Special Lecture 1

DISTRACTION OSTEOGENESIS for the CLEFT LIP and PALATE PATIENTS

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When the congenital cleft runs through the alveolar ridge, as it does in 75% of CLP patients, a residual peri-alveolar oronasal fistula and bony defect through the alveolar ridge and floor of the nose will remain despite satisfactory lip and palate repair. Unfortunately, one long-term negative effect of CLP repair is a 25% incidence of maxillary growth restriction that produces secondary deformities of the jaws and occlusion, which will also have a negative impact on speech and self-esteem to the extent that further skeletal surgery will be required. Alveolar cleft reconstruction and Orthognathic surgery for Midfacial deficiency are options for secondary treatment of patients with CLP. Treatment results may be compromised by the standard surgical techniques due to soft tissue scarring. We apply distraction osteogenesis for the treatment of CLP patients positively and have got good results.

I'll present our experience with maxillary distraction osteogenesis using minimally invasive Le Fort I osteotomyand maxillary bone transportation osteogenesis for the treatment of alveolar cleft repair.

1. Maxillary distraction osteogenesis using Le Fort I osteotomy without down fracture.

Introduction

Distraction osteogenesis has led to great advances in the treatment of craniomaxillofacial deformity in the past ten years. Maxillary distraction osteogenesis has also become an accepted alternative in the treatment of cleft patients with severe maxillary hypoplasia. In LeFort 1 osteotomy, down

fracture must be completed with Rowe forceps. Complications can be encountered during mobilization of the maxilla, including unexpected bleeding and undesirable fracture. The purpose of this study is to present our technique for the maxillary distraction osteogenesis using Le Fort I osteotomy without down fracture to minimize the risk in surgical procedure and shorten the operation time.

METHODS

Under general anesthesia, the halo portion of the RED II system(Martin, Tuttlingen, Germany) is adjusted following intubation while the nasal tube is fixed to the central part of the frame. To avoid excoriation of the nasal septum and piriform aperture, a mucoperiosteal flap was made after a marginal incision from canine to first molar in each side. This is followed by a Le Fort I osteotomy without down-fracture and fixation of the Leipzig retention plate (Martin, Tuttlingen, Germany)to the lateral maxillary wall, from paranasal to zygomatic buttresses using monocortical screws. Attachment of the device was followed by a trial distraction to ensure maxillary movement in the desired vector.

Active distraction was started on the 5th post operative day with 1.0 to 2.0 mm per day. The distraction device remained in place for 4 post-surgical weeks and after appropriate distraction had been achieved, up/down elastics were attached (for 2 weeks) to improve occlusal relations. After this, internal rigid fixation of the segment using the mini-plate was performed under a local anesthesia and the RED system removed.

I will show the stable results of 3DCT, cephalometrics and clinical evaluations after an average follow-up period of one year. This technique seems to minimize the risk in surgical procedure and shorten the operation time, it may become an alternative method for the treatment of cleft lip and palate patients suffering from severe midfacial deficiency.

2. Maxillary bone transportation in alveolar cleft - Transport distraction osteogenesis for treatment of alveolar cleft repair -

Introduction

Secondary autogenous cancellous bone grafting is an established method for treatment of alveolar clefts and oronasal fistulae. This method allows

eruption of teeth into the graft area facilitating orthodontic treatment. However, graft failure sometimes occurs due to inappropriate oral mucoperiosteal flaps, patient age, or the size of the alveolar cleft.

Transport distraction osteogenesis as applied to the mandible by McCarthy et al. has been established as a mandibular correction method4and is used not only for congenital anomalies such as micrognathia and hemifacial macrosomia but also for reconstruction after segmental mandibulectomy. In this bone transport method, bone is distracted in the defect direction by osteotomy of bone adjacent to the bone defect. The advantage of this method is simultaneous distraction of the surrounding soft tissue. As treatment for alveolar clefts by distraction osteogenesis, Liou et al. reported a method in which the alveolar cleft area is closed. We developed a method in which the cleft area is repaired using a bone-borne distractor, and complete closure is achieved by grafting of new bone from the distraction gap. This method has been performed in 18 patients since 1997 using bone borne devices and good results have been obtained.

Method

This method is indicated in patients with cleft lip, alveolar, and palate who have large untreated alveolar clefts, patients who have undergone bone grafting resulting in failure, those who have crowding and require spaces for dental correction, or patients who do not desire iliac bone grafting.

Before operation, the local area was examined, and the study model and cephalograms were evaluated in detail. In addition, for 3-dimensional evaluation of the dental arches, imaging diagnosis of the head and face was performed by 3D-CT.

In early patients, we produced tooth-borne distractors for each patient, but this strategy imposed a burden on the teeth and caused unstable fixation and inadequate distraction. In more recent patients, we have used a vertical device for alveolar bone-borne distraction(Martin, Germany) and fixed it horizontally at the maxillary bone.Bone segment transport using the distractor is linear, but ideally, bone transportation along the curve of the dental arch is desirable. For this, an orthodontic arch wire was used as a rail. The position of the bracket was determined to allow passive application of the wire. Using an indirect bonding method, the brackets were attached to a thin arch wire. This allowed movement of the dental arch together with the bracket along the curve of the wire. The surgery can be also performed under local anesthesia at an outpatient clinic. A minimal incision was made on the buccal side, and the periosteal flap was dissected while the alveolar crest and palatal periosteum were preserved to maintain blood flow. Sagittal interdental osteotomy was performed

completely to the nasal floor. The plate of the distractor was fixed with a screw with care not to bring it into contact with the dental root. After confirmation of the mobility of the bone segment, the wound was closed.

Distraction was performed after a period of 7-10 days. Considering gingival extension, a rather slow distraction rate (0.3-0.5 mm/day) was used. At the end of the distraction period, soft tissue in the cleft was removed using a cautery to allow bone contact at the docking site on the cleft side. At the same time, we flatten the docking edges.After a consolidation period of 6-8 weeks following distraction, cancellous bone grafting was performed in the small space at the docking site under local anesthesia at the time of removal of the device. The bone graft was harvested from the regenerate in the distraction gap. The teeth were aligned by postoperative orthodontic treatment guiding them toward the distracted area. Tooth movement to the cleft area was initiated only after confirmation of the survival of the bone graft.

In patients with bilateral clefts, one side was narrowed by dental arch correction, and bone grafting was performed. When the treatment was performed at the outpatient clinic, intraoral bone was used as a donor. Premaxilla transport was initiated after 3-4 weeks before adequate consolidation of the bone graft. The subsequent procedure was similar to that in patients with unilateral cleft.

This method allows simultaneous correction of the malocclusion, nasal septal deviation and maxillary arch deformity allowing expansion of the dental arch without donor sacrifice. This method can be regarded astissue engineering to expand bone tissue. This method can be safely performed not only in patients undergoing initial treatment for alveolar clefts but also in patients in whom bone grafting has failed.

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