Case Report

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Distraction Osteogenesis: Treatment of a Case with Maxillary Hypoplasia and Mandibular Prognatism

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Key Words

Distraction osteogenesis, maxillary hypoplasia, mandibular prognatism

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Abstract

Aim: Although the sagital split-ramus osteotomy is the most popular method for treating mandibular prognathism, distraction osteogenesis (DO) of the maxillary complex is an alternative approach.
Methodology: The clinical and radiological examinations of a 29-year-old male revealed maxillary retrognathism and mandibular prognathism without a vertical abnormality. The patient was treated with maxillary advancement by DO and mandibular setback surgery.
Results: Long-term functional muscle exercises were scheduled. No relapse has occurred.
Conclusions: We believe that the patient's cooperation and commitment to the functional exercise program played the most important role in the long-term success.

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Introduction

Distraction osteogenesis (DO) is a useful technique that is used widely in combination with orthognathic surgery (OS) to correct congenital and acquired dentofacial discrepancies.

Several surgical procedures can be used to correct various jaw deformities. Conventional bimaxillary techniques are challenging methods when bigger discrepancies are involved. Conventional osteotomies in OS have anatomical and physiological limits.

The tendency of the jaw position to relapse after repositioning cannot be avoided completely. However, DO minimizes such relapses because the jaw is advanced gradually in multiple daily increments, and the retention time is unlimited. DO enables advancement over a greater distance than is attainable with conventional OS (1,2,3).

Mandibular prognathism (MP) or skeletal Cass III malocclusion with a prognathic mandible is an excessive maxillofacial deformity. OS in conjunction with orthodontic treatment is required to correct MP in an adult (1,3). The two procedures applied to correct MP are a sagittal split-ramus osteotomy (SSRO) and an intraoral vertical ramus osteotomy.

Case Report

A 29-year-old male was referred to Istanbul University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery complaining of difficulty chewing and biting and esthetic problems. He no significant medical or family history. His main

problems were maxillary retrognathism and mandibular prognathism. His facial profile was the concave type (N-A-Pg: 186°) without asymmetry. Soft tissue analysis showed that the upper lip was 1 mm backward and the lower lip 6 mm forward relative to the S-line in the resting position. He had skeletal and dental Class III malocclusion. There was an anterior crossbite with an 8-mm negative overjet and 5-mm overbite (Fig. 1). The incisors revealed compensatory inclination (Max1-NA = 27°/7 mm, Mand1-NB = 18°/7 mm). Lateral cephalometry confirmed the maxillary retrognathism (SNA = 76°) and mandibular prognathism (SNB = 84°), but there was no vertical abnormality (S-N/Go-Me = 37°). The patient also had missing teeth and bridgework in the maxilla and mandible.

Figure 1. Photograph showing the preoperative occlusion in this case

A two-stage procedure was planned, with maxillary advancement using the distraction technique and mandibular setback surgery. The distractors were previously adapted to a model of the patient's skull produced using a stereolithographic method.

Following a Le Fort I osteotomy, intraoral distractors were placed on both sides of the maxilla (Fig. 2). The maxilla was distracted by 0.5 mm × twice per day for 11 days. After a consolidation period, bilateral sagittal split osteotomies were performed to locate the mandible back in the desired position to maintain the occlusal relationship (Fig. 3). The distractors were removed at the same operation. The postoperative period was uneventful, except for slight paresthesia and difficulty with mouth opening in the first month. The paresthesia disappeared in the second postoperative month.

Figure 2. Cephalometric radiograph obtained after the distraction osteogenesis

Figure 3. Cephalometric radiograph showing a postoperative view of the case

The patient was followed up at 1 week, 1 month, and 6 months postoperatively and then annually for 5 years. The patient continued to perform his functional exercises during the entire period. There were no signs of relapse.

Discussion

There are several methods for treating maxillary hypoplasia, including maxillary advancement and mandibular setback. These produce differences in the functional and esthetic results depending on the method used.

The sagittal split-ramus osteotomy is the most popular method for treating mandibular prognathism. Alternatively, the newer technique involving DO of the maxillary complex can be used. This may offer long-term stability. The risk of relapse is higher in patients who seek treatment at older ages (i.e., from the end of the third decade of life on) due to a proprioceptive muscle mechanism.

Distraction osteogenesis is the best treatment for reducing the risk of relapse. (4). Additionally, long-term functional muscle exercises are usually scheduled. We believe that our patient's commitment to our exercise program played a crucial role in the long-term success of the treatment and the stability of the postoperative occlusion.

In cases requiring more than 7~8 mm of maxillary advancement, two jaw operations are indicated, and the likelihood of success decreases when advancement of more than 10 mm is required. DO is an alternative method to maintain the stability of bimaxillary surgery (5,6).

The combination of a Le Fort I osteotomy to perform DO of the maxilla and setback of the mandible through a sagittal split osteotomy is another way to maintain the stable occlusion and correct such deformities.

Conclusions

These combined orthognathic procedures appear to be good methods for treating severe deformities such as mandibular prognathism in combination with a hypoplastic maxilla and to prevent relapse. However, the long-term postoperative success of orthognathic surgery depends on various factors. We believe that the patient's cooperation with and commitment to the functional exercise program plays the most important role because it serves to adapt the existing muscle mechanism to the new occlusion, especially in older patients seeking treatment. Our patient has continued to do his exercises for 5 years after the surgery.

Acknowledgments

The authors deny any conflicts of interest related to this study.

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