



Clinical Study on Surgical Correction of Cleft Lip Nasal Deformity

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요 약

구순열비변형 환자의 외과적 교정에 관한 임상적 연구

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본 논문에서는 구순열 환자의 비기형에 대한 주소(chief complaints)와 그 원인이 되는 해부학적 요인, 그리고 각각의 요소에 대응하는 교정 술식들에 관해 저자의 임상적 경험을 토대로 한 견해 및 유의사항 등을 공유하고자 한다. 본 연구에서는 지난 7년간 구순열에 의한 비변형을 주소로 서울대학교 치과병원 구강악안면외과에 내원하여 수술적 비교정 수술을 시행받은 47명의 환자—남자 26명, 여자 21명, 평균연령 만 21.3세—를 편측성(36명)과 양측성(11명) 구순열 군으로 나누어 주소, 발견된 비기형, 시행받은 술식 등을 분석하였다. 구순열 비변형환자가 병원을 찾는 주소로는 편측성의 경우 코의 비대칭의 교정, 양측성의 경우 넓어지고 낮아진 코의 교정을 원하는 경우가 가장 많았고, 대표적인 해부학적 요인으로는 공통적으로 콧날개연골의 외하방변위(47), 편측성에서는 비중격 변위(17), 양측성에서는 부족한 비중격 지지 및 비주 연조직의 부족(8) 등이 있었다. 교정 술식으로는 콧날개연골의 재위치 및 고정(47), 비주 연장을 위한 forked flap(10), 비주 및 비익의 지지를 위한 경조직 이식(비중격 연골 10, 외이연골 15, 자가 늑연골 2, 사체 늑연골 2), 비익의 상하적 비대칭 교정을 위한 편측성 회전편판 술식(2) 등이 있었다. 한편 구순열 비변형 뿐 아니라 미적 관점에서 필요한 부분에 대한 수술을 추가함으로써 보다 만족할 만한 결과를 얻을 수 있었다. 이상의 연구 결과는 향후 구순열 비변형 환자에 있어서 개별화된 분석(구순열 비변형 및 심미적 평가)을 통하여 치료계획을 세우고 수술을 진행하는 것이 환자에게 보다 큰 만족을 줄 수 있다는 것을 제시한다.

주요어 : 구순열비변형, 편측성 구순열, 양측성 구순열

I . Introduction

The surgical correction of cleft lip nasal deformity is unequivocally one of the most difficult surgeries regardless of the operating surgeon's field of specialty.¹⁾⁻⁷⁾ Secondary rhinoplasty of cleft lip patients poses an even greater challenge compared to other primary or secondary rhinoplasty procedures due to (1) congenital anatomic deficiency, (2) extensive scar formation from previous reconstructive attempts, and (3) growth-related anatomic changes. Common chief complaints and their associated anatomic abnormalities in unilateral or bilateral cleft lip and palate patients are listed in *Table 1 and Table 2*,

respectively. In brief, lack of hard tissue support under lower lateral cartilage caused by incomplete fusion of maxillary prominence with medial nasal prominence results in latero-inferior dislocation of lower lateral cartilage and growth disturbance in septal cartilage and overlying soft tissue leading to depression and deviation of nasal tip and widening of alar base. Discontinuity and dislocated attachments of nasalis and orbicularis oris muscles result in deformation of nostril shape. In order to obtain desirable and stable outcome, secondary correction of the cleft lip nasal deformity should address each of the aforementioned considerations. The purpose of this study was to review chief complaints, causative anatomic deformities, surgical

Table 1. Common chief complaints and associated anatomic deformities found in *unilateral* cleft lip and palate patients

Chief complaints	Anatomic abnormalities
<ul style="list-style-type: none"> - Deviated columella - Depressed and deviated nasal tip - Wide and snub ala on cleft side - Flat and V-shaped nostril, nasal rim skin webbing 	<ul style="list-style-type: none"> - Deviated septal cartilage and unilaterally dislocated lower lateral cartilage(LLC) - Latero-inferior dislocation of LLC - Maldevelopment/underdevelopment of soft tissue and supporting framework

Table 2. Common chief complaints and associated anatomic deformities found in *bilateral* cleft lip and palate patients

Chief complaints	Anatomic abnormalities
<ul style="list-style-type: none"> - Short columella, and flat and flared nasal tip - Wide and snub ala - Flat and V-shaped nostrils, nasal rim skin webbing 	<ul style="list-style-type: none"> - Underdeveloped septal cartilage and latero-inferiorly dislocated lower lateral cartilage(LLC) - Latero-inferior dislocation of LLC - Maldevelopment/underdevelopment of soft tissue and supporting framework

procedures used to correct the specific nasal anatomical problems of cleft lip patients, and share empirical clinical knowledge.

II. Patients and method

In this study, medical records of 47 patients who underwent secondary rhinoplasty for cleft lip nasal deformity at Department of Oral and Maxillofacial Surgery, Seoul National University Dental Hospital by a single operator over a 7-year period (2007~2013) were reviewed. Among the patients, 26 were male and 21 female. Ages of patients ranged from 6 to 43 years with mean age of 21.3 years. Types of cleft lip consisted of 36 unilateral and 11 bilateral.

III. Results

Common chief complaints of unilateral cleft patients included flattened nasal tip (21) and nasal asymmetry (17). Bilateral cleft patients' common chief complaints were widened alar base (11) and flat nasal tip (10). Most common nasal anatomic deformity found in unilateral cleft patients was septal deviation and depression of nasal tip (21 of 36 patients) followed by columellar deviation (17 of 36 patients). In bilateral cleft patients, columellar height deficiency was observed most commonly (10 of 11 patients).

Different sets of surgical procedures were

performed according to each patient's specific needs. Nasal septoplasty was performed for the correction of septal deviation in unilateral cleft patients (13). In correcting uni- or bilateral latero-inferior malpositioning of lower lateral cartilage (LLC), LLC repositioning was performed (47). In a number of cases, corrections of alar base position were necessary. In these cases, alar base correction (5) or rotational flap (2) was performed. Figure 1. One of the most common nasal deformities found in bilateral cleft patients was columellar height deficiency (8). Forked flap procedure was used for columellar soft tissue lengthening (10), and various cartilage grafts were used for height support. In addition to correction of cleft-induced nasal deformities, other esthetic needs were also addressed at the same time. These included low dorsum and nasal tip augmentation using cartilage grafts or alloplastic grafts such as polytetrafluoroethylene (Goretex®). Autogenous cartilage graft donor sites included septal cartilage (20), auricular cartilage (15), and costal cartilage (2). 2 patients received homogenous costal cartilage graft harvested from cadavers.

Number of procedures-wise, LLC repositioning was done in all 47 patients regardless of type of cleft. Columellar lengthening was performed on most bilateral cleft patients (8 of 11). Aside from these common procedures, 13 of the unilateral cleft patients received septoplasty, 4 received alar base corrections, and 20 patients received cartilage grafts (7 septal and 13 auricular cartilages). 2 of the unilateral cleft patients required rotational flap



Figure 1. Rotational flap design (left) and repositioned flap (right)

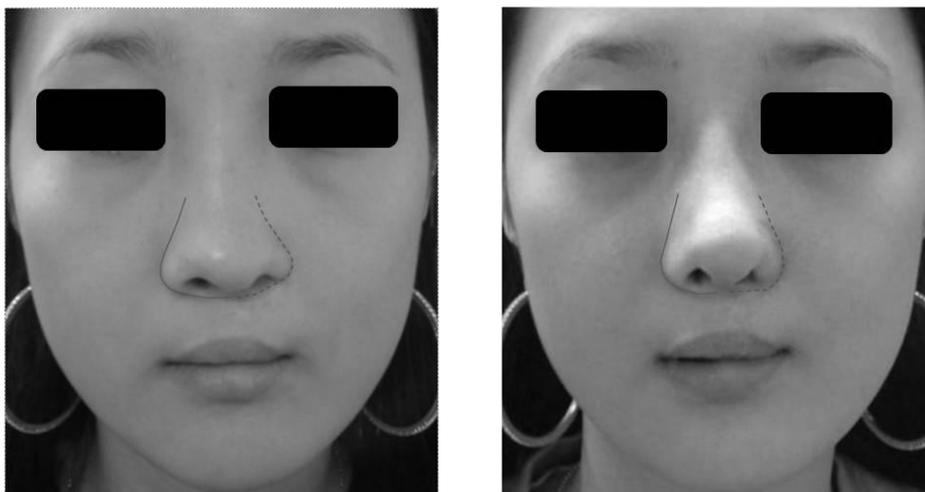


Figure 2. Rotational flap for alar base asymmetry correction: pre-op (left) and post-op (right)

Table 3. Nasal deformities and procedures performed according to types of cleft

	Unilateral (36)	Bilateral (11)
Deformities (number of cases)	Deviated columella(17) Depressed or deviated nasal tip (21) Wide alar base (2) Laterlized alar base (4)	Short columella (8) Bilateral alar cartilage rotation (1) Alar base eversion (1) Wide flaring nostrils(1)
Surgical treatments (number of cases)	Septoplasty (13) LLC reposition (36) Alar base correction (4) Rotational flap (2) Cartilage grafts: septal (7), auricular (13)	Columellar lengthening (10) LLC reposition (11) Alar base correction (1) Cartilage grafts: septal (3), auricular (2), autogenous costal (2), homogenous costal (2)

surgery for the correction of alar base height discrepancy (Figures 1 and 2). Selective procedures done on bilateral cleft patients included alar base correction (1) and cartilage graft. Nasal deformities and procedures performed according to types of cleft are listed in *Table 3*.

IV. Discussion

Secondary rhinoplasty in patients with unilateral and bilateral clefts is very complex due to its pathological and anatomical characteristics. Surgeons are often confronted with distorted anatomy, scar tissue from previous surgeries, and sparseness of donor cartilage.⁶⁻⁹⁾ Therefore it is very important that surgical treatment plan is individualized to each patient for successful results. Criteria for a successful surgical repair of the cleft lip and nose deformity include normal orbicularis oris function and symmetrical and esthetic lip and nose. In

order to meet the criteria, surgeons need to have complete understanding of the normal and defective anatomy of the midfacial region. Many surgical techniques have been designed to correct nasal deformity of cleft lip and palate patients. Complete correction, however, still remains as a difficult task.

One of the congenital defects that must be addressed with priority is the continuity and symmetry of piriform aperture and the maxillary alveolus. Unilateral cleft lip patients often complain of asymmetrical height of nasal base. This is due to lack of bony support under alar base. In moderate to severe cases of cleft lip, alveolar bone and the base of piriform aperture sometimes are impaired by discontinuity and asymmetry. In such patients, concomitant or separate preparatory correction of bony support is necessary. Autogenous or allogeneous bone graft with or without isolation technique more than often suffices. If nostril size discrepancy still remains after the correction of

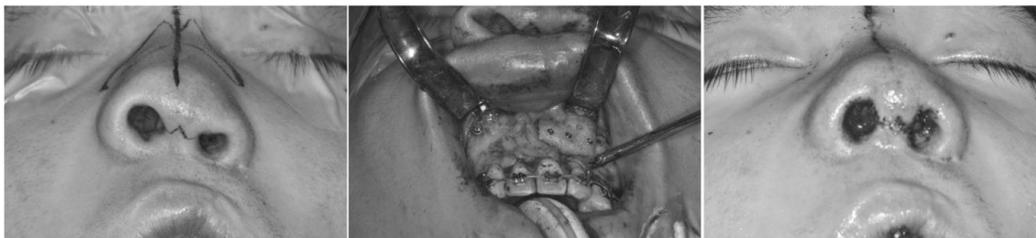


Figure 3. Allogenous graft (Medpor®) on alveolus for hard tissue support of alar base in unilateral cleft patient with asymmetrical piriform aperture base.

bony support for alar base, surgical correction of nostril size through alar base excision and cinch suture may be necessary. In this study, a male patient received porous polyethylene (Medpor®) graft on alveolus for bony support of alar base and the patient was very satisfied with the results (Figure 3).

Repositioning of the lower lateral cartilage (LLC) is an essential step in cleft lip rhinoplasty. In order to accurately place and fix the LLC to its normal anatomic position, separation of the cartilage via complete dissection is required. When the LLC is freely movable, it then may be placed at the ideal position and fixed by various suture techniques including interdomal sutures, transdomal sutures, lateral crural sutures, etc.¹⁰⁾ In this study, all 47 patients regardless of type of cleft received LLC repositioning procedure.

Although still debated, Millard's forked flap for columellar soft tissue lengthening is an excellent surgical option in adult patients when performed along with stable cartilage graft support.^{5),7),8),11)} Cartilage graft materials used as struts include but are not limited to autogenous septal cartilage, autogenous auricular cartilage, and autogenous or

homogenous costal cartilage.¹²⁾⁻¹⁷⁾ Among various cartilages, many surgeons prefer autogenous septal cartilage for its ease of contouring and lack of donor site morbidity. However, septal cartilages in secondary rhinoplasty patients are often times defective or not present due to congenital deformity or previous surgeries.¹²⁾⁻¹⁴⁾ Moreover, in this study, autogenous septal cartilages were often found to be thin, fragile, and insufficient in height and thickness. This may be attributable to the ethnic (Korean) anatomic characteristics. Further investigation into ethnic variability of physical properties of septal cartilage seems necessary in order to make a definitive statement on this topic. Auricular cartilage, which can be an alternative graft material, are found to lack mechanical support.^{12),14),15)} When autogenous septal cartilage is not available, the preferred second choice is autogenous costal cartilage.^{7),8),12),14),16),17)} Even though costal cartilage is known for its tendency to warp post-operatively, meticulous design and careful surgical technique can prevent unwanted deformation of the graft.¹⁸⁾ In this study, 2 bilateral cleft patients had received autogenous costal cartilage grafts. Although the results were

satisfactory and post-operative warpage was not noted, patients had to receive an additional surgery for graft harvest.

Another option for cartilage graft is homogenous costal cartilage graft. Since the first reported use of irradiated human costal cartilage by Dingman and Grabb¹⁹⁾ in 1961, homogenous costal cartilage graft has been widely accepted as an effective replacement of autogenous costal cartilage graft with added benefit of lack of additional surgery site.^{13),14),20)} However, since irradiated homogenous costal cartilage graft is more brittle than freshly harvested autogenous costal cartilage, careful handling is required during shaping, fixating, and in general manipulation. In this study, the operator noted easier contouring and reduced surgery time when homogenous costal cartilage was used instead of autogenous costal cartilage (Figure 4).

In addition to nasal deformity due to cleft lip,

if patients' chief complaints include nasal esthetic dissatisfaction, they should also be addressed at the same time to avoid additional surgeries and entailed morbidity. Simple nasal esthetic procedures such as dorsal augmentation and nasal tip surgery using synthetic graft materials such as Medpor[®] and Goretex[®] can be added without additional morbidity¹⁴ (Figure 5).

On final note, in performing nasal corrective surgery on cleft lip patients, it is essential to collect and analyze each patient's chief complaints, identify the specific causative anatomic defects, and apply individualized sets of procedures including esthetic surgeries. Also, regardless of surgical technique or graft material used, long-term follow-up is necessary to observe the dynamics of the healing process and outcomes of graft materials especially in case of secondary rhinoplasty of cleft lip patients.



Figure 4. Columellar lengthening with irradiated homogenous costal cartilage: pre-op (left) and post-op (right).

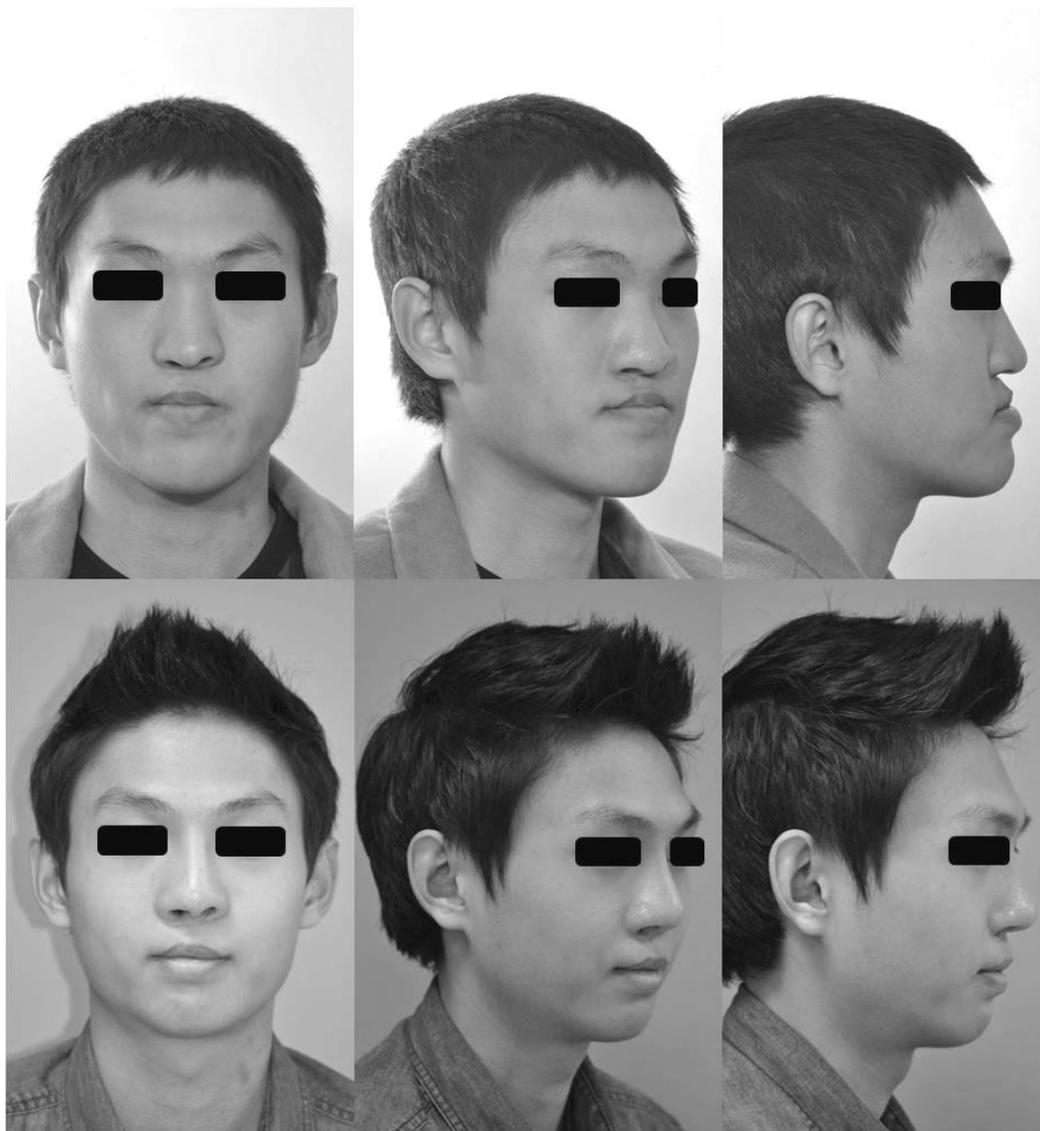


Figure 5. Pre-op (upper) and post-op (lower) photos of patient who underwent concomitant esthetic surgeries (augmentation of nasal dorsum) along with cleft lip rhinoplasty.

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