radiographs, conic beam computed tomography (CBCT) images and magnetic resonance imaging. In cephalometric radiographs, an increase in overjet, a decrease in overbite or both can be observed, together with a decrease in the height of the mandibular branch [16]. In the CBCT a significant decrease in the condylar axial width, height and angle is observed; the most obvious degenerative changes are a non-congruent condyle-fossa relation, resorption and lack of continuity in the bone cortex [17]. Studies have been conducted in which CBCT images have been observed and the condylar change quantified due to resorption [18]. In magnetic resonance, a decrease in size and volume of the condyle can be observed, anterior displacement of the articular disc with or without reduction to the opening, loss of continuity in the bone cortex and amorphous soft tissue in the space between the condyle and the fossa [19]. Although there is literature mentioning that the anterior displacement of the articular disc may or may not be present and that there is no direct relationship between idiopathic condylar resorption and disc displacement [15]. Because the condylar reabsorption is progressive, it is convenient to maintain a photographic and radiographic record of the patient to evaluate if there have been changes in his overjet and overbite. When idiopathic condylar resorption is suspected, the best diagnostic method will be CBCT images to observe the head of the condyle in search of areas of resorption and interruptions of the bone cortex.

3.2 Etiology

The temporomandibular joint is a dynamic structure capable of adapting to mechanical stress to maintain morphological, functional and occlusal homeostasis [20]. This is known as functional condylar remodeling. When there is excessive

mechanical stress or when the adaptive capacity of the host has been lost, dysfunctional remodeling that involves condylar resorption occurs [21]. Arnett and collaborators have proposed 3 categories of etiological factors that favor the dysfunctional remodeling of the temporomandibular joint:

1. The age being on average 20.5 years
2. Systemic factors, especially autoimmune diseases that can influence the metabolism of fibrocartilage and affect the adaptive capacity of the temporomandibular joint
3. Hormonal factors that directly influence mandibular condylar remodeling such as estrogen, prolactin and corticosteroids (7-21). It has also been observed in 2 studies that women with low serum levels of 17 β -estradiol develop condylar resorption (22-23).

In addition to this, it has been reported that the temporomandibular joint can react to orthognathic surgery sporadically with pain, functional limitations, condylar resorption and, therefore, skeletal recurrence [24]. An incidence of 1 to 31% has been reported by non-surgical and surgical factors [4]. Although it is impossible to predict which patients will present idiopathic condylar resorption after this surgery [25], it has been found that young women with mandibular deficiency and high mandibular plane angle, when surgically exposed to counterclockwise rotation of the mandibular segments, they are more likely to present condylar resorption [26]. In these cases, this pathology occurs due to condylar compression caused by a posterior position or excessive torque of the condyle in the glenoid cavity [27]. In the case of orthodontic treatment, 1 case of condylar resorption is presented for every 5,000 patients [1]. Condylar resorption presents very varied etiological factors, the most important being systemic factors and recurrence after orthognathic surgery. The orthodontist must keep in mind that this condition can occur in patients during or after orthodontic treatment.

3.3 Pathophysiology

Regardless of the etiological factor that has triggered condylar resorption, all converge in a single pathway in which there is no balance between bone apposition and remodeling. Free radicals cause oxidation reactions with molecules which can have damaging effects on tissues [28]. This can be triggered by excessive loads in the temporomandibular joint which causes a mechanism of hypoxia-reperfusion. A high oxidation state has been demonstrated in the synovial fluid of the temporomandibular joint when there is bone damage, inflammation and joint dysfunction [29]. The cytokines of the temporomandibular joint are produced by osteoblasts and synoviocytes. The cytokines TNF- α , IL-6 and receptor activator nuclear ligand factor kappa-beta (RANKL) have been associated with condylar resorption, its severity in accordance with its concentration [30]. Osteoprotegerin (OPG) is an inhibitor of RANKL and is more abundant in states of repair and homeostasis [31]. TNF- α , IL-6 and RANKL induce the osteoclast and other cell groups to produce matrix metalloproteinases (MMPs) which degrade extracellular matrix molecules such as collagen and elastin [28]. As the condylar reabsorption progresses, there will be a higher concentration of osteoclast activating cytokines so that it can be potentiated. It has been shown that 17 β -estradiol has a positive effect on the inhibition of TNF- α release, which explains why a low level of 17 β -estradiol favors condylar resorption [22]. The arachidonic acid formed by phospholipids by the action of phospholipases is converted into prostanoid

inflammatory mediators by cyclooxygenases or leukotrienes by the action of lipoxygenases [28]. There is another theory that establishes that female hormones cause biochemical changes in the temporomandibular joint causing hyperplasia of synovial tissues adjacent to the condylar head. This tissue stimulates the production of destructive cytokines in the articular ligament, causing its anterior migration, triggering the reabsorption of the mandibular condyle [32]. The resorption process can be stopped after 1 to 5 years although there is also the possibility that it will be reactivated [33]. These mechanisms can be triggered due to excessive mechanical loads in the joint caused by alterations in the occlusion. The orthodontist, by aligning and leveling the teeth to their ideal position can cause lesion loads in the temporomandibular joint favoring the release of free radicals and proinflammatory cytokines in the joint, so it is advisable not to start orthodontic treatment if a patient has reabsorption active condylar.

3.4 Treatment

Idiopathic condylar resorption is one of the most difficult conditions to treat due to the variability of expression and the unpredictability of existing management options [33]. Currently there are no published randomized clinical trials comparing the results of the various treatments of condylar reabsorption [34]. Although there are very few cases of patients with condylar resorption that can be corrected merely with orthodontic treatment due to the bone discrepancy caused by condylar rebirth, cases have been documented in which conservative orthodontic treatment is performed achieving adaptive condylar remodeling [35]. A new non-surgical treatment protocol has been proposed which consists of placing an occlusal guard that increases the height of premature contact, use of elastics during the night and physiotherapy to restore normal occlusion which has shown good results [36]. In order to correct bone class II, open bite and aesthetics in patients with condylar resorption, orthognathic surgery or its repetition has been performed according to the case; however, the rate of recurrence is high, and additional reabsorption can occur [37]. In a prospective study, 21 patients who were prescribed pharmacotherapy before and after orthognathic surgery were evaluated, and normal opening, stable occlusion and absence of joint pain after up to 36 months were observed [38]. Currently there are 5 agents that block TNF- α which are: etanercept, infliximab, adalimumab, certolizumab and golimumab; In addition, the omega-3 supplement has shown beneficial effects [29]. On the other hand, there are authors who recommend in addition to orthognathic surgery, remove hypertrophied synovial tissue surrounding the condyle, reposition and stabilize the articular disc surgically [32]. There is no scientific information that supports this treatment protocol, but its results are stable [33]. Another treatment option is the reconstruction of the temporomandibular joint with total alloplastic prosthesis which, according to the literature, has had good results [39]. There are several therapeutic options for the management of condylar resorption, each with its advantages and disadvantages. In patients who do not want to be exposed to surgical treatment, conservative orthodontic treatment or the protocol proposed by Dr. Nitzan is recommended. On the other hand, in patients interested in correcting their aesthetics, orthognathic surgery combined with occlusal guard and pharmacotherapy is a very good option.

4. Conclusions

Condylar reabsorption manifests with decreased condylar

size, mandibular ramus and progressive class II open bite. The best diagnostic method is CBCT images to observe the head of the condyle in search of areas of resorption and interruptions of the bone cortex. There are 5 main etiological factors: age, gender, hormonal, systemic factors and orthognathic surgery, with systemic factors being the most relevant. The orthodontist during treatment may cause harmful loads on the temporomandibular joint favoring the release of free radicals and proinflammatory cytokines in the joint that trigger condylar resorption. In patients who do not want to be exposed to surgical treatment, conservative orthodontic treatment or a new protocol is recommended. The best treatment in patients who want to recover their aesthetics is orthognathic surgery combined with occlusal guard and pharmacotherapy to avoid more condylar resorption.

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