

Editorial

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Condylar Hyperactivity, Hyperplasia or Hypertrophy? A Comprehensive Guide to Nomenclature and Surgical Techniques

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Unilateral condylar hyperactivity (UCH) has many different definitions in the literature [1–3]. Still, one of the most encompassing definitions describes it as a condition with increased bone-cell activity of one mandibular condyle, resulting in growth-resembling progressive mandibular asymmetry of unknown etiology occurring over an uncertain period of time and at an uncertain rate in patients with varying age ranges, lacking a gold standard [4]. Dr. Robert Adams lived between 1791 and 1875 and, to our knowledge, was the first to describe a UCH in a female patient (Mary Keeve). In the literature and clinical discussions, it is very common to observe confusion between (1) condylar hyperactivity, (2) condylar hyperplasia, (3) condylar hypertrophy, and (4) hypermetabolic condyle. Condylar hyperactivity suggests an increased growth regardless of size, and it's a dynamic term [5]; Condylar hyperplasia means an increase in cell number, ongoing mitosis and a static end stage [6]. Condyle hypertrophy implies an increase in cell size, no mitosis and static end stage. Hypermetabolic condyle suggests an abnormal hypermetabolic growth centre, but it's not a histological term. To use the correct terminology, we should use hyperactivity, usually the primary cause, and hyperplasia, usually secondary to the hyperactivity. Condylar hyperactivity means a growing condyle; size does not matter – the condyle is actively growing.

During the last few years, different classifications have been proposed for UCH. Obwegeser and Makek proposed three types: hemimandibular hyperplasia (HH), hemimandibular elongation (HE) and hybrid forms [1]. A special remark for the term hyperplasia and not hyperactivity. A recent study from Gateno *et al.*, has demonstrated that some assumptions from Obwegeser and Rushton related to UCH subtypes were probably wrong: (1) assumption that the direction of overgrowth was vertical or horizontal but rarely oblique – according to Gateno J. *et al.* [7], the condyle overgrowth is mostly oblique; (2) assumption that there is an association between condylar expansion and direction of growth – according to Gateno J. *et al.* [7], there is no such association.

Nitzan *et al.* proposed a different classification based on the clinical signs and symptoms, namely the direction of asymmetry: transverse, vertical, or combined. In her study on UCH, only 27% of condyles were deformed, the size of the condylar head was larger in 58% of the cases, and the condylar neck was elongated in 69% of the cases and enlarged only in 12% [2].

Further, the Wolford classification system categorised conditions causing condylar hyperplasia, defined as an abnormal enlargement of the jaw condyle. It prioritises by frequency: CH type 1, unilateral or bilateral excessive growth of the condyle; CH type 2: unilateral overgrowth due to benign tumours like osteochondromas or osteomas; CH type 3: rare benign tumours other than osteochondromas/osteomas; CH type 4: malignant tumours originating in the condyle. Type 1 is the most common, and it is further divided into type 1A, which is idiopathic (unknown cause) with potentially ongoing growth into adulthood, and type 1B, which is unilateral with normal condyle architecture but an enlarged head. Growth is usually self-limited. This system helps diagnose condylar hyperplasia and guide the treatment based on the underlying histopathological cause and growth pattern [3].

Please note how, in the classifications, the word used is hyperplasia and not hyperactivity.

Within the classification of condylar pathologies, mandibular condyle hyperplasia takes the centre stage. However, hyperactivity of the condyle becomes paramount in establishing a diagnosis and selecting the most appropriate treatment course. For when the condyle is “active”, the surgical goal is to turn it off, removing the abnormally active growing centre. Current evidence suggests that SPECT scans are the most reliable diagnostic tool to detect condylar hyperactivity. A positive scan with progressive facial asymmetry warrants a condylectomy. Conversely, a positive scan without progression may indicate a watchful waiting approach to be more prudent. Orthognathic surgery is recommended in the case of a negative scan but with present facial asymmetry. The terminology surrounding treatment options can be a source of confusion as well. To clarify:

- **Condylectomy:** this surgical technique involves an osteotomy (bone cut) performed at the level of the sigmoid notch, followed by the removal of the condyle’s head and neck.
- **Condylar Shaving:** this procedure removes a limited amount (2-3mm) of the condylar surface, specifically targeting the fibrocartilage.
- **Condylar Reduction:** this technique removes a more substantial portion (5-6mm) of the condylar surface. It is the preferred treatment for unilateral condylar hyperplasia (UCH).

While some surgeons may mistakenly use the term “condylectomy” for condylar reduction, it is crucial to maintain accurate terminology for clarity. Recently, TMJ surgeons have implemented different types of condylectomy, such as guided proportional condylar reduction [8] or slice functional technique, where the amount of bone to be removed is planned previously. This technical modification aims to equalise the healthy and unhealthy condyles, removing either a single piece or small slices [9]. The advent of 3D planning technology has also brought significant innovations in this field, making condylectomy techniques less invasive and more predictable. To improve the treatment accuracy, the ultimate technique is to perform an intraoral guided proportional condylar reduction [10]. A 3D-printed custom-made cutting guide laying over the sigmoid notch creates a glide plane for oscillating/piezoelectric tools, making the procedure easier.

In conclusion, unilateral condylar hyperactivity (UCH) presents a complex and evolving field of study, marked by a mare magnum of definitions, classifications, and treatment approaches. Despite the frequent misunderstanding between terms such as condylar hyperactivity, hyperplasia, and hypertrophy, understanding the nuances of each is crucial for accurate diagnosis and effective treatment. The advancements in classification systems—from Obwegeser and Makek’s to the Wolford system—have significantly improved our ability to categorize and manage UCH. Surgical interventions like the proportional condylar reduction, particularly when guided by advanced imaging techniques, offer promising outcomes for patients with mandibular asymmetry. While challenges remain, particularly in terminological clarity and treatment precision, the integration of modern technology like 3D planning is enhancing surgical accuracy and in experienced hands to perform an intraoral approach. Ultimately, individualized treatment, based on a thorough diagnostic process, remains key to addressing condylar hyperactivity and restoring facial symmetry for affected patients.

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