Spect bone scintigraphy in the diagnosis of unilateral condylar hyperplasia: a systematic review

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Abstract

Unilateral condylar hyperplasia is an uncommon condition with unknown aetiology which causes overdevelopment of condyle leading to facial asymmetry, mandibular deviation, malocclusion, and articulation dysfunction. The comparison of radiographs and clinical photographs is considered the current accepted standard for the diagnosis of active condylar hyperplasia in patients with facial asymmetry. Single photon emission computed tomography (SPECT) has recently been proposed as an alternative method. SPECT can be interpreted using three reported methods: absolute difference in uptake, uptake ratio, and relative uptake. The sensitivity and specificity of the three methods range between 32.4% and 67.6% and 36.1% and 78.3%, respectively. With such low sensitivity and specificity values, it is not justifiable to use SPECT in place of serial growth assessment for the determination of condylar hyperplasia.

Introduction

Condylar hyperplasia is an unusual malformation of the mandible involving a change in the size and morphology of the condylar neck and head. Skeletal asymmetries of the mandible caused by condylar hyperactivity can pose serious functional, aesthetic, and psychosocial problems for the patients. Unilateral hyperplasia of the mandibular condyle is generally characterized by a slowly developing, progressive enlargement of the condyle and mandibular neck resulting in facial asymmetry and shifting of the midline of the chin to the unaffected side. The aesthetically and functionally unsatisfactory condition has an unknown aetiology, although possible causes include trauma, functional influence, developmental causes, and heredity or genetics factors. The condition may present in early childhood at 6-7 years of age, or at any time during the patient's adolescence growth period, and even after the cessation of skeletal bone growth. This makes the timing of treatment commencement crucial and possibly difficult to predict. Epidemiological data have suggested that there is a female predominance in UCH (unilateral condylar hyperplasia), which theories suggest is related to oestrogenic influences. Based on the clinical and radiological findings, some authors proposed the division of condylar hyperplasia in three pathological subtypes. Hemimandibular elongation (type I), represents the major part of case. It is characterized by an increase in the length of the neck of the condyle and mandibular body shifting. Patients present with contralateral chin deviation, interincisal midline deviation and lateral crossbite on the healthy side. Hemimandibular hyperplasia (type II), the condyle grows in length and diameter. There is an increase in mandibular body height without latero deviation. There is a typical "hack sign" in the mandibular symphysis to abruptly change the height of a horizontal branch to another. Condylar hyperplasia such as a combination of the two entities (type III). On the other hand, Sloowtweg and Muller (1986) classified hyperplastic condyles into 4 different types depending on the arrangement and morphology of the layers of the condyle. For the diagnosis of condylar hyperplasia, in addition to the medical history, it is essential to carry out a good physical examination with special emphasis on symptoms related to possible TMJ dysfunction. As complementary tests, an orthopantomography may be useful, to allow study of the condyle morphology and size. Other interesting tests are computed tomography (CT) or magnetic resonance imaging (MRI). Radioisotope test play an important role in the diagnosis of CH by providing information regarding the activity of the lesion, which will be crucial in deciding the type of treatment to perform. These tests are based on measuring the uptake of the radioisotope at the TMJ level to identify areas of increased osteoblastic activity. There are many references to be found in the literature that discuss the role of radioisotope diagnostic tests in CH, but few authors have investigated the possible relationship of these tests with osteoblastic or growth activity. Treatment of CH is primarily surgical, with or without orthodontic treatment. There are two different procedures, the indication for which depends on the level of activity that shows the affected condyle. During the active phase, a subtotal condylectomy for excess growth stops is mandatory. Once growth has finished, or in the inactive phase, there is a need to correct facial asymmetry or residual malocclusion by means of orthognathic surgery procedures; mainly
maxillary and mandibular osteotomies. For all this, one needs to know exactly in which situation is growing activity at the condylar level and especially whether this has ceased.

Methods

The authors searched PubMed, Web of Science, Embase, Scopus, Medline computerized literature database, supplemented by manual searching of reference lists from each relevant paper identified. The selected articles were evaluated according to the following criteria: patients with mandibular asymmetry caused by condylar hyperplasia, who underwent SPECT bone scintigraphy for pre-treatment assessment. The main search terms were - condylar hyperplasia - SPECT bone scintigraphy - serial radiograph tracing - sensitivity - specificity - TMJ - facial asymmetry - condylectomy - orthognathic surgery -.

Review

The treatment of patients with condylar hyperplasia is determined by the progression of the individual’s condylar growth. There are advantages and disadvantages to both commencing treatment earlier and adopting a watch-and-wait approach in the management of such patients. The condition tends to present during the patient’s adolescence period and may continue even after the cessation of skeletal bone growth. This gradual dentofacial asymmetry and its attendant dental malocclusion will not doubt result in some negative impact on the patient's self image and confidence. A statistically significant female predominance was observed. Vertical forms were more represented than transversal forms. The use of serial observation of growth and serial cephalometric and dental model comparisons is considered as the current accepted standard for the determination of condylar growth status. This technique requires a minimum period of time between observations (6 months - 1 year) in order to determine the status. Bone scintigraphy has been used to aid to determination of bone growth activity since the early 1980. The initial method of scintigraphy involved capture in planar view. In recent years, single photon emission computed tomography (SPECT) has been proposed. However, it has been reported that bone scans are sensitive but no specific, and that conditions affecting the joints, such as healing bone, infection, inflammation, and neoplastic changes, can result in a positive scan value. The reported sensitivity and specificity of SPECT scans has varied amongst studies. The absolute difference in uptake yielded the lowest sensitivity at 32.4% and the uptake ratio had the highest sensitivity at 67.6%; the sensitivity of relative uptake was 41.2%. With regard to specificity at 36.1%, relative uptake had a specificity of 67.5%, and absolute difference in uptake had the highest specificity at 78.3%. The sensitivity and specificity of all three methods are considered to be low. Based on the findings of the primary outcome of sensitivity and specificity the three SPECT analysis methods proposed (absolute difference in uptake, uptake ratio, and relative uptake) are not suitable to be used as a diagnostic tool for condylar hyperplasia.

Conclusions

Facial asymmetry in an aesthetically and functionally unsatisfactory condition that may arise from a number of causes, such as joint resorption, infection-related growth disturbances, and neoplastic changes, among others. SPECT has recently been proposed for the diagnosis of condylar hyperplasia, but when compared to serial growth assessment using cephalometric radiographs and clinical photographs, SPECT bone scintigraphy did not achieve an acceptable sensitivity and specificity, and it is therefore not justifiable to use this for the routine assessment of growth in patients with CH.

References

17. Delaire J. The role of the condyle in the growth of the mandible and in facial balance. Revue De Stomatologie Et De Chirurgie Maxillo-Faciale. 1990;