Temporomandibular Joint Reconstruction in the Growing Child

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KEYWORDS

• TMJ reconstruction • Children • Jaw deformity • Joint replacement

KEY POINTS

- Congenital deformities, pathologic conditions, ankylosis, and progressive resorptive processes are the most common indications for temporomandibular joint (TMJ) reconstruction in young patients.
- Distraction osteogenesis is a useful tool for mandibular reconstruction, particularly for congenital deformities or ankylosis, though long-term stability varies by indication.
- Costochondral grafts and free fibula flaps are the most versatile autogenous reconstructive options.
- The use of alloplastic total joint replacement has burgeoned in recent years and may have a role in pediatric reconstruction, particularly for progressive resorptive diseases.
- Evaluation of the growth pattern plays an important role in planning TMJ reconstruction in children.

INTRODUCTION

The temporomandibular joint (TMJ) is a biarthrodial hinge joint with complex function. The primary growth center for the mandible is contained within the joint and is protected only by a thin layer of fibrocartilage. Therefore, reconstruction of this joint, particularly in growing patients, requires careful consideration and meticulous technique.

INDICATIONS

The most frequent indication for TMJ reconstruction is chronic destruction from osteoarthritis. In young patients, however, osteoarthritis is rare. Common indications for TMJ reconstruction in the growing child include congenital deformities, acquired abnormalities from pathology or ankylosis, and progressive condylar resorption.

Congenital Deformities

Hemifacial microsomia (HFM) is the most common congenital deformity affecting the TMJ and the second-most common of all craniofacial anomalies. HFM occurs in 1 in 5600 live births.[1] Most cases are isolated and sporadic. HFM variably affects the structures derived from the first and second pharyngeal arches, including the orbits, external and middle ear, cranial nerves, facial soft tissues, and mandible. Several methods for characterization of the mandibular deformity have been proposed; the Kaban-Pruzansky classification system is the most widely used.[2]

Patients with Kaban-Pruzansky type I mandibular deformities may not require TMJ construction; often the facial asymmetry can be corrected with standard orthognathic surgery after skeletal maturity. Some with type I and most with types IIA, IIB, and III deformities will benefit from construction. For type I, IIA, and some IIB with sufficient ramal bone, construction can be accomplished either with an osteotomy (vertical ramus or inverted-L) or with distraction osteogenesis (DO). For many type IIB and all type III, the ramus is too diminutive for either of these techniques and construction

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with a graft or flap is necessary. Costochondral grafts and vascularized free fibula flaps are most commonly used.

Some surgeons advocate for mandibular construction during growth; others prefer to wait until skeletal maturity. The primary goal for TMJ construction in HFM during growth (early treatment) is to minimize or eliminate the maxillary deformity that otherwise occurs as the maxilla grows to meet the asymmetric mandibular position, possibly avoiding the need for Le Fort I osteotomy after skeletal maturity. To accomplish this, an open bite is created on the affected side by lengthening the constructed ramus and the maxillary occlusal plane is gradually leveled using an orthodontic appliance to direct dental eruption and close this open bite. Outcomes for early treatment in avoiding the need for future surgery, however, have been disappointing, with more than 50% experiencing recurrent facial asymmetry by skeletal maturity.[3–6]

Additional benefits of early treatment include immediate improvement in facial symmetry and occlusion, creation of an articulation between the mandible and temporal bone when one is not present, and enhancement of psychosocial well-being.[7] Early TMJ construction in HFM should be considered a component of a staged approach to asymmetry correction, with the expectation that an additional operation will be necessary at skeletal maturity.

After HFM, the next most common syndrome with TMJ abnormalities is Treacher Collins syndrome (TCS). TCS affects 1 in 50,000 live births and variably includes a constellation of craniofacial findings, such as coloboma of the lower eyelid, absence of lateral eyelashes of the lower lid, microtia, zygomatic hypoplasia, and bilateral mandibular ramus and condyle hypoplasia. Some patients with TCS will have retroglossal airway obstruction as a result of mandibular retrognathia. Many will require mandibular reconstruction; considerations regarding technique and timing are similar to those described for HFM, except when obstructive sleep apnea necessitates earlier intervention. A concomitant maxillary and/or midfacial operation is often necessary for counterclockwise rotation. Other congenital anomalies, such as bilateral craniofacial microsomia, congenital TMJ ankylosis, Nager syndrome, and congenital syngnathia, may also require TMJ construction.

Acquired Deformities

Acquired deformities of the TMJ can occur from pathology, trauma, infection, ankylosis, or arthritis. The most common primary neoplasms of the TMJ are osteochondroma and synovial chondromatosis; these are extremely rare in children.[8] TMJ deformation and destruction from cysts and tumors more commonly occurs from neoplasms and odontogenic lesions originating elsewhere, such as the mandibular body and extending in to the joint or from the necessary extirpative operation to remove these lesions.[9] Reconstructive options and staging vary based on the extent of destruction; need for adjunctive treatment, such as radiotherapy; desire for dental rehabilitation; and status of the adjacent structures including the temporal bone, articular disc, and soft tissues.

Trauma is the most common instigator of TMJ ankylosis in the developed world.[10] Infection has historically been the leading cause in third-world countries.[11] Juvenile idiopathic arthritis (JIA), pathology, radiation therapy, and prior reconstructions with autologous tissue or DO are other possible causes. A congenital form of TMJ ankylosis may also exist.[12]

TMJ ankylosis is extremely difficult to treat and has a high rate of recurrence. Secondary problems (ie, mandibular and maxillary asymmetry) must also be addressed. Kaban and colleagues[13] defined a protocol for management of TMJ ankylosis that centers on aggressive excision of the ankylotic mass, ipsilateral and sometimes contralateral coronoidectomy, lining of the fossa with the native disc or a temporalis myofascial flap, joint reconstruction with DO or a costochondral graft, early mobilization, and aggressive physical therapy. Others favor alloplastic joint replacement after excision of the ankylotic mass, particularly for recurrent ankylosis.[14]

Progressive Condylar Resorption

Progressive condylar resorption may occur in rheumatologic conditions, such as JIA, from steroid use, or of unknown cause. JIA, called juvenile rheumatoid arthritis before 1995, is the most common pediatric rheumatologic condition.[15] The TMJs are affected in 39% to 75% of patients with JIA.[16,17] Some affected patients will experience condylar resorption, which can be unilateral or bilateral. Bilateral resorption may result in clockwise rotation of the mandible, steep mandibular plane, long anterior facial height, short posterior facial height, Angle class II malocclusion, and anterior open bite. Unilateral disease can create lower facial asymmetry.[15] Some patients will also have facial pain and limited mouth opening.[18] There is little agreement regarding diagnostic and management protocols for TMJ disease associated with JIA.[19] A small percentage of affected patients will require TMJ replacement, and the