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Condylar resorption after orthognathic surgery: A systematic review

Résorption condylienne après chirurgie orthognathique : revue de la littérature

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Summary

Introduction. Condylar resorption after orthognathic surgery (CROS) represents a progressive alteration of shape and volume of the mandibular condyle. It is a known factor of surgical relapse. The aim of this systematic review was to discuss the physiopathology, mechanisms, risk factors, diagnosis and treatment of this disease.

Materials and methods. A systematic review of the literature was performed on the Pubmed database from 1970 to 2014, using following terms: (“orthognathic surgery”) AND (“condylar resorption” OR “progressive condylar resorption” OR “idiopathic condylar resorption” OR “condylar atrophy” OR “condylolysis”). Papers were included according inclusion and exclusion criterias.

Results. The search led to 32 articles. Seventeen were included. CROS was a condylar remodeling secondary to an imbalance between mechanical stress applied to the temporomandibular joints (TMJ) and the host adaptive capacities. It mainly occurred in 14 to 50 years old women with pre-existing TMJ dysfunction, estrogen deficiency, class II malocclusion with a high mandibular plane angle, a diminished posterior facial height and a posteriorly inclined condylar neck. Mandibular advancement superior to 10 mm, counterclockwise rotation of the mandible and posteriorly condylar repositioning were associated with an increased risk of CROS.

Discussion. Treatment consists in re-operation in case of degradation of the occlusal result after an inactivity period of at least 6 months. Condylectomy with allogenic or autologous reconstruction is an alternative. Prevention is crucial and requires at-risk patient information.

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Résumé

Introduction. La résorption condylienne après chirurgie orthognathique (RCCO) correspond à une altération progressive de la forme et du volume du condyle mandibulaire. Elle est un facteur connu de récurrence après chirurgie orthognathique. L'objectif de cette revue de la littérature était de discuter de la physiopathologie, des mécanismes, des facteurs de risques, du diagnostic et traitements de cette pathologie condylienne.

Matériels et méthodes. Une revue systématique de la littérature scientifique a été réalisée à partir de la base de données PubMed de 1970 à 2014, en associant les combinaisons de termes suivantes : (« orthognathic surgery ») AND (« condylar resorption » OR « progressive condylar resorption » OR « idiopathic condylar resorption » OR « condylar atrophy » OR « condylolysis »). Les articles ont été inclus selon des critères d'inclusion et d'exclusion.

Résultats. Trente-deux articles ont été trouvés. Dix-sept ont été inclus. La RCCO correspondait à un remodelage condylien évolutif secondaire à un déséquilibre entre un stress mécanique appliqué à l'articulation temporomandibulaire (ATM) et les capacités adaptatives de l'hôte. Elle survenait principalement chez les femmes entre 14 et 50 ans, présentant une dysfonction de l'ATM préexistante, un déficit estrogénique, une classe II avec un angle mandibulaire ouvert, une hauteur faciale postérieure diminuée et un col condylien incliné en arrière. Une avancée mandibulaire supérieure à 10 mm, une rotation mandibulaire antihoraire et un repositionnement postérieur du condyle étaient des facteurs associés à une augmentation du risque de RCCO.

Discussion. Le traitement de référence est la reprise chirurgicale en cas de dégradation du résultat occlusal après une période inactive

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minimale de 6 mois. Une alternative est la condylectomie et reconstruction allo- ou autologue. La prévention est essentielle. Elle passe par l'information des patients à risque.

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Mots clés : Résorption osseuse, Condyle mandibulaire, Chirurgie orthognathique, Récidive

Introduction

Phillips and Bell reported the first case of bilateral condylar resorption following sagittal split osteotomy in 1978 [1]. Although no obvious cause was found, they suggested it was due to a modification of biomechanical forces in the TMJ. Since then, numerous theories have emerged and several risk factors were pointed out.

Condylar resorption after orthognathic surgery (CROS) is a rare but well-known clinical entity affecting the temporomandibular joint (TMJ). It is defined as a progressive alteration of shape and volume of the mandibular condyles following either a bilateral sagittal split osteotomy (BSSO), a bimaxillary surgery or even a Le Fort I osteotomy [2–4]. It leads to posterior facial and ramal heights decrease, a progressive mandibular retrusion, an anterior open bite. It is commonly seen in young teenage girls with TMJ dysfunction [5–7]. It must be distinguished from condylar resorptions associated with local (traumatic, tumoral or malformative) or systemic (inflammatory or infectious) diseases [8–11]. It is also referred to as condylolysis, condylar atrophy or osteoarthritis [2,12,13].

The risk factors have been largely reported in literature. They are classified into surgical and non-surgical factors [7,14–16]. Identifying at-risk patients before surgery is important as CROS is a known relapse factor [4].

Treating CROS can be hazardous as the risk of progression of the disease is high. Some physicians recommend a conservative attitude (splints, physiotherapy) while others advocate for surgery (orthognathic surgery, distraction, condylectomy and reconstruction) [3,4,17,18].

The aim of this systematic review was to examine all publicly available literature on CROS in order to discuss the pathophysiology and mechanisms of this disease, as well as the surgical and non-surgical risk factors on an evidence-based-medicine base.

Materials and methods

A systematic review was performed of all English and French language literature on the Pubmed database from 1970 to 2014 using the following headings: (“orthognathic surgery”)

AND (“condylar resorption” OR “progressive condylar resorption” OR “idiopathic condylar resorption” OR “condylar atrophy” OR “condylolysis”). All abstracts were reviewed by one observer. Articles responding to the following criteria: full text in English or French language; human clinical trials; randomized, prospective, multicenter and comparative articles; primary cases of CROS, case series were included and analyzed. It was followed by a chain research of the references. Case reports, previous reviews, descriptive studies, opinion articles, syndrome or systemic disease related condylar resorption, cases of reoperation for CROS were excluded.

Results

The search resulted in 32 papers. After selection according to inclusion and exclusion criteria, 10 papers were included. After chain researching the reference lists, 7 papers were added for the review, resulting in a total of 17 papers (table I).

The follow-up period ranged from 12 to 120 months. The total number of patients was 2994, ranging from 16 to 505 per study. CROS was found in 224 patients (7.5%), with an incidence ranging from 1.2 to 20.2%. Patients' age ranged from 14 to 50 years. De Clercq et al. did not find any influence of age in his series of 29 patients [19]. Female patients seemed to have a greater risk of CROS. Even though four authors did not specify the gender ratio of their series [2,20–22], 87% (164 cases) of the remaining 172 patients with CROS were women. According to Hwang, gender did not influence the onset of CROS [14].

In 152 patients (67.8%), CROS occurred after bimaxillary surgery, in 55 patients (24.5%) after BSSO, in 15 patients (6.7%) after Le Fort I osteotomy and in 2 patients (0.8%) after unilateral sagittal split osteotomy (table II).

CROS occurred with any kind of fixation (table III). Bouwman et al. showed that intermaxillary fixation increased the risk of CROS (26.4% vs 11.9%, $P = 0.039$) [20]. Concerning BSSO, rigid fixation was used in 1692 patients, among which 107 (6.3%) developed CROS. Wire fixation was used in 676 patients among which 67 (9.9%) developed CROS. Borstlap et al. did not specify the kind of fixation used in 222 patients [23]. Hoppenreijns and Hwang did not find any statistical difference

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