

## — Original Article —

### The effects of timing of secondary alveolar bone graft on craniofacial morphology in patients with unilateral cleft lip and alveolus.

Yassin Hemoudi<sup>1)</sup>, Kazuhiro Yamada<sup>5)</sup>, Toshikazu Asahito<sup>1)</sup>,  
Kazuhiro Ono<sup>2)</sup>, Chikara Saito<sup>3)</sup>, Ritsuo Takagi<sup>4)</sup>, Isao Saito<sup>1)</sup>

<sup>1)</sup> Division of Orthodontics, Niigata University Graduate School of Medical and Dental Sciences (Chief: Prof. Isao Saito)

<sup>2)</sup> Department of Oral health and Welfare, Niigata University Graduate School of Medical and Dental Sciences (Chief: Prof. Kazuhiro Ono)

<sup>3)</sup> Division of Reconstructive Surgery for Oral and Maxillofacial Region, Niigata University Graduate School of Medical and Dental Sciences (Chief: Prof. Chikara Saito)

<sup>4)</sup> Division of Oral and Maxillofacial Surgery, Niigata University Graduate School of Medical and Dental Sciences (Chief: Prof. Ritsuo Takagi)

<sup>5)</sup> Department of Orthodontics, Matsumoto Dental College. (Chief: Prof. Kazuhiro Yamada)

### 片側性唇顎裂患者における二次的顎裂部骨移植の時期の違いが 顎顔面形態に及ぼす影響について

ヘモージェイ ヤシン<sup>1)</sup>, 山田一尋<sup>5)</sup>, 朝日藤寿一<sup>1)</sup>  
小野和宏<sup>2)</sup>, 齊藤 力<sup>3)</sup>, 高木律男<sup>4)</sup>, 齋藤 功<sup>1)</sup>

<sup>1)</sup> 新潟大学大学院医歯学総合研究科歯科矯正学分野 (主任: 齋藤 功教授)

<sup>2)</sup> 新潟大学大学院医歯学総合研究科口腔衛生支援学科 (主任: 小野 和宏教授)

<sup>3)</sup> 新潟大学大学院医歯学総合研究科組織再建口腔外科学分野 (主任: 齊藤 力教授)

<sup>4)</sup> 新潟大学大学院医歯学総合研究科顎顔面口腔外科学分野 (主任: 高木 律男教授)

<sup>5)</sup> 松本歯科大学歯科矯正学講座 (主任: 山田 一尋教授)

平成 22 年 4 月 13 日受付 4 月 27 日受理

**Key word** : unilateral cleft lip and alveolus, early secondary bone grafting, late secondary bone grafting, cephalometrics

#### Abstract

**Objective:** The purpose of this study was to compare the effect of early and late bone grafts in patients with Cleft lip and alveolus only, consequently excluding the influence of palatal closure on craniofacial growth.

**Subjects and Methods:** The subjects were chosen from the records of the Orthodontic Clinic, Niigata University Medical and Dental Hospital. 30 patients with unilateral cleft lip and alveolus only (without cleft palate) were chosen and divided into 2 groups based on the following selection criteria: Early bone grafting (EBG) at a mean age of 8 years and 3 months. Late bone grafting (LBG) at a mean age of 13 years and 7 months. The majority had orthodontic treatment during the mixed dentition. Lateral cephalograms were traced, and then 22 angular and 27 linear measurements were analyzed.

**Results:** Mann-Whitney test showed that all angular measurements were not significantly different between the 8 and the 14 years old subjects in the EBG and LBG groups. The difference in the value of A'-PNS between 14 and 8 years showed a significant difference when the groups were compared.

**Conclusion:** The present study showed decrease in anteroposterior maxillary growth in the EBG group. A possible reason for our finding might be the inhibition of maxillary growth that caused bone grafting operation and the short evaluation period (around 1 year) in the LBG group, while it was longer for the EBG group. Grafted bone is possibly allowed to undergo resorption during remodeling or displacement of the new bone with longer time. As a result, the decrease in the maxillary anteroposterior length exhibited by the distance from A'-PNS was

recognized in the EBG group.

#### 抄録

目的：本研究の目的は片側性唇顎裂患者において二次的顎裂部骨移植の時期の違いが顎顔面形態に及ぼす影響を明らかにすることである。

対象：新潟大学医歯学病院矯正歯科診療室において管理されている片側性唇顎裂患者のうち、早期二次的顎裂部骨移植を施行した17名（骨移植施行平均年齢8歳3か月、以下早期群と略す）、晚期二次的骨移植群骨移植を施行した13名（平均年齢13歳7か月、以下晚期群と略す）の計30名を対象とした。これらの8歳時ならびに14歳時の側面頭部X線規格写真をトレースし、22項目の角度計測ならびに27項目の距離計測を行ない、両群の8歳時ならびに14歳時の値、および8歳時から14歳時の変化について両群間で比較した。

結果：8歳時ならびに14歳時両時期において、角度計測項目ならびに距離計測項目のすべての計測項目について両群間で有意差は認められなかった。しかしながら、8歳から14歳の変化量に関し距離計測項目のうちA'-PNSにおいて、両群間で有意差を認めた。

結論：本研究では上顎骨の前後的な長さに関してその変化量に差を認めた。その理由として1. 骨移植術施行時の外科的侵襲による成長抑制、2. 晚期群では骨移植後移植骨の置換が完了せず、移植骨の吸収も少ない反面、早期群では骨移植後5年前後経過しており移植骨の置換がおこなわれ、A点付近の骨吸収が生じること、から、上顎骨の前後的な長さには差が生じたと考えられた。

## Introduction

Orofacial clefts are very complicated conditions, with huge psychosocial difficulties to the patients and their families. Interdisciplinary management by oral surgeons, orthodontists, pedodontists, general dentists and speech pathologists is required for these patients.

Because the treatment protocol differs among different centers, many researchers have been trying to assess the effects of the various steps of these different protocols. The subjects' craniofacial morphology is often characterized by a concave facial profile, which is believed to be caused by a lack of the intrinsic growth potential of the nasomaxillary complex and/or the influence of surgical intervention<sup>1,2)</sup>. Moreover, the difference in craniofacial growth in cleft patients seems to depend on the extent of the clefting<sup>3,4)</sup>. Closure of the cleft in infancy by primary bone grafting or periosteoplasty is generally considered to cause inhibition of subsequent maxillary growth<sup>5,6,7,8)</sup>.

Since Boyne and Sands<sup>9,10)</sup> introduced a technique for bone grafting prior to the eruption of the canine, many hospitals have adopted this method. Ideally, secondary bone grafting should be performed at the early transitional dentition stage, after the eruption of the permanent incisors, but before the eruption of the

permanent maxillary canines<sup>9,11,12,13)</sup>. Specifically, bone grafting should be undergone before the eruption of the canine in the cleft region, when the root of the canine is one-fourth to two-thirds formed<sup>14)</sup>. Bone grafting shouldn't be considered in isolation, but as a part of a more comprehensive orthodontic treatment, as it will allow a smooth eruption of the lateral incisor and/or canine and will guarantee a well aligned maxillary arch without restoring to bridgework. In addition, oronasal fistulae are closed, and the maxillary segment is stabilized<sup>11,12)</sup>. At this point, the procedure is able to create an osseous environment that permits the spontaneous eruption or orthodontic adjustment of the canine tooth. The chances of obtaining a normal interdental septum in the former site of a cleft are considerably higher when the grafting is done prior to canine eruption<sup>12)</sup>. On the other hand, bone graft placed after the eruption of permanent dentition has more chances of resorption<sup>15)</sup>.

As sagittal and transverse growth of the maxilla has largely finished by 8 to 9 years of age<sup>12)</sup>, the chances of interfering with maxillary growth are minimal after this age; however, vertical growth of the alveolus continues after that age. The beneficial effects of bone grafting before eruption of the canine is that, as the canine erupts, it induces deposition of bone on the alveolar crest and adds to the vertical height of the maxilla<sup>14)</sup>.