

Recognition of Idiopathic Condylar Resorption as a Diagnostic Possibility in an Academic Orthodontic Clinic

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Abstract

Purpose: This study evaluated the efficacy of orthodontic diagnostics in condylar resorption and specifically idiopathic condylar resorption (ICR) in patients who presented with the cardinal signs of anterior open bite and Class II malocclusion prior to orthodontic treatment.

Methods: This retrospective study evaluated the electronic patient record database from 2010 to 2014. The database search inclusion criteria were: a) anterior open bite, b) Class II malocclusion and c) ages 10 to 40 years. The corresponding panoramic and cephalometric radiographs were evaluated for condylar resorption or condylar degenerative changes. The history and diagnostics portion of the electronic patient record was reviewed for patients identified with condylar changes/resorption and evaluated for diagnostic accuracy.

Results: Data collection revealed 122 (n=122) patients, ranging from 10 to 40 years of age, who presented with anterior open bite and Class II malocclusion. Of these 122 patients, a total of 23 showed radiographic condylar changes, consistent with adaptive changes, 1 had changes consistent with bilateral congenital condylar malformations and 3 (2.45%) were consistent with idiopathic condylar resorption but this was not considered as a diagnosis or investigated further in 2 of these patients.

Conclusion: Our data demonstrate poor diagnostic recognition and accuracy of ICR even in a major academic Orthodontic Department, where only 1 of 3 cases of likely ICR were correctly identified and diagnosed. There is a need for increasing the awareness of ICR and incorporating guidelines for diagnostics and treatment protocols which exist in the current literature. It is critical for the orthodontist to recognize and properly diagnose ICR as timely as possible within their patient population.

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Introduction

Anterior open bite has many etiologies, but condylar resorption and idiopathic condylar resorption (ICR) are among them. ICR is a relatively recently recognized etiology and the underlying cause is poorly understood at the present time [1]. Nonetheless, it is essential that condylar resorption as a cause of anterior open bite is recognized and that patients receive the appropriate work-up.

Idiopathic condylar resorption is a condition in which the

mandibular condyles undergo resorption, leading to loss of condylar height [2]. Clinically this presents as mandibular retrusion with clockwise rotation (high angle), Angle Class II anterior open bite (AOB) with excess overjet, malocclusion and loss of overall posterior facial height [3,4]. Typically a diminished condylar head is seen on imaging (e.g., panoramic x-ray, magnetic resonance imaging or computed tomography scanning). The glenoid fossa is morphologically normal and the articular disc may or may not be displaced. ICR typically progresses actively for 6–12 months before stabilizing or “burning out”. In some cases this leaves a

condyle diminished in size while in others the condylar resorption is complete down to the sigmoid notch.

ICR has also been called idiopathic condylitis, condylar atrophy, cheerleader syndrome and progressive condylar resorption. Most often ICR affects females between the ages of 15 to 35 years [5,6] and shows greater frequency during the pubertal growth spurt. It presents most commonly with bilateral but occasionally unilateral condylar involvement. Since condylar resorption has a higher incidence in women over men, it is thought that a prominent systemic factor in the pathogenesis of this disease may be related to sex hormones [7] and the influence a low estrogen level has on bone turnover and metabolism [4]. At the present time, the dominant theory holds that the etiology of ICR is hormonally initiated, modulated by immunological responses and may afflict genetically susceptible individuals influenced by environmental factors [8-10].

At the current time, the diagnosis of idiopathic condylar resorption is made after exclusion of all other known causes of condylar resorption such as autoimmune/inflammatory arthritides (rheumatoid or psoriatic), degenerative osteoarthritis and post-traumatic.

ICR often causes occlusal and skeletal changes, TMJ dysfunction, pain and alterations of the maxillofacial morphology [2-4]. Therefore, it is very likely that the orthodontic specialist will encounter patients with ICR based on the typical clinical presentation and the age range within which orthodontics is typically conducted. Furthermore, ICR may coincide with or follow orthodontic procedures that alter the mechanical loading of the TMJ, including intermaxillary elastics, orthopedic appliances such as Herbst or chin cup. Additionally, ICR may follow dental restorative or orthognathic surgical interventions [11-13]. Therefore, the recognition and management of ICR clearly is essential in patients undergoing orthodontic treatment and it is imperative that it is considered as a diagnosis. Handelman [14] surveyed orthodontists regarding their experience with ICR and estimated an incidence of 1 in 5000 orthodontic patients. This may be an underestimation due to a failure to recognize the condition resulting in poor diagnostic efficacy. Here, we investigate the efficacy of diagnosing possible ICR in an academic orthodontic department.

Methods

IRB approval was obtained for a retrospective database investigation. A database query was initiated to filter the orthodontic electronic patient record database for potential patients afflicted with idiopathic/progressive condylar resorption from 2010 to 2014. This query consisted of the following data retrieval algorithm within the electronic data base (Axium): Anterior open bite (AOB), Class II malocclusion and the age range was 10 to 40 years. The determination for anterior open bite included open bite occlusion from at least canine to canine without anterior contact in maximal intercuspation. Anterior open bites which included only central incisors or laterals were excluded. The specifics for Class II determination included Angle Class II molar relationship and/or skeletal Class II relationship. The skeletal Class II relationship was determined by an ANB

angle (Steiner) greater than 2 degrees. The inclusion criteria did not differentiate between race or gender. Exclusion criteria were children under the age of ten years and individuals above the age of 41 years.

Panoramic and cephalometric radiographs of the patients identified were reviewed for mandibular and occlusal findings. The panoramic radiographic assessment included the point of occlusal contact in relation to the AOB, condylar resorption, decrease in condylar height, condylar head erosion, or flattening and thinning of the condylar heads.

The cephalometric radiographs were evaluated for Angle Class II anterior open bite malocclusion, excess overjet malocclusion, loss of overall posterior facial height and mandibular retroposition with clockwise rotation (high angle). ICR was considered a possible diagnosis in radiographs demonstrating these changes AND contact only on the second molars, indicative of loss of posterior vertical ramus height.

The history and diagnostics portion of the electronic patient record was reviewed for patients identified with condylar changes/resorption and evaluated for diagnostic accuracy in order to identify if a diagnosis for the condylar resorption was considered.

Results

The query of the orthodontic patient database revealed 122 (n=122) patients, ranging from 10 to 40 years of age, who presented with anterior open bite and Class II malocclusion. Of these 122 patients, a total of 23 showed radiographic condylar changes. 1 had bilateral congenital condylar malformations and 3 (2.45%) were consistent with idiopathic condylar resorption (Table 1).

Two of the three patients with changes suggestive of ICR were female and one was male. Only one of the three cases was recognized and diagnosed accurately in the patient's record. The other two cases were undiagnosed/unrecognized and no data entries were found regarding ICR as a possible diagnosis, nor were any modifications made in the orthodontic treatment planning to include the management of ICR (Table 2).

Discussion

Although condylar resorption is well documented in the literature dating back to 1961 [14], idiopathic condylar resorption has only been described and recognized more recently. There are relatively few publications on ICR, from an even smaller number of authors contributing to the literature. Much of this literature comes from the USA and Europe, with a smaller contribution from Asia. This may be due in part to the limited awareness and recognition of this condition. With the gradual dissemination of information, ICR is now more widely recognized. Even with a greater recognition, the diagnosis of ICR remains challenging. ICR is a diagnosis made after exclusion of all other known causes of condylar resorption. Furthermore, the clinical and radiographic features may be very subtle, especially early in the ICR process [15]. Wolford [16] reported an average condylar resorption rate of 0.12 mm per month on panoramic radiograph.

Table 1 Cases identified consistent with ICR.

Patient	Sex	Age at symptom onset	Symptoms	Radiographic findings	Prior orthodontic treatment
1	F	27	AOB, limited and painful mouth opening	Bilateral condylar flattening and thinning, AOB (2nd molars), class II, retrusion and clockwise rotation of the mandible	Age 17
2	F	15	AOB, TMJ pain, limited opening, progressive mandibular retrusion	Bilateral condylar resorption, AOB (2nd molars), Class II and mandibular retrusion	
3	M	17	TMJ pain, progressive AOB, mandibular retrusion	Bilateral condylar flattening and thinning, AOB (2nd molars), class II, retrusion and clockwise rotation of the mandible	Age 12-14

Table 2 Results.

	# of patients with AOB, CI II, age range 10-40 years	Condylar adaptive changes	Findings consistent with ICR (%)	Correct identification of ICR (%)
Patients	n=122	n=23	n=3 (2.45%)	n=1 (33%)

Radiographic imaging using panoramic radiographs, lateral cephalometric radiographs, CT scans and MRI's plays an important part in diagnosis. The condyles will show loss of mass, and can have a thin and shortened morphology with flattening of the superior and anterior curvature [17]. Often, a distal inclination of the condylar neck can be observed [12,18]. The lateral cephalometric radiograph will demonstrate mandibular retrusion and divergence relative to the cranial base (clockwise rotation), shortened posterior facial height, increased overjet and anterior open bite malocclusion with contact on the second molars. Panoramic radiographs were the most common imaging modality in a recent systematic review of ICR [19], yet the ability to detect condylar changes on panoramic radiograph is limited [11]. Cone beam CT scans (CBCT) may provide greater diagnostic sensitivity in ICR.

In addition to the sometimes slow rate of progression and the subtle radiographic changes early in the disease process, diagnosis is also difficult because many patients are asymptomatic. Therefore, idiopathic condylar resorption may go undetected and undiagnosed during routine pretreatment evaluation of orthodontic patients.

The results of our study show that patients presenting to a university orthodontic clinic with preexisting condylar dysmorphologies suggestive of ICR frequently went undiagnosed and unrecognized.

Three cases identified in this study had clinical and radiographic findings suggestive of preexisting ICR. All radiographs were reviewed and interpreted by one surgeon experienced in TMJ surgery. Thus there was no interobserver bias and the intraobserver bias was minimized by evaluating radiographs with the same objective criteria: AOB, point of first contact, condylar size, condylar contour etc. A change in occlusion of this type, particularly when growth is no longer a factor, raises strong suspicion of idiopathic condylar resorption. This study is limited by several factors, including the accuracy and content of the

electronic patient record, the small number of cases identified and the fact that the patients did not receive full work-up to rule out other possible causes of condylar resorption. Therefore, only patients with findings suggestive of ICR and a probable diagnosis of ICR could be identified.

It is essential to recognize and diagnose idiopathic/progressive condylar resorption in orthodontic patients from a case management perspective. When confronted with the possibility of this disease, the orthodontist should seek collaboration with a team of medical and surgical experts; a rheumatologist to rule out autoimmune and rheumatoid disease and a surgeon with experience in TMJ/orthognathic surgery.

Conclusion

This study revealed that only 1 of 3 patients with possible ICR was recognized as such in an academic orthodontic clinic. The correct and timely diagnosis of idiopathic condylar resorption is critical for the orthodontist. The typical patient demographic seeking orthodontic treatment consists of pre-adolescent and adolescents, precisely the time of the onset of ICR, especially in females. Hence, the orthodontist is likely to encounter patients afflicted with ICR in the following circumstances: a) patients who spontaneously develop ICR irrespective of previous orthodontic intervention and b) those patients who manifest ICR during or following orthodontic treatment. Contrary to current literature, ICR may be more common than reported. Thus, there is a need for understanding and better recognition of ICR in the orthodontic practice. Even though ICR is a rare condition, there is a need for educating clinicians and following crucial guidelines for diagnostics and treatment protocols set forth in current literature, which propose practical aspects of recognizing and managing PCR/ICR in the orthodontic practice.

It is critical for the orthodontist to recognize and properly diagnose ICR as timely as possible within their patient population.

References

- 1 Arnett GW, Gunson MJ (2013) Risk factors in the initiation of condylar resorption. *Seminars in Orthodontics* 19: 81-88.
- 2 Huang YL, Pogrel MA, Kaban LB (1997) Diagnosis and management of condylar resorption. *J Oral Maxillofac Surg* 55: 114-119.
- 3 Handelman CS (2004) Ask us. Condylar resorption. *Am J Orthod Dentofacial Orthop* 125: 16A.
- 4 Arnett GW, Tamorello JA (1990) Progressive Class II development: female idiopathic condylar resorption. *Oral Maxillofacial Surg Clin North Am* 2: 699-716.
- 5 Moore KE, Gooris PJ, Stoelinga PJ (1991) The contributing role of condylar resorption to skeletal relapse following mandibular advancement surgery: report of five cases. *J Oral Maxillofac Surg* 49: 448-460.
- 6 Kerstens HC, Tuinzing DB, Golding RP, van der Kwast WA (1990) Condylar atrophy and osteoarthritis after bimaxillary surgery. *Oral Surg Oral Med Oral Pathol* 69: 274-280.
- 7 Gunson MJ, Arnett GW, Formby B, et al (2009) Oral contraceptive pill use and abnormal menstrual cycles in women with severe condylar resorption: A case for low serum 17 beta-estradiol as a major factor in progressive condylar resorption. *Am J Orthod Dentofacial Orthop* 136: 772-779.
- 8 Abubaker AO, Arslan W, Sotereanos GC (1993) Estrogen and progesterone receptors in the temporomandibular joint disk of symptomatic and asymptomatic patients. *J Oral Maxillofac Surg* 51: 1096.
- 9 Arnett GW, Milam SB, Gottesman L (1995) Progressive condylar resorption: Host adaptive capacity factors. *Am J Orthod Dentofacial Orthop*.
- 10 Arnett GW, Milam SB, Gottesman L (1996) Progressive mandibular retrusion – idiopathic condylar resorption. Part II. *Am J Orthod Dentofacial Orthop* 110: 117-27.
- 11 Hwang SJ, Haers PE, Zimmermann A, Oechslin C, Seifert B, et al. (2000) Surgical risk factors for condylar resorption after orthognathic surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 89: 542-552.
- 12 Hoppenreijts TJ, Freihofer HP, Stoelinga PJ, Tuinzing DB, van't Hof MA (1998) Condylar remodelling and resorption after Le Fort I and bimaxillary osteotomies in patients with anterior open bite. A clinical and radiological study. *Int J Oral Maxillofac Surg* 27: 81-91.
- 13 De Clercq CA, Neyt LF, Mommaerts MY, Abeloos JV, De Mot BM (1994) Condylar resorption in orthognathic surgery: A retrospective study. *Int J Adult Orthodon Orthognath Surg* 9: 233-240.
- 14 Burke PH (1961) A case of acquired unilateral mandibular condylar hypoplasia. *Proc R Soc Med* 54: 507-510.
- 15 Handelman C, Greene C (2013) Progressive Condylar Resorption and Dentofacial Deformities. *Seminars in Orthodontics* 19: 53-126.
- 16 Wolford LM, Cardenas L (1999) Idiopathic condylar resorption: Diagnosis, treatment protocol, and outcomes. *Am J Orthod Dentofacial Orthop* 116: 667-677.
- 17 Hoppenreijts TJ, Stoelinga PJ, Grace KL, Robben CM (1999) Long-term evaluation of patients with progressive condylar resorption following orthognathic surgery. *Int J Oral Maxillofac Surg* 28: 411-418.
- 18 Hwang SJ, Haers PE, Seifert B, Sailer HF (2004) Non-surgical risk factors for condylar resorption after orthognathic surgery. *J Craniomaxillofac Surg* 32: 103-111.
- 19 Sansare K, Raghav M, Mallya SM, Karjodkar F (2015) Management-related outcomes and radiographic findings of idiopathic condylar resorption: A systematic review. *Int J Oral Maxillofac Surg* 44: 209-216.