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A Rare Complication Associated with Distraction Osteogenesis in Correction of Maxillary Hypoplasia

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Abstract

Aim: Distraction osteogenesis (DO) is an alternative to orthognathic surgery that appears to have some advantages for advancement in the maxilla and mandible, but relatively high complication rates have been reported in the maxillofacial region.
Methodology: A 22-year-old female with the chief complaint of maxillary hypoplasia was referred to our clinic. A two-stage procedure combining maxillary advancement by distraction technique with mandibular setback surgery was performed to correct jaw deformity. At the sixth day of the distraction breakage of the device occurred. The distractors were removed and the patient was treated using conventional osteotomy techniques to achieve good occlusion and improve the facial profile
Results: Besides there are a number of studies about complications of DO, breakage of distractor has been really rare reported. In our case this unexpected and a very rarely reported complication occurred.
Conclusions: The purpose of the present case report is to present an undesirable and very rare complication associated with the maxillary distraction device and an alternative treatment method for managing this undesirable failure.

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Key Words

Distraction osteogenesis, complication, breakage of distractor, maxillary hypoplasia

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Introduction

Distraction osteogenesis (DO) is a surgical procedure for the reconstruction of skeletal deformities. Maxillary DO has become an accepted alternative treatment for patients with severe maxillary hypoplasia, craniofacial syndromes, and bone deformities. Insufficient distraction, undesirable soft-tissue changes, the occurrence of defective distraction vectors, and psychological problems are among the potential complications of intraoral maxillary DO (1-3).

Several complications encountered during distraction have been reported in the literature, including infection, device exposure, dislocation, and device distortion, but few complications have been reported in association with Le Fort I distraction (4-9).

Case Report

A 22-year-old woman was referred to the Oral and Maxillofacial Surgery clinic of Istanbul University with the complaint of maxillary retrognathism. She

had no history of medical problems and no family history of hereditary disease. No sign of temporomandibular dysfunction were observed. Her facial profile was concave (N–A–Pg: 196°) and lacked asymmetry. Soft-tissue analysis showed that the upper lip was 4 mm behind the S-line in the resting position. The patient had a dental class III malocclusion of 16 mm in the molar region and 10 mm in the canine region, and an anterior crossbite with 2 mm negative overjet and 2 mm overbite. The incisors revealed compensatory inclination (Max 1–NA: 28°/8 mm; Mand 1–NB:21°/3 mm). Lateral cephalometry confirmed maxillary retrognathism (SNA: 75.5°) rather than mandibular prognathism (SNB: 85.5°), and no vertical abnormality was present (S–N/Go–Me: 32°).

The initial surgical plan was developed using cephalometric prediction and model surgery. A two-stage procedure combining maxillary advancement with the distraction technique and mandibular setback surgery was planned to correct the jaw deformity. We planned the distraction vectors using models of the patient.

Before surgery, the distractors were adapted to the patient's skull model, which had been produced using a stereolithographic method (Fig. 1).

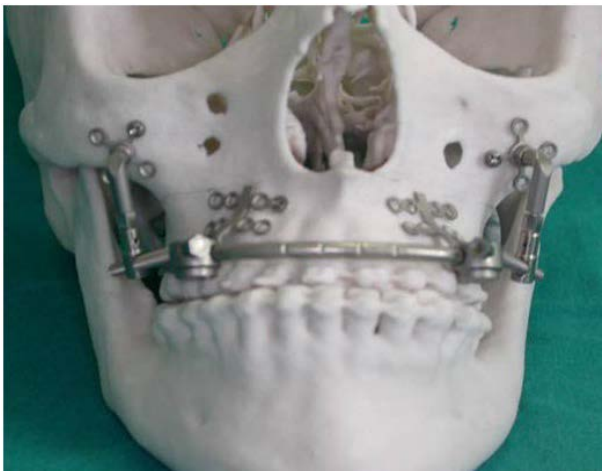

Figure 1. Model surgery before the operation

During surgery, osteotomies were performed and the maxilla was slightly mobilized after down-fracture. The distractors were placed intraorally on both sides of the maxilla. One week after the operation, we started to distract the maxilla (0.5 mm, twice daily). On the sixth day of distraction (5 mm total movement), we noticed the loosening of the right distraction rod. A careful examination of the rod revealed that it had broken. (Fig. 2). The manufacturer was informed of the failure immediately, because we decided initially to replace the device as soon as possible. After further evaluation of the situation, we decided that it would be better to use a conventional method to avoid the interruption of the distraction period. Thus, the distractors were removed and the patient was treated using conventional osteotomy techniques to achieve good occlusion and improve the facial profile (Fig. 3).

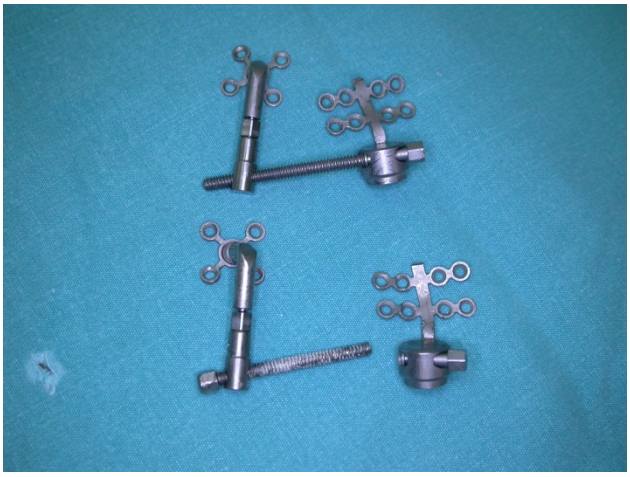

Figure 2. Photograph of the distraction devices

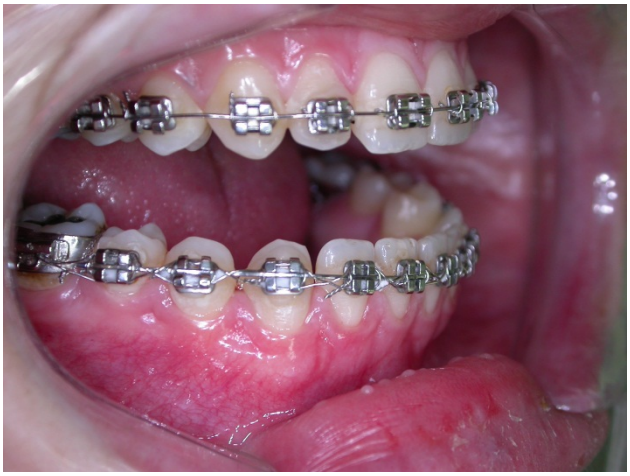

Figure 3. Postoperative occlusion

The final outcome was considered acceptable because the patient was satisfied after the completion of the treatment and no relapse occurred within 3 years.

Discussion

DO is an alternative to orthognathic surgery that appears to have some advantages (and fewer disadvantages) for advancement in the maxilla and mandible. The operation time is shorter than some orthognathic procedures. However, the follow-up is more extensive. After the distraction period, the control of occlusion is much less precise than that achieved with conventional orthognathic surgery. The greatest difference between DO and orthognathic surgery is the role of the patient in his/her treatment (2). DO has important advantages over conventional techniques, but relatively high complication rates have been reported in the maxillofacial region (1). DO was the preferred treatment in this case because it is easier and safer than conventional Le Fort I advancement. It is also the first choice of treatment in patients who require maxillary advancement of >10 mm to prevent relapse.

Some case reports have described device-failure complications (4-9). Uçkan et al, reported the unexpected major complication of the distractor device breaking during the consolidation period of mandibular midline DO (4). The authors suggested that the distractor failure may have been the result of an undiagnosed crack at the union of the miniplate screw hole and the head of the stabilization part. The crack could have formed during the adaptation of the plate, and this weak point may have led to failure. The authors also suggested that the design of the device, which lacks an area for bending between the connection point of the miniplate screw hole and the stabilization part, may also have contributed to its failure (4).

Aikawa et al. also reported two cases of the internal maxillary distractor breaking in patients with cleft lip and palate. One failure was observed during the distraction period and the other occurred during the retention period. Both breakages were located at the joint of the anchorage plate and the extension rod, which is flexible to allow the adjustment of the plate to the bone surface. The authors stated that surgeons should pay special attention to this mechanically weak area in this distractor design during the advancement and retention periods, and that they should avoid unnecessary frequent bending to adapt the device to the bone surface, which directly weakens the joint (7).

In our case, an unexpected and very rare complication occurred: the distractor broke into two pieces on the sixth day of the distraction period. This failure was unexpected because no excessive force had been applied and the patient had not been exposed to trauma, as in other case reports (4,7).

The most common reasons for distractor breakage are the application of excessive force and problems with device adaptation, but we experienced no problem with adaptation and fixation during surgery. We preferred this device because of its simple modular assembly, fewer parts, and ease of adaptation compared to other devices used in Le Fort I distraction procedures. Because the distractors were adapted preoperatively to the patient's skull model, they were positioned passively during surgery. In contrast with the findings of other case reports, no stress accumulation was present in our case. In addition, the breakage did not occur at a weak point of the device. We believe that the complication may have occurred due to a manufacturing error. The timing of the breakage (day 6 of the distraction period) suggests that the failure may be attributed to metal fatigue due to a fault that could have occurred during several stages of manufacture and distribution (e.g., production, storage, transportation). No previously reported factors explain the site of breakage in our case, although we are confident that the manufacturers of distractor devices monitor their physical properties to prevent such complications.

We ultimately preferred to remove the distractors and use conventional osteotomy techniques. We also considered the immediate replacement of the broken distractor part with a new part, but this option would require an additional operation. Our evaluation of the entire situation included the consideration of the patient's expectations and the advantages and disadvantages of different procedures. To avoid the need for an additional surgical procedure to resolve this unpleasant situation, we decided to remove the distractors. Because the patient had refused a treatment option that potentially would have required two additional operations, we used conventional osteotomy techniques to resolve the problem according to her expectations and requirements.

We emphasize that the practitioner should be aware of possible unexpected technical complications when using all types of devices, and should be prepared to use an alternative method to achieve a successful final outcome. This is especially important for DO techniques, in which timing is critical.

Acknowledgments

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

References

1. Cheung LK, Chua HD. A meta-analysis of cleft maxillary osteotomy and distraction osteogenesis. Int J Oral Maxillofac Surg 2006;35(1):14-24.
2. Panula K, Finne K, Oikarinen K. Incidence of complications and problems related to orthognathic surgery: a review of 655 patients. J Oral Maxillofac Surg 2001;59(10):1128-37.
3. Spaey YJE, Bettens RME, Mommaerts MY, Adrıaens J, Van Landuyt HW, Abeloos JVS, De Clercq CAS, Lamoral PRB, Neyt LF. A prospective study on infectious complications in orthognathic surgery. J Craniomaxillofac Surg 2005;33:24-9.
4. Uckan S, Veziroglu F, Arman A. Unexpected breakage of mandibular midline distraction device: case report. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006;102(6):e21-5.
5. Parashar SY, Anderson PJ, David DJ. An unusual complication of mandibular distraction. Int J Paediatr Dent 2006;16(1):55-8.
6. von Bremen J, Schäfer D, Kater W, Ruf S. Complications during mandibular midline distraction. Angle Orthod. 2008;78(1):20-4.
7. Aikawa T, Iida S, Isomura ET, Namikawa M, Matsuoka Y, Yamada C, Yamamoto T, Takigawa Y. Breakage of internal maxillary distractor: considerable complication of maxillary distraction osteogenesis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008;106(1):e1-7.
8. Saulacic N, Zix J, Iizuka T. Complication rates and associated factors in alveolar distraction osteogenesis: a comprehensive review. Int J Oral Maxillofac Surg. 2009;38(3):210-7.
9. Enislidis G, Fock N, Schobel GM, Klug C, Wittwer G, Kaan Y, Ewers R. Analysis of complications following alveolar distraction osteogenesis and implant placement in the partially edentulous mandible. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2005;100:25-30.