

# Hemimandibular hyperplasia and facial deformities associated with temporomandibular joint problems.

## A review

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Mini Review

Orthodontics



### Background

Jaw growth involves the interaction of the muscles of mastication, occlusion, and jaw function. The mandibular condyle is considered a primary growth center of the mandible influencing overall facial size, function and shape. Temporomandibular disorder can present as a musculoskeletal and neuromuscular disease, its clinical characteristics include the masticatory muscles and the temporomandibular joint itself. Facial asymmetry can arise from some pathological condition that affects the temporomandibular joint, having direct changes in facial aesthetics, which is an important aspect for the patient, causing an increase in consultations due to the patient's need to improve their appearance, to achieve a more symmetrical and harmonious contour. Hemimandibular hyperplasia is caused by progressive hemimandibular growth with important aesthetic as well as functional deformities. The main treatment is surgical, performing partial condylectomy in conjunction with orthognathic surgery, which is why timely diagnosis is important to predict a prognosis with an adequate treatment plan.

**Keywords:** Jaw disorders, mandibular condyle, temporomandibular joint, facial asymmetry, hemimandibular hyperplasia, orthognathic surgery.

Jaw growth involves the interaction of the muscles of mastication, occlusion, and jaw function. The mandibular condyle is considered a primary growth center of the mandible influencing overall facial size, function and shape. It is important to determine if any deformity exists in order to predict prognosis and treatment planning.<sup>1</sup> (Figure 1) Joint anomalies can be classified into:

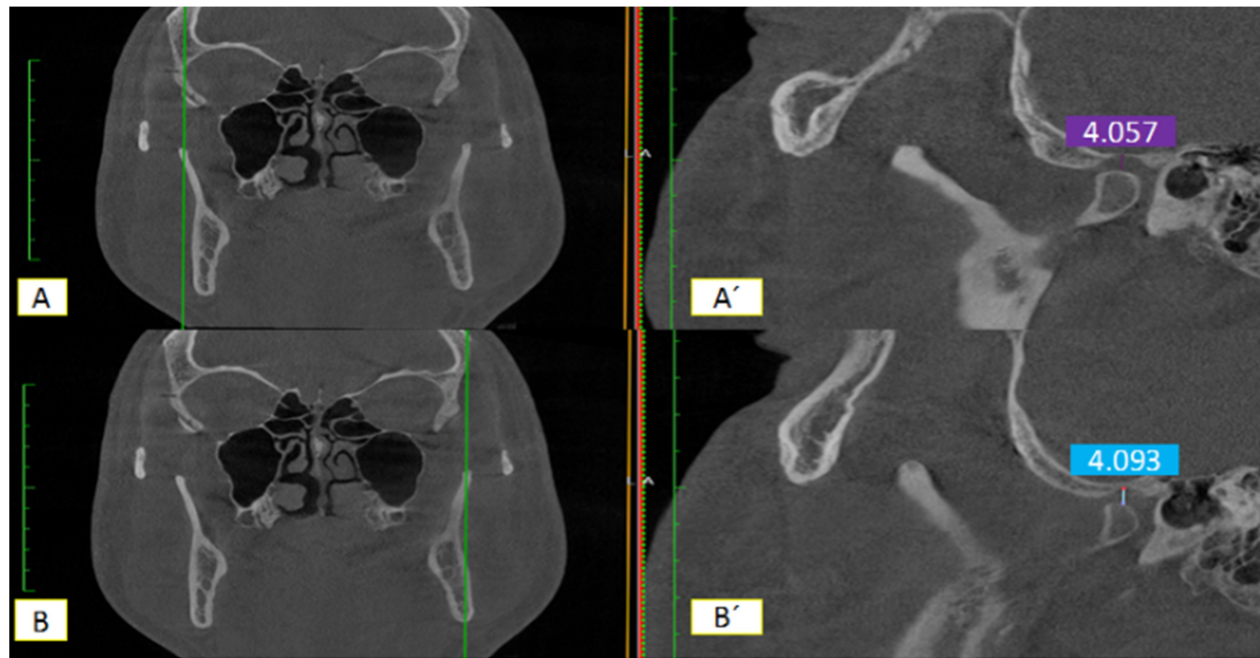
1. Insufficient/destructive growth pattern: Restriction of condylar growth secondary to juvenile idiopathic arthritis, idiopathic condylar resorption, traumatic condylar injury or post-traumatic hypomobility.
2. Excessive growth pattern: condylar hyperplasia, hemihypertrophy or benign neoplasms (osteochondroma).

Temporomandibular disorder can present as a musculoskeletal and neuromuscular disease. Its clinical characteristics include the masticatory muscles and the temporomandibular joint itself,<sup>2</sup> at the same time, its associated structures may present pain or sensitivity in the preauricular area and in the muscles of mastication, as well as limitation in mandibular movements and joint sounds (clicking or crepitation).<sup>3</sup> The prevalence of temporomandibular disorder affects 5% to 12% of the population, with the female sex being more prevalent<sup>4,5</sup> and is associated with

considerable morbidity. However, epidemiological studies in different countries show a high frequency of patients with temporomandibular dysfunction. Matsuka in Japan reports a frequency of 46%,<sup>6</sup> Maglione in Argentina of 27%,<sup>7,8</sup> Riva in Uruguay of 26%,<sup>9</sup> Gesch in Germany of 25%.<sup>10</sup>

Facial asymmetry can arise from some pathological condition that affects the temporomandibular joint, such as: congenital, internal disorders, rheumatoid arthritis and osteoarthritis,<sup>11-13</sup> having direct changes in facial aesthetics, which is an important aspect for the patient causing an increase in consultations due to the patient's need to improve their appearance, to achieve a more symmetrical and harmonious contour, which is why imaging studies such as x-rays are essential. and tomography. (Figure 2)

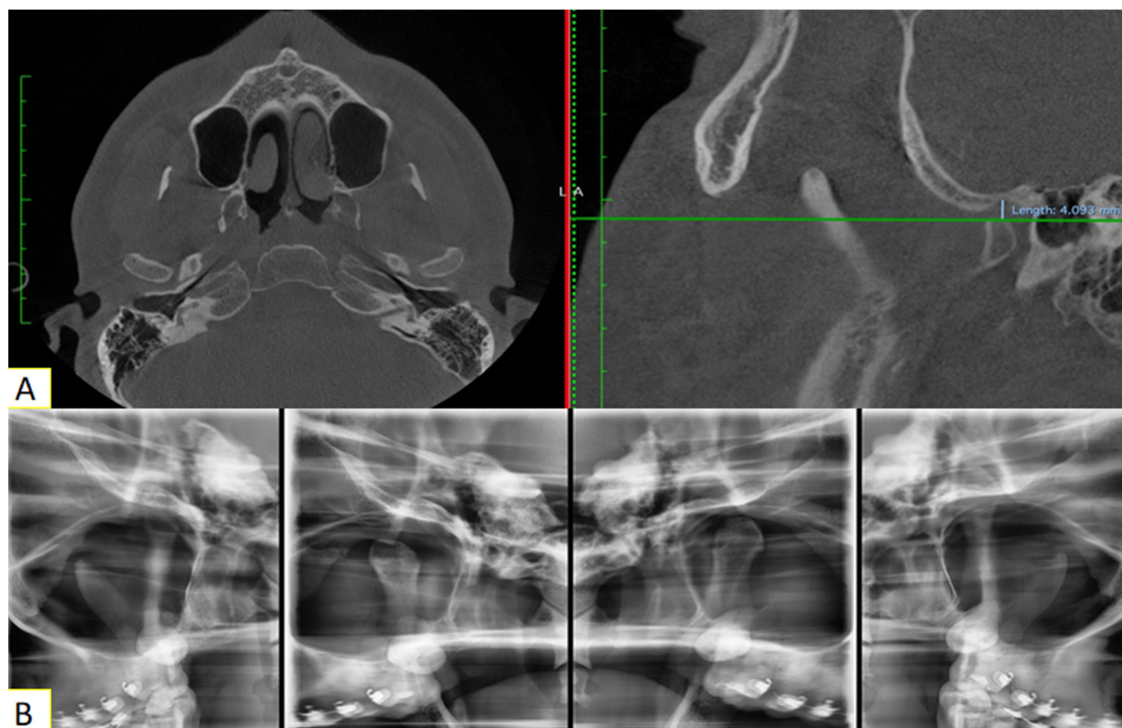
An asymmetric face is one in which the proportions of the left and right sides are different in size. This may be due to a hypertrophy of the facial tissues, which begins mainly with an unbalanced development of the lower jaw and the zygomaticus, characterized by facial enlargement. unilateral or bilateral inclination of the lower mandibular margin, prominent mandibular angle, as well as a shift of the mandibular midline<sup>14</sup> related to hemimandibular hyperplasia. Hemimandibular hyperplasia is caused by progressive hemimandibular growth with important aesthetic as well as functional deformities. Their



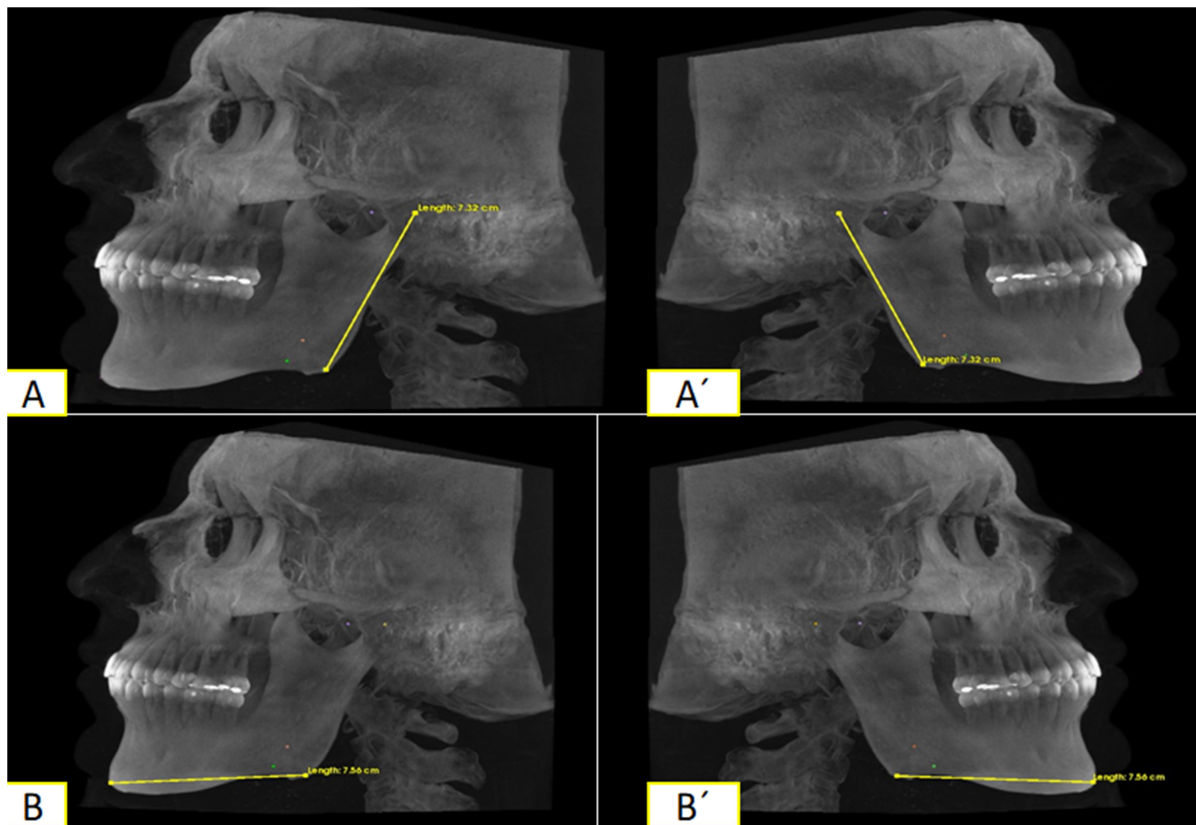
**Figure 1.** Tomography allows evaluating the temporomandibular joint to detect morphological changes and degenerative pathologies, to measure the space occupied by the articular disc. Figure 1 A and 1 B. Coronal section of the right and left temporomandibular joint. Figures 1 A' and 1 B'. Sagittal section of the temporomandibular joint where asymmetry is observed in the joint space.

clinical and radiographic characteristics may vary between patients, but they present a unilateral three-dimensional enlargement of the mandible involving the head of the condyle, ramus and mandibular body that ends in the symphysis causing facial asymmetry. (Figure 3) Clinically there is a transverse inclination of the occlusal plane, labial commissure inclined towards

the affected side. There are functional mandibular asymmetries, the deviation caused by dental contacts being the one that produces a mandibular dislocation in the maximum intercuspation position.<sup>15</sup> Its etiology is multifactorial since it can occur due to traumatic, genetic, hormonal and mechanical factors. Historically, the first author to report condylar



**Figure 2.** Comparison between tomography and radiography in the evaluation of the temporomandibular joint. A. Head computed tomography that allows observing the temporomandibular joint with different cuts, which allows evaluating the presence of an osteochondroma or some other associated pathology. Figure 2 B X-ray of the temporomandibular joint.



**Figure 3.** 3D reconstruction of head computed tomography for the evaluation of the temporomandibular joint. A and A' evaluation of the length of the mandibular ramus and mandibular body (B, B') to evaluate the discrepancies between both sides.

hyperactivity as condylar hyperplasia was Robert Adams in 1836. Severt and Proffit found that the probability of a deformity on the upper face is lower. Alghren and Posselt demonstrated that in an occlusal interference, the mandible closes in a position of maximum intercuspation, the result being a mandibular displacement from the original position (or "functional displacement"). This displacement continues until there is accommodation, ending in a functional posterior crossbite. In approximately 80% of children with unilateral posterior crossbite, lateral functional displacement of the mandible occurs.<sup>16</sup> The main treatment is surgical, performing partial condylectomy in conjunction with orthognathic surgery, with or without contour correction<sup>17</sup> these asymmetries are caused by unilateral damage to the temporomandibular joint.

### Discussion

The growing facial skeleton, together with internal disorder of the temporomandibular joint can delay or even stop the growth of the condyle, resulting in mandibular deficiency or asymmetry,<sup>18</sup> Significantly shorter maxillae and mandibular lengths have been found in patients with disc displacement compared to patients with normal temporomandibular joint.<sup>19, 20</sup> A systematic review and meta-analysis indicated that unilateral temporomandibular joint disorders are associated with facial asymmetry.<sup>2</sup>

The smaller size of the condyle is not limited only to the head of the condyle, it can also involve the neck and sometimes the ascending ramus of the maxilla, after the secondary degenerative process that can have an effect on the growth of the maxillary condyle complex, the internal disorder affects to the nutrition and lubrication of the jaw. Osteoarthritis originates from an inflammatory process due to abrasion, deterioration and thinning of cartilage, characterized by pain and alteration in morphology with cellular changes due to an increase in osteoclasts and macrophages.<sup>8</sup>

### Conclusion

The different disorders of the temporomandibular joint associated with facial asymmetry include problems associated with the joint, bone and muscle tissues that surround it, the etiology is multifactorial and treatment must be timely to mitigate disproportionate facial development and growth as it can produce serious functional, anatomical and psychological consequences.

### Conflicts of interests

The authors declare no conflict of interest.



## References

1. Chouinard AF, Kaban LB, Peacock ZS. Acquired Abnormalities of the Temporomandibular Joint. *Oral Maxillofac Surg Clin North Am.* 2018;30(1):83-96.
2. Marques FBC, de Lima LS, Oliveira PLE, et al. Are temporomandibular disorders associated with facial asymmetry? A systematic review and meta-analysis. *Orthod Craniofac Res.* 2021;24(1):1-16.
3. R.D. Sheats, P. Susan, S.P. McGorray, Q. Musmar, T.T. Wheeler, G.J. King. Prevalence of orthodontic asymmetries. *Sem Orthod.* 1998; 4(3): 138-145.
4. Fillingim RB, Ness TJ. Sex-related hormonal influences on pain and analgesic responses. *Neurosci Biobehav Rev.* 2000; 24(4): 485-501.
5. Jung WS, Kim H, Jeon DM, Mah SJ, Ahn SJ. Magnetic resonance imaging-verified temporomandibular joint disk displacement in relation to sagittal and vertical jaw deformities. *Int J Oral Maxillofac Surg.* 2013; 42(9): 1108-1115.
6. Matsuka Y, Yatani H, Kuboki T, Yamashita A: Temporal disorders in the adult population of Okayama City, Japan. *J Craniomandib Pract.* 1996;14:158-162.
7. Maglione H, Fernandez Soetbeer G, Allende A, Perez A; Disfunción craneomandibular: frecuencia y formas de presentación en una población de trescientos adultos jóvenes y su demanda de atención. *Rev CAO* 2006;199:32-42.
8. Maglione HO, de Zavaleta LA, Laraudo J, Falisi G, Fernandez F. Temporomandibular dysfunction: internal derangement associated with facial and/or mandibular asymmetry. *Cranio.* 2013;31(4):276-282.
9. Riva L, Sanguinetti M, Rodríguez A, Guzzetti L, Lorenzo S, et al.: Prevalencia de trastornos temporomandibulares y bruxismo en Uruguay. *Rev Odontostomatología* 2011; 13:54-71.
10. Gesch E, Bernhardt O, Alte D, Schwahn V, Kocher C, et al. Prevalence of signs and symptoms of temporomandibular disorders in an urban and rural German population: result of a population based study of health in Pomerania. *Quintessence Int.* 2004; 35:143-150.
11. Kaneyama K, Segami N, Hatta T. Congenital deformities and developmental abnormalities of the mandibular condyle in the temporomandibular joint. *Congenital Anomalies.* 2008; 48: 118-125.
12. Trpkova B, Major P, Nebbe B, Prasad N. Craniofacial asymmetry and temporomandibular joint internal derangement in female adolescents: a posteroanterior cephalometric study. *Angle Orthod.* 2000; 70(1): 81-88.
13. Abramowicz S, Levy JM, Prahalad S, Travers CD, Angeles-Han ST. Temporomandibular joint involvement in children with juvenile idiopathic arthritis: a preliminary report. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2019; 127(1): 19-23.
14. Liao L, Hsu Y, Hu J, Li X, Li H, Li J. Correction of asymmetric facial deformity by contouring: indications and outcomes. *J Craniofac Surg.* 2015;26(2):e94-e98.
15. D'Ippolito S, Ursini R, Giuliente L, Deli R. Correlations between mandibular asymmetries and temporomandibular disorders (TMD). *Int Orthod.* 2014;12(2):222-238.
16. J. Ahlgren, U. Posselt. Need of functional analysis and selective grinding in orthodontics. A clinical and electromyographic study. *Acta Odontol Scand.* 1963: 21: 187-226.
17. Abotaleb B, Bi R, Telha W, Zhao W, Li Y, Zhu S. Treatment measures of hemimandibular hyperplasia and associated facial deformities. *J Craniomaxillofac Surg.* 2021;49(2):126-134.
18. Schellhas KP, Pollei SR, Wilkes CH. Pediatric internal derangements of the temporomandibular joint: Effect on facial development. *Am J Orthod Dentofacial Orthop* 1993;104:51-9.
19. Brand JW, Nielson KJ, Tallents RH, et al. Lateral cephalometric analysis of skeletal patterns in patients with and without internal derangement of the temporomandibular joint. *Am J Orthod Dentofacial Orthop.* 1995;107:121-8.
20. Obamiyi S, Malik S, Wang Z, Singh S, Rossouw EP, et al. Radiographic features associated with temporomandibular joint disorders among African, White, Chinese, Hispanic, and Indian racial groups. *Niger J Clin Pract.* 2018;21:1495-500.

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