

Dentofacial orthopedic and surgical orthodontic treatment in hemifacial microsomia

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Case Report: Dentofacial orthopedic and surgical orthodontic treatment in hemifacial microsomia

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Branchial arch dysplasia is characterized by underdevelopment of the ear, mandible, and contiguous bony structures of the cranium and face.¹ The heterogeneous nature of this malformation results in inconsistent phenotypic expressions and requires a variety of treatment approaches.² Patients with branchial arch dysplasia characteristically show hypogenesis or agenesis of the condylar process and mandible. As a result, facial deformities often become worse during growth.³ In growing patients, orthopedic treatment with functional appliances is indicated.^{2,3}

For patients with severe deformities, early surgical intervention with autogenous costochondral grafting may be indicated.³ After pubertal growth, mild deformities can be corrected with orthodontic treatment, genioplasty, or unilateral mandibular augmentation,⁴ while more severe cases may also require simultaneous mandibular and maxillary surgery.⁴

Hemifacial microsomia affects aural, oral, and

mandibular growth. Involvement is usually limited to one side of the face.⁵ The patient in this case report showed bilateral agenesis of the mandibular condyle and glenoid fossa, which is a rare feature of hemifacial microsomia. The patient was treated with functional appliances during active facial growth. After the pubertal growth spurt, correction of the deformities required rotational advancement of the mandible as well as alloplastic reconstruction of the temporomandibular joint structures.

Case report

The patient, a 10-year-old female, presented at the orthodontic clinic of the University Dental Hospital for evaluation. She showed severe micrognathia with bilaterally malformed ears. She had been diagnosed with first and second branchial arch syndrome at another institution, and the right malformed pinna and accessory ear had been treated surgically. There was no relevant family history, and her mother had been well during pregnancy and delivery. Cardiac func-

Abstract

The patient showed bilateral agenesis of the mandibular condyle and glenoid fossa, rare features of hemifacial microsomia. The patient was treated with functional appliances to modify mandibular growth during active facial growth. After the pubertal growth spurt, treatment included rotational advancement of the mandible combined with alloplastic reconstruction of the condylar process and glenoid fossa.

Key Words

Hemifacial microsomia

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Figure 1A



Figure 1B

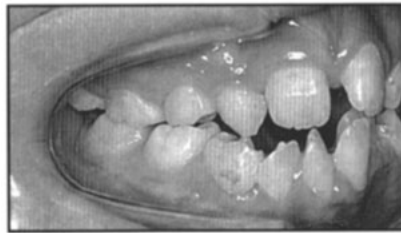


Figure 2A

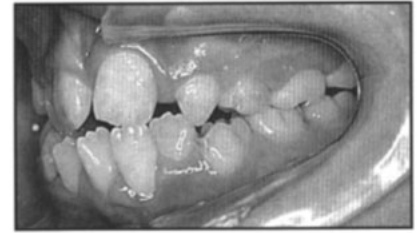


Figure 2B

Figure 1A-B
Facial photographs before treatment. Note severe micrognathia.

Figure 2A-B
Intraoral photographs before treatment. Note anterior crowding in both arches.

Figure 3
Tracing of panoramic radiograph before treatment. The mandibular condyle, coronoid process, and glenoid fossa were missing on both sides. The ascending ramus was severely deformed bilaterally.

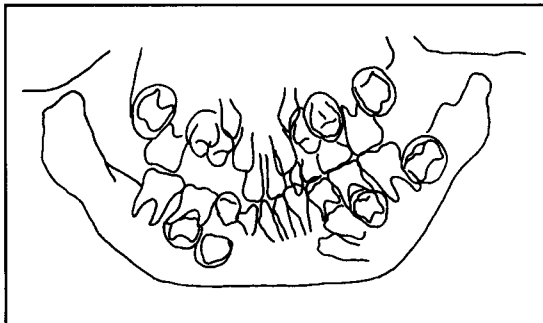


Figure 3

tion, eyes, and vision were excellent, and no mental retardation was found.

The clinical examination revealed severe micrognathia, with the chin deviated to the left (Figure 1). A malformed pinnacle and accessory ear were present on the left side, but hearing was normal. Hypoplasia of the malar bone, zygomatic bone, or other structures was not observed; neither were down-slanting palpebral fissures. Intraoral soft and hard tissues were normal, but anterior crowding was observed in both the maxillary and mandibular anterior dental arches (Figure 2). The panoramic radiograph showed that the ascending ramus and temporomandibular articulation were severely deformed (Figure 3). The mandibular condyles and coronoid processes were missing on both sides, and bilateral hypoplasia of the ascending ramus was observed. The glenoid fossa was also missing bilaterally (Figure 3). The lateral cephalogram showed underdevelopment of the mandible. Ramus height and mandibular length were markedly short and the mandibular plane was steep (Figure 4).

Treatment progress

A functional appliance was prescribed to modify facial growth during active growth. The patient began wearing a Frankel appliance at 7 years 8 months of age. She wore the appliance 12 hours a day for about 2 years. At the age of 10, the maxillary arches were expanded laterally with a quad helix appliance to correct the narrowing that was occurring. Functional appli-

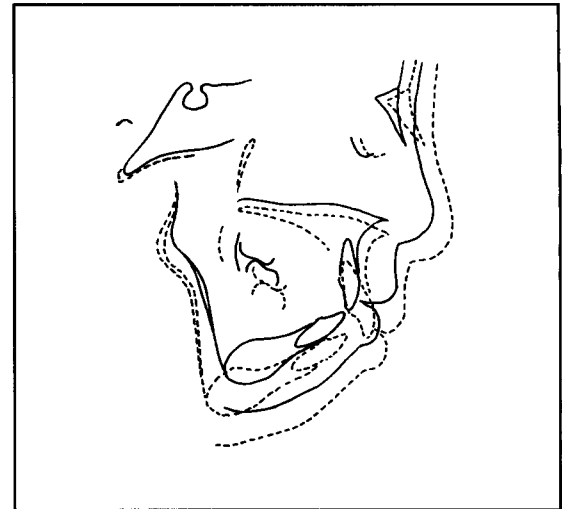


Figure 4

ances were placed until age 12. Superimposition of the lateral cephalograms revealed the mandible had grown in a downward and backward direction and the dentofacial deformity had not improved (Figure 4).

Severe micrognathia and agenesis of the temporomandibular joint structures require orthognathic correction at the proper time. After the pubertal growth spurt, presurgical orthodontic treatment was started. At this time, the patient's profile was retrognathic (Figure 5). Severe crowding was observed in both the maxillary and mandibular dental arches and an anterior openbite was present (Figure 6). Following extraction of the mandibular and maxillary lateral incisors, an .022-inch preadjusted edge-wise appliance was placed. The patient was 14 years old. Presurgical orthodontic treatment was nearly complete 2 years later, but the planned surgery was postponed until the patient was 17.

Presurgical evaluation showed that the severely retrognathic profile had become even more retrognathic (Figure 7) and the openbite was 4 mm (Figure 8). The occlusion did not show a stable functional relationship, and the mandible could be manipulated upward until maxillary and mandibular incisors came into contact.



Figure 5A



Figure 5B

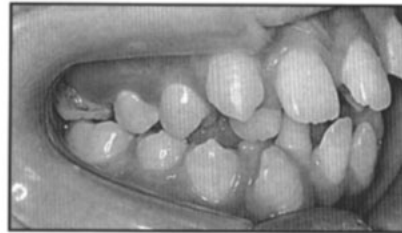


Figure 6A



Figure 6B



Figure 7A



Figure 7B



Figure 8A



Figure 8B

Skeletal discrepancies were corrected with rotational advancement of the mandible. Agenesis of the condylar process and glenoid fossa were corrected with alloplastic reconstruction of the temporomandibular joint structures using a polymer glenoid fossa prosthesis and metallic condyle.

The surgical plan called for moving the mandible upward and anteriorly in a counterclockwise rotation. Simultaneously, a genioplasty would be performed to reposition the chin forward by 7 mm.

Surgery was performed at the Department of Second Oral Surgery of the University Dental Hospital. Following release of maxillomandibular fixation, intermaxillary elastics were applied for 6 months. Postoperative orthodontic treatment lasted 15 months and resulted in good intercuspation of teeth. Total treatment time was 25 months. Removable Hawley-type retainers were placed in the maxillary and mandibular dental arches. The patient was instructed to wear them full-time for the first year, then at night for the second year.

Results

The patient's profile became much less retrognathic (Figure 9). Anterior openbite and crowding in the maxillary and mandibular arches were corrected (Figure 10). A functional jaw relation was established and the maximum jaw opening was 35 mm without restricted mandibular movement.

The panoramic radiograph showed that bone continuity was established around the implants (Figure 11). Superimposition of pretreatment and posttreatment cephalograms demonstrated that the anterior openbite was corrected with mandibular rotation (Figure 12).

Discussion

The patient presented with micrognathia and bilateral agenesis of the mandibular condyle and glenoid fossa. Malformed ears were also observed bilaterally. Hemifacial microsomia affects aural, oral, and mandibular growth, and in most cases, usually on one side of the face.⁵ One well-known condition that shows bilateral malformation of the ear and micrognathia is Treacher Collins syndrome. This condition is characterized by bilateral zygomatic hypoplasia and down-slanting palpebral fissures.⁵ This patient did not exhibit these features. Therefore, she might have shown rare features of hemifacial microsomia with bilateral involvement.

The patient did not show marked asymmetric growth of the mandible, presumably due to bilateral agenesis of condylar process. However, the skeletal openbite worsened during active facial growth. Superimposition of the lateral cephalograms showed the mandible grew downward and backward and the retrognathic profile was exacerbated. The functional appliance could not influence growth in a favorable direction.

Agenesis of the condylar process and glenoid fossa were corrected with alloplastic reconstruc-

Figure 5A-B
Facial photographs before presurgical orthodontic treatment.

Figure 6A-B
Intraoral photographs before presurgical orthodontics.

Figure 7A-B
Facial photographs before surgery. Note severely retrognathic profile.

Figure 8A-B
Intraoral photographs before surgery.



Figure 9A

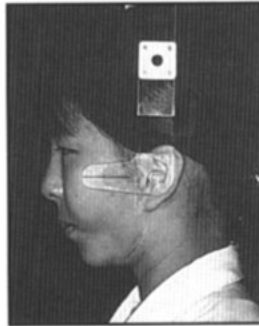


Figure 9B



Figure 10A



Figure 10B

Figure 9A-B
Facial photographs after orthodontic treatment. Retrognathic profile has been improved.

Figure 10A-B
Intraoral photographs after orthodontic treatment. Crowding and anterior openbite have been eliminated.

Figure 11
Panoramic radiograph after treatment.

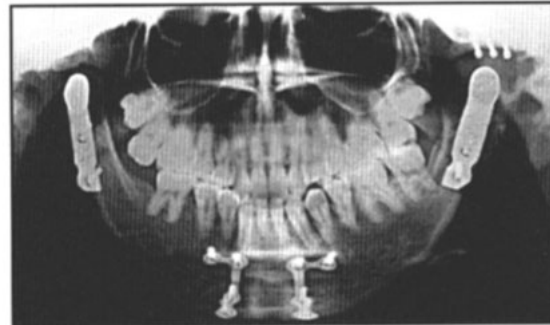


Figure 11

Figure 12
Superimposition before surgery and after orthodontic treatment. Deformities were corrected with rotational advancement of the mandible with alloplastic reconstruction of condylar process and glenoid fossa.

tion of the temporomandibular joint structures using a polymer glenoid fossa prosthesis and metallic condyle. Partial or total replacement of the temporomandibular joint articulation is indicated for the correction of fibrous or bony ankylosis, chronic arthritis, or traumatic resorption.⁶⁻⁹

Evaluation 3 years after surgery revealed that a stable functional relation was maintained.

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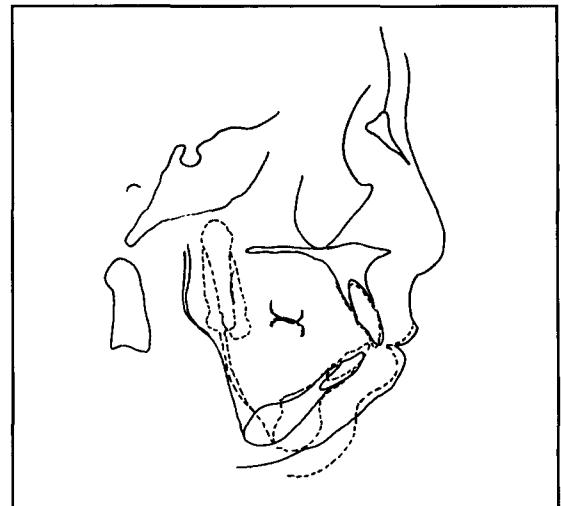


Figure 12

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