



## MASSACHUSETTS

Blue Cross Blue Shield of Massachusetts is an Independent Licensee of the Blue Cross and Blue Shield Association

# Medical Policy

## Orthognathic Surgery

### Table of Contents

- [Policy: Commercial](#)
- [Policy: Medicare](#)
- [Authorization Information](#)
- [Coding Information](#)
- [Description](#)
- [Policy History](#)
- [Information Pertaining to All Policies](#)
- [References](#)
- [Endnotes](#)

### Policy Number: 179

BCBSA Reference Number: N/A

NCD/LCD: N/A

### Related Policies

Plastic Surgery, [#068](#)

Temporomandibular Joint Disorder, [#035](#)

Surgical Treatment of Snoring and Obstructive Sleep Apnea Syndrome, [#130](#)

### Policy<sup>1</sup>

#### Commercial Members: Managed Care (HMO and POS), PPO, and Indemnity Medicare HMO Blue<sup>SM</sup> and Medicare PPO Blue<sup>SM</sup> Members

##### **Congenital anomalies - Prior authorization is not required**

Orthognathic surgery for correction of congenital (apparent at birth) deformities may be considered **MEDICALLY NECESSARY** for the following diagnoses (list may not be all inclusive):

- Apert syndrome
- Cleft deformity
- Crouzon syndrome
- Hemifacial microsomia (HFM)
- Pfeiffer syndrome
- Pierre Robin syndrome
- Treacher Collins syndrome.

**Note:** Abnormal growth of the jaws (resulting in maxillary and/or mandibular hypo- or hyperplasia) is **NOT** considered a congenital anomaly.

##### **Traumatic injury or tumor - Prior authorization is not required**

Orthognathic surgery may be considered **MEDICALLY NECESSARY** for restoration of function related to an acute traumatic injury or surgical removal of a tumor.

##### **Maxillary and/or mandibular facial skeletal deformities associated with masticatory malocclusion Prior authorization is required**

Orthognathic surgery for correction of skeletal deformities of the maxilla or mandible may be considered **MEDICALLY NECESSARY** when **ALL** of the following criteria (A, B, C) are met:

- A. ONE** of the following significant functional impairments is present and persists for at least 4 months:
- Impaired masticatory or incisive function (difficulty chewing), **OR**
  - Chewing-induced trauma to the soft tissues of the mouth, **OR**
  - Impaired swallowing or choking on incompletely chewed solid foods, **OR**
  - Abnormal tongue thrust is present, **OR**
  - Speech abnormality impairs the patient's ability to communicate and is determined by a speech pathologist or therapist to be due to skeletal malocclusion and the speech deficit cannot be resolved by speech therapy

**AND**

- B. ONE** of the following facial skeletal deformities: is present
- Mandibular excess or maxillary deficiency with a reverse overjet (ROJ) of at least 2 mm, **OR**
  - Maxillary excess or mandibular deficiency with an overjet (OJ) of at least 5 mm, **OR**
  - Open bite (OB) of at least 2 mm, **OR**
  - Deep bite (DB) of at least 7mm or impingement or irritation of the buccal or lingual soft tissue of the opposing arch

**AND**

- C.** An orthodontic specialist has documented that orthodontia (conservative therapy) alone is not adequate for remediation of the condition

#### **Treatment of severe malocclusion that contributes to TMJ syndrome symptoms - Prior authorization is required**

Treatment of severe malocclusion that contributes to temporomandibular joint (TMJ) syndrome symptoms may be considered **MEDICALLY NECESSARY** when **ONE** of each of the following elements (A, B, C) are met:

- **ONE** of the following symptoms is present and has persisted for at least 4 months:
  - Painful chewing clearly related to the TMJ
  - Frequent and significant headaches clearly related to TMJ
  - Significant temporomandibular joint and/or muscle tenderness, **AND**
- Symptoms persist after 4 months of treatment with **ONE** of the following conservative measures:
  - Elimination of aggravating factors such as: gum chewing, chewing hard or tough foods
  - Use of anti-inflammatory medications, unless contraindicated
  - Treatment with splint therapy, unless not tolerated, **AND**
- Malocclusion or dental misalignment is present and supported by **ONE** of the following measurements:
  - Mandibular excess or maxillary deficiency with a reverse overjet (ROJ) of at least 2 mm, **OR**
  - Maxillary excess or mandibular deficiency with an overjet (OJ) of at least 5 mm, **OR**
  - Open bite (OB) of at least 4 mm or deep bite (DB) of at least 7mm or impingement or irritation of the buccal or lingual soft tissue of the opposing arch.

[Related Policy: Medical policy #035 Temporomandibular Joint Disorder](#)

Diagnostic procedures, non-surgical and surgical treatments of TMJD

#### **Mandibular and maxillary deformities contributing to airway dysfunction and associated obstructive sleep apnea (OSA) - Prior authorization is required**

Maxillofacial surgery for treatment of mandibular and maxillary deformities contributing to airway dysfunction and associated OSA may be considered **MEDICALLY NECESSARY** when **ALL** of the following are present and documented:

- Moderate to severe OSA (confirmed by a sleep study result of AHI\*  $\geq$  15)
- Patient has trialed and failed a minimum 90-day use of positive airway pressure (PAP)
- A qualified sleep specialist has documented that other surgical options are not recommended for OSA **or** another surgical option has already been tried and was not adequate.

**Note:** \*AHI: apnea/hypopnea index

[Related AIM Specialty Health Guidelines](#)

- Management of Obstructive Sleep Apnea using Oral Appliances
- Management of Obstructive Sleep Apnea using Auto-Titrating and Continuous Positive Airway Pressure Devices

[Related Policy: 130 Surgical Treatment of Snoring and Obstructive Sleep Apnea Syndrome prn.pdf](#)

**Orthognathic surgical splints - Prior authorization is not required**

The use of two orthognathic surgical splints is considered medically necessary. Any use of greater than two orthognathic surgical splints is considered **NOT MEDICALLY NECESSARY**.

**Other indications**

The use of condylar positioning devices in orthognathic surgery is considered **INVESTIGATIONAL**.

Orthognathic surgery is considered **INVESTIGATIONAL** for all other indications.

**Unaesthetic facial features and psychological impairments**

**No benefits are available for orthognathic surgery when performed primarily for cosmetic purposes.**

Orthognathic surgery performed to reshape or enhance the size of the chin to restore facial harmony and chin projection (e.g., mentoplasty chin augmentation, chin implants, genioplasty or mandibular osteotomies/ostectomies); to address genial hypoplasia, hypertrophy, or asymmetry; or when performed as an isolated procedure or with other procedures, is considered cosmetic in nature.

**Documentation Requirements**

The patient's medical records submitted for review for all conditions should document that medical necessity criteria are met. The record should include the following:

- A written explanation of the member's clinical course, including dates and nature of any previous treatment, and specialist clinical documentation (e.g., Orthodontic and Sleep Specialist) **AND**
- A detailed description of the functional impairment considered to be the direct result of the skeletal abnormality **AND**
- Physical evidence of a skeletal, facial or craniofacial deformity defined by study models and pre-orthodontic imaging such as cephalometric radiographs cephalometric diagrams with standard computer-generated measurements, and panoramic radiographs **AND**
- Clear frontal/full face and lateral view photographs (digital or film).

**Prior Authorization Information**

**Inpatient**

- For services described in this policy, precertification/preauthorization **IS REQUIRED** for all products if the procedure is performed **inpatient**.

**Outpatient**

- For services described in this policy, see below for products where prior authorization **might be required** if the procedure is performed **outpatient**.

	<b>Outpatient/Inpatient</b>
<b>Commercial Managed Care (HMO and POS)</b>	Prior authorization is <b>required</b>
<b>Commercial PPO and Indemnity</b>	Prior authorization is <b>required</b>
<b>Medicare HMO Blue<sup>SM</sup></b>	Prior authorization is <b>required</b>
<b>Medicare PPO Blue<sup>SM</sup></b>	Prior authorization is <b>required</b>

## Requesting Prior Authorization Using Authorization Manager

Providers will need to use [Authorization Manager](#) to submit initial authorization requests for services. Authorization Manager, available 24/7, is the quickest way to review authorization requirements, request authorizations, submit clinical documentation, check existing case status, and view/print the decision letter. For commercial members, the requests must meet medical policy guidelines.

To ensure the service request is processed accurately and quickly:

- Enter the facility's NPI or provider ID for where services are being performed.
- Enter the appropriate surgeon's NPI or provider ID as the servicing provider, *not* the billing group.

## Authorization Manager Resources

Refer to our [Authorization Manager](#) page for tips, guides, and video demonstrations.

## CPT Codes / HCPCS Codes / ICD Codes

*Inclusion or exclusion of a code does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage as it applies to an individual member.*

*Providers should report all services using the most up-to-date industry-standard procedure, revenue, and diagnosis codes, including modifiers where applicable.*

*The following codes are included below for informational purposes only; this is not an all-inclusive list.*

**The above medical necessity criteria MUST be met for the following codes to be covered for Commercial Members: Managed Care (HMO and POS), PPO, Indemnity, Medicare HMO Blue, and Medicare PPO Blue:**

### CPT Codes

CPT codes:	Code Description
21193	Reconstruction of mandibular rami, horizontal, vertical, C, or L osteotomy; without bone graft
21194	Reconstruction of mandibular rami, horizontal, vertical, C, or L osteotomy; with bone graft (includes obtaining graft)
21195	Reconstruction of mandibular rami and/or body, sagittal split; without internal rigid fixation
21196	Reconstruction of mandibular rami and/or body, sagittal split; with internal rigid fixation
21198	Osteotomy, mandible, segmental;
21199	Osteotomy, mandible, segmental; with genioglossus advancement
21206	Osteotomy, maxilla, segmental (eg, Wassmund or Schuchard)
21240	Arthroplasty, temporomandibular joint, with or without autograft (includes obtaining graft)
21242	Arthroplasty, temporomandibular joint, with allograft
21243	Arthroplasty, temporomandibular joint, with prosthetic joint replacement

### Description

Orthognathic surgery is surgery to correct conditions of the jaw. The surgical revision by osteotomy, osteotomy or osteoplasty of the upper jaw (maxilla) and/or the lower jaw (mandible) is intended to alter the relationship of the jaws and teeth. These surgical procedures are intended to correct skeletal jaw and cranio-facial deformities that may be associated with significant functional impairment, and to reposition the jaws when conventional orthodontic therapy alone is unable to provide a satisfactory, functional dental occlusion within the limits of the available alveolar bone.

Congenital or developmental defects can interfere with the normal development of the face and jaws. These birth defects may interfere with the ability to chew properly and may also affect speech and

swallowing. In addition, trauma to the face and jaws may create skeletal deformities that cause significant functional impairment. Functional deficits addressed by this type of surgery are those that affect the skeletal masticatory apparatus such that chewing, speaking and/or swallowing are impaired.

Certain jaw and cranio-facial deformities may cause significant functional impairment. These deformities include apertognathia (either lateral or anterior not correctable by orthodontics alone), significant asymmetry of the lower jaw, significant class 2 and class 3 occlusal discrepancies, and cleft palate. Orthognathic surgery may help to reduce the flattening of the face that is characteristic of severe cleft deformity. Treatment approaches include maxillary advancement, a type of orthognathic surgery which surgically moves the maxilla and fixes it securely into place using sophisticated bone mobilizing techniques. This method of surgery is used when there is a need to improve the facial contour and normalize dental occlusion due to relative deficiency of the mid-face region. The approach utilized is case dependent and may include surgery on the mandible, depending on the soft tissue profile of the face and/or severity of an occlusal discrepancy, and problems present in the lower face. By using osteotomy techniques along with bone and cartilage grafts, the upper and lower jaws and facial skeletal framework are moved and appropriately reconstructed.

Studies demonstrate that persons with vertical hyperplasia of the maxilla have an associated increase in nasal resistance, as do persons with maxillary hypoplasia with or without clefts. Following orthognathic surgery, such individuals routinely demonstrate decreases in nasal airway resistance and improved respiration.

Anomaly: Deviation from normal

Anteroposterior: From front to back

Apertognathia: Open-bite deformity; the cause of poor speech, loss of masticatory function

Asymmetry: The lack of balance or symmetry

Cephalometric: A scientific measurement of the head

Dentoalveolar: Relating to a tooth and the part of the alveolar bone that immediately surrounds it

Malocclusion: Imperfect contact with the mandibular and maxillary teeth

Mandible: The horseshoe-shaped bone forming the lower jaw

Maxilla: A paired bone that forms the skeletal base of the upper face, roof of the mouth, sides of the nasal cavity and floor of the orbit (contains the eye); the upper jaw

Occlusion: Bringing the opposing surfaces of the teeth of the two jaws (mandible and maxilla) into contact with each other

Orthodontics: The division of dentistry dealing with prevention and correction of abnormally positioned or aligned teeth

Ostectomy: Excision of a bone or part of a bone

Osteoplasty: Surgical repair or alteration of bone

Osteotomy: An operation in which a bone is cut to allow the bone to be repositioned; for example, to shorten, lengthen

Supraeruption: The occurrence of a tooth continuing to grow out of the gum if the opposing tooth in the opposite jaw is missing

## Summary

There is convincing evidence of the relationship between facial skeletal abnormalities and malocclusions, including asymmetry and open bite deformities. A strong correlation has been demonstrated between the state of the individual's occlusion and his or her chewing efficiency, bite forces, and restricted mandibular excursions. Orthognathic surgery has resulted in significant improvement in skeletal deformities that contribute to chewing, breathing and swallowing dysfunction and where the severity of the deformity cannot be corrected through dental therapeutics or orthodontics. Studies have shown that individuals with skeletal malocclusions suffer from a variety of functional impairments, including diminished bite forces, restricted mandibular excursions, and abnormal chewing patterns.

The evidence in the peer-reviewed literature to support this conclusion includes non-randomized controlled trials and case series studies. Clinical practice guidance has been published by the American

Association of Oral and Maxillofacial Surgeons on criteria for orthognathic surgery (2020). Orthognathic surgery is supported by clinical evidence and medically appropriate for specific conditions. These include treatment of maxillary and/or mandibular facial skeletal deformities associated with masticatory malocclusion.

The AAOMS Criteria for Orthognathic Surgery have become widely adopted as a tool to assist in determining whether orthognathic surgery is medically indicated. As listed below, these maxillary and/or mandibular facial skeletal deformities associated with masticatory malocclusion relate verifiable clinical measurements to significant facial skeletal deformities:

Antero-posterior discrepancies:

- Maxillary/mandibular incisor relationship: overjet of 5 millimeter (mm) or more, or a 0 to a negative value (norm 2 mm)
- Maxillary/mandibular antero-posterior molar relationship discrepancy of 4 mm or more (norm 0 to 1 mm)

Note: These values represent 2 or more standard deviations (SDs) from published norms

Vertical discrepancies:

- Presence of a vertical facial skeletal deformity which is 2 or more SDs from published norms for accepted skeletal landmarks
- Open Bite
- No vertical overlap of anterior teeth greater than 2 mm
- Unilateral or bilateral posterior open bite greater than 2 mm
- Deep overbite with impingement or irritation of buccal or lingual soft tissues of the opposing arch
- Supraeruption of a dento-alveolar segment due to lack of opposing occlusion creating dysfunction not amenable to conventional prosthetics

Transverse discrepancies:

- Presence of a transverse skeletal discrepancy which is 2 or more SDs from published norms.
- Total bilateral maxillary palatal cusp to mandibular fossa discrepancy of 4 mm or greater, or a unilateral discrepancy of 3 mm or greater, given normal axial inclination of the posterior teeth

Asymmetries:

- Antero-posterior, transverse or lateral asymmetries greater than 3 mm with concomitant occlusal asymmetry

American Association of Oral and Maxillofacial Surgeons. Criteria for Orthognathic Surgery. 2020. [http://www.aaoms.org/docs/practice\\_resources/clinical\\_resources/ortho\\_criteria.pdf](http://www.aaoms.org/docs/practice_resources/clinical_resources/ortho_criteria.pdf).

## Policy History

Date	Action
9/2023	Policy clarified to include prior authorization requests using Authorization Manager.
3/2023	<p>New medical policy describing ongoing medically necessary indications. Policy expanded to include additional medically necessary and not medically necessary indications. Effective 3/1/2023.</p> <p>The following surgical procedures were transferred from policy #068 Plastic Surgery to new medical policy #179, Orthognathic Surgery.</p> <ul style="list-style-type: none"> <li>• Mandibular or maxillary osteotomy/plasty for prognathism or micrognathism with documented severe handicapping malocclusion.</li> <li>• Other osteotomy/plasty for congenital conditions that cause severe facial or cranio-facial deformities including but not limited to Crouzon's syndrome, Treacher Collin's dysostosis, or Romberg's disease.</li> <li>• Mentoplasty.</li> </ul>

## Information Pertaining to All Blue Cross Blue Shield Medical Policies

Click on any of the following terms to access the relevant information:

[Medical Policy Terms of Use](#)

[Managed Care Guidelines](#)

[Indemnity/PPO Guidelines](#)

[Clinical Exception Process](#)

[Medical Technology Assessment Guidelines](#)

## References

1. McCarthy JG, Stelnicki EJ, Grayson BH. Distraction osteogenesis of the mandible: A ten-year experience. *Semin Orthod*. 1999;5(1):3-8.
2. Baker NJ, David S, Barnard DW, et al. Occlusal outcome in patients undergoing orthognathic surgery with internal fixation. *Br J Oral Maxillofac Surg*. 1999 37(2):90-93.
3. Bennett ME, Phillips CL. Assessment of health-related quality of life for patients with severe skeletal disharmony: A review of the issues. *Int J Adult Orthodon Orthognath Surg*. 1999;14(1):65-75.
4. Cope JB, Samchukov ML, Cherkashin AM. Mandibular distraction osteogenesis: A historic perspective and future directions. *Am J Orthod Dentofacial Orthop*. 1999;115(4):448-460.
5. Drew SJ, Schwartz MH, Sachs SA. Distraction osteogenesis. *N Y State Dent J*. 1999;65(1):26-29.
6. Buttke TM, Proffit WR. Referring adult patients for orthodontic treatment. *J Am Dent Assoc*. 1999;130(1):73-79.
7. Davies J, Turner S, Sandy JR. Distraction osteogenesis--a review. *Br Dent J*. 1998;185(9):462-467.
8. Barkate HE. Orthognathic surgery by distraction osteogenesis: A literature review. *Dentistry*. 1997;17(3):14, 16-18.
9. Lupori JP, Van Sickels JE, Holmgren WC. Outpatient orthognathic surgery: Review of 205 cases. *J Oral Maxillofac Surg*. 1997;55(6):558-563.
10. Tompach PC, Wheeler JJ, Fridrich KL. Orthodontic considerations in orthognathic surgery. *Int J Adult Orthodon Orthognath Surg*. 1995;10(2):97-107.
11. Ruhl CM, Bellian KT, Van Meter BH, et al. Diagnosis, complications, and treatment of dentoskeletal malocclusion. *Am J Emerg Med*. 1994;12(1):98-104.
12. Sinn DP, Ghali GE. Advances in orthognathic surgery. *Curr Opin Dent*. 1992;2:38-41.
13. Hunt OT, Johnston CD, Hepper PG, et al. The psychosocial impact of orthognathic surgery: A systematic review. *Am J Orthod Dentofacial Orthop*. 2001;120(5):490-497.
14. Tulloch JF, Proffit WR, Phillips C. Outcomes in a 2-phase randomized clinical trial of early Class II treatment. *Am J Orthod Dentofacial Orthop*. 2004;125(6):657-667.
15. Fedorowicz Z, Nasser M, Newton T, Oliver R. Resorbable versus titanium plates for orthognathic surgery. *Cochrane Database Syst Rev*. 2007;(2):CD006204.
16. Costa F, Robiony M, Toro C, et al. Condylar positioning devices for orthognathic surgery: A literature review. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2008;106(2):179-190.
17. Kang SH, Yoo JH, Yi CK. The efficacy of postoperative prophylactic antibiotics in orthognathic surgery: A prospective study in LeFort I osteotomy and bilateral intraoral vertical ramus osteotomy. *Yonsei Med J*. 2009;50(1):55-59.
18. Danda AK, Wahab A, Narayanan V, Siddareddi A. Single-dose versus single-day antibiotic prophylaxis for orthognathic surgery: A prospective, randomized, double-blind clinical study. *J Oral Maxillofac Surg*. 2010;68(2):344-346.
19. Dan AE, Thygesen TH, Pinholt EM. Corticosteroid administration in oral and orthognathic surgery: A systematic review of the literature and meta-analysis. *J Oral Maxillofac Surg*. 2010;68(9):2207-2220.
20. Garg M, Cascarini L, Coombes DM, et al. Multicentre study of operating time and inpatient stay for orthognathic surgery. *Br J Oral Maxillofac Surg*. 2010;48(5):360-363.
21. Pineiro-Aguilar A, Somoza-Martín M, Gandara-Rey JM, Garcia-Garcia A. Blood loss in orthognathic surgery: A systematic review. *J Oral Maxillofac Surg*. 2011;69(3):885-892.
22. Danda AK, Ravi P. Effectiveness of postoperative antibiotics in orthognathic surgery: A meta-analysis. *J Oral Maxillofac Surg*. 2011;69(10):2650-2656.
23. Sher AE, Schechtman KB, Piccirillo JF. The efficacy of surgical modifications of the upper airway in adults with obstructive sleep apnea syndrome. *Sleep*. 1996 Feb;19(2):156-77.

24. Thorpy M, Chesson A, Derderian S, Kader G, Millman R, Potolicchio S, et al. Practice parameters for the treatment of obstructive sleep apnea in adults: the efficacy of surgical modifications of the upper airway. *Sleep*. 1996;19(2):152-155.
25. Mattos CT, Vilani GN, Sant'Anna EF, et al. Effects of orthognathic surgery on oropharyngeal airway: A meta-analysis. *Int J Oral Maxillofac Surg*. 2011;40(12):1347-1356.
26. Lye KW. Effect of orthognathic surgery on the posterior airway space (PAS). *Ann Acad Med Singapore*. 2008;37(8):677-682.
27. Won CH, Li KK, Guilleminault C. Surgical treatment of obstructive sleep apnea: Upper airway and maxillomandibular surgery. *Proc Am Thorac Soc*. 2008;5(2):193-199.
28. Aurora RN, Casey KR, Kristo D, Auerbach S, Bista SR, Chowdhuri S, Karippot A, Lamm C, Ramar K, Zak R, Morgenthaler TI; American Academy of Sleep Medicine. Practice parameters for the surgical modifications of the upper airway for obstructive sleep apnea in adults. *Sleep*. 2010 Oct;33(10):1408-13.
29. Hassan T, Naini FB, Gill DS. The effects of orthognathic surgery on speech: A review. *J Oral Maxillofac Surg*. 2007;65(12):2536-2543.
30. Van Lierde KM, Schepers S, Timmermans L, et al. The impact of mandibular advancement on articulation, resonance and voice characteristics in Flemish speaking adults: A pilot study. *Int J Oral Maxillofac Surg*. 2006;35(2):137-144.
31. Chanchareonsook N, Samman N, Whitehill TL. The effect of cranio-maxillofacial osteotomies and distraction osteogenesis on speech and velopharyngeal status: A critical review. *Cleft Palate Craniofac J*. 2006;43(4):477-487.
32. American Academy of Oral and Maxillofacial Surgeons (AAOMS). Criteria for orthognathic surgery. Reimbursement and Appeal Resources. Health Policy and Third Party Payor Relations Resources. Rosemont, IL: AAOMS; 2002. Available at: <http://www.aaoms.org/continuing-education/professional-allied-staff> Accessed August 1, 2022.
33. American Society of Plastic and Reconstructive Surgeons (ASPRS). Orthognathic Surgery: Recommended Criteria for Third-Party Payer Coverage. Arlington Heights, IL: ASPRS; September 1997.
34. Koh H, Robinson PG. Occlusal adjustment for treating and preventing temporomandibular joint disorders. *Cochrane Database Syst Rev*. 2003;(1):CD003812.
35. Lindenmeyer A, Sutcliffe P, Eghtessad M, et al. Oral and maxillofacial surgery and chronic painful temporomandibular disorders -- a systematic review. *J Oral Maxillofac Surg*. 2010;68(11):2755-2764
36. American Association of Oral and Maxillofacial Surgeons. Parameters of Care: Clinical Practice Guidelines for Oral and Maxillofacial Surgery. 2017. Available at: [http://www.aaoms.org/images/uploads/pdfs/parcare\\_assessment.pdf](http://www.aaoms.org/images/uploads/pdfs/parcare_assessment.pdf) . Accessed on August 1, 2022.
37. American Association of Oral and Maxillofacial Surgeons. Clinical Paper. Criteria for Orthognathic Surgery. 2020. Available at: [https://www.aaoms.org/docs/practice\\_resources/clinical\\_resources/ortho\\_criteria.pdf](https://www.aaoms.org/docs/practice_resources/clinical_resources/ortho_criteria.pdf) Accessed August 1, 2022.
38. Panula K, Somppi M, Finne K, et al. Effects of orthognathic surgery on temporomandibular joint dysfunction. A controlled prospective 4-year follow-up study. *Int J Oral Masillofac Surg*. 2000; 29 (3); 183-187. PMID: 10970079.
39. Dervis E, Tuncer E. Long-term evaluations of temporomandibular disorders in patients undergoing orthognathic surgery compared with a control group. *Oral Surg Oral Med Oral Pathol Oral Radio Endod*. 2002; 94(5);554-560. PMID: 12424447.
40. Abrahamsson C, Ekberg E, Henrikson T, Bondemark L. Alterations of temporomandibular disorders before and after orthognathic surgery: A systematic review. *Angle Orthod*. 2007;77(4):729-734.
41. Dolwick MF, Widmer CG. Orthognathic surgery as a treatment for temporomandibular disorders. *Oral Maxillofac Surg Clin North Am*. 2018;30(3):303-323.
42. Zaghi S, Holty JE, Certal V, et al. Maxillomandibular advancement for treatment of obstructive sleep apnea: A meta-analysis. *JAMA Otolaryngol Head Neck Surg*. 2016; 142(1):58-66. PMID: 26606321.
43. John CR, Gandhi S, Sakharia AR, et al. Maxillomandibular advancement is a successful treatment for obstructive sleep apnoea: a systematic review and meta-analysis. *Int J Oral Maxillofac Surg*. 2018;47(12):1561-1571. PMID: 29871788.



44. Giralt-Hernando M, Valls-Ontañón A, Guijarro-Martínez R. et al. Impact of surgical maxillomandibular advancement upon pharyngeal airway volume and apnoea-hypopnoea index in the treatment of obstructive sleep apnoea; systematic review and meta-analysis. *BMJ Open Respir Res* 2019; 6(1): e000402. PMID: 31673361.
45. Peck CJ, Pourtaheri N, Shultz BN, Parsaei Y, Yang J, Park KE, Allam O, Steinbacher DM. Racial Disparities in Complications, Length of Stay, and Costs Among Patients Receiving Orthognathic Surgery in the United States. *J Oral Maxillofac Surg.* 2021 Feb;79(2):441-449. PMID: 33058772.
46. American Academy of Pediatric Dentistry. Management of the Developing Dentition and Occlusion in Pediatric Dentistry. Revised 2021. Available at: [https://www.aapd.org/globalassets/media/policies\\_guidelines/bp\\_developdentition.pdf](https://www.aapd.org/globalassets/media/policies_guidelines/bp_developdentition.pdf). Accessed on April 8, 2022.
47. American Association of Oral and Maxillofacial Surgeons. Criteria for Orthognathic Surgery. 2020. Available at: [http://www.aaoms.org/docs/practice\\_resources/clinical\\_resources/ortho\\_criteria.pdf](http://www.aaoms.org/docs/practice_resources/clinical_resources/ortho_criteria.pdf). Accessed on April 11, 2022.
48. American Association of Oral and Maxillofacial Surgeons. Parameters of Care: Clinical Practice Guidelines for Oral and Maxillofacial Surgery. 2017. Available at: [http://www.aaoms.org/images/uploads/pdfs/parcare\\_assessment.pdf](http://www.aaoms.org/images/uploads/pdfs/parcare_assessment.pdf). Accessed on April 11, 2022.

## Endnotes

---

<sup>1</sup> Based on expert opinion