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석사학위논문

Analysis of Soft Tissue Changes after Genioplasty in Skeletal Class III Dentofacial Deformity

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골격성 III급 부정교합 환자에서 이부성형술 후 연조직 변화에 관한 연구

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이 논문을 치의학 석사학위신청 논문으로 제출함.

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골격성 III급 부정교합 환자에서 이부성형술 후 연조직 변화에 관한 연구

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본 연구의 목적은 이부성형술만 시행한 환자, 이부성형술과 하악지 상행지 분할골절단술(BSSRO)을 시행한 환자, 이부성형술과 하악지 상행지 분할골절단술 및 Le Fort I 골절단술(Le Fort I osteotomy)을 시행한 환자에서 경조직과 연조직의 전하방적인 변화와 수직적 변화량을 측정하여 치료 결과 예측에 도움을 제공하는데 있다.

본 연구는 2001년 1월에서 2006년 12월까지 조선대학교 치과병원 구강악안면외과에서 이부성형술을 시행한 환자 중 추적가능한 15명의 환자를 대상으로 시행하였다. 남자가 7명, 여자가 8명이었으며, 평균 나이는 22세(18~37세)였다.

환자를 대상으로 술 전, 술 후 1주일 이내, 술 후 6개월에 규격 측모두부 방사선 사진을 촬영하여 투시도를 작성후 V-ceph program을 이용하여 수직, 전후방향적 상대적인 변화량을 알아보기 위해 측정한 경조직 및 연조직 계측점들은 N(nasion), S(sella), Me(menton), Pog(pogonion), B(B point), Ns(soft tissue nasion), Li(Labialis inferious), MLS(soft tissue B point), Pogs(soft tissue pogoion), Mes(soft tissue menton) 이었다.

계측 후 다음과 같은 결과들을 얻었다.

1. B-point의 평균 회귀량은 12.98%, Pogs의 평균 회귀량은 39.83%이었다.
2. 수직적인 회귀량은 유의성이 없었다.
3. Pog 및 B-point에 대한 Pogs, MLS, Li의 평균 변화량은 0.86이었다.
4. Me에 대한 Mes의 평균 변화량은 0.66이었다.

측모 두부방사선 사진 분석에 있어서 술 전, 술 후에 대한 규격화된 계측을 통하여 계측점을 재현성있게 설정하여 측정오차를 줄일 수 있어야 하고, 장기간의 추적조사를 통하여 확보된 술 후 안정성을 참고로 한 수술계획 설정이 필요할 것이다. 또한, 수술방법이나 고정방법 등 수술에 관계된 요소에 따른 경조직과 연조직에 미치는 영향을 세분화하는 기준 필요하며 많은 증례를 이용한 통계적 유의성 높이는 작업이 요구될 것이다.

Introduction

The thickness of the soft tissue in the maxillofacial area is diverse, and depends on the individual and the site. Therefore, in patients who are diagnosed, or in whom the treatment protocol is designed only on the basis of tooth and skeletal measurements, errors can readily occur. In particular, in the case of orthognatic surgery for facial aesthetic improvement, accurate analysis of soft tissues should be considered a prerequisite.[1] During presurgical assessment, by measuring the soft and hard tissues, an aesthetic balance must be considered. For establishing appropriate treatment plans and prognosis, the estimated value of the correlation between the change in hard and soft tissues is required, and the application of such an estimated value may be of help in more accurately predicting the soft tissue lateral image after orthognatic surgery.[1]

Most facial deformity accompanies the protrusion or retrusion of the mentum, and surgery for the location of the mentum therefore contributes greatly to the balance of the maxillofacial area.[2] After genioplasty, the change in soft tissues is diverse, depending upon the individual and the presence or absence of other simultaneous surgery.[3]

The purpose of this study was to measure the anteroinferior changes and the level of vertical changes to facilitate the prediction of treatment outcome in patients undergoing genioplasty only, genioplasty with bilateral sagittal split ramus osteotomy(BSSRO), genioplasty with BSSRO and Lefort I osteotomy.

Materials and Methods

PATIENTS

This study was made on 15 patients who underwent genioplasty in the department of Oral and Maxillofacial Surgery at Chosun University Dental Hospital, Korea, from January 2001 to December 2006, and who were available for follow-up. Seven male and eight female patients (mean age 22 years; range 18–37) participated.

METHODS

In patients undergoing genioplasty only, genioplasty with BSSRO, or genioplasty with BSSRO and Lefort I osteotomy, cephalometric radiographs were taken prior to surgery, after 1 week and after 6 months of the surgery. Perspective maps were prepared. Subsequently, using the V-ceph program, the relative changes in the vertical and anteroposterior directions were compared and analyzed (Figs. 1–3).

The measurement sites of hard and soft tissues were nasion (N), sella (S), menton (Me), pogonion (Pog), B point (B), soft tissue nasion (Ns), labialis inferius (Li), soft tissue B point (MLS), soft tissue pogonion (Pogs), and soft tissue menton (Mes). The baseline was defined as the horizontal plane (HP) of the line connecting the N and S moved by 7° in the clockwise direction, based on S. This line was chosen because the angle formed by the Frankfurt horizontal (FH) plane close to the physiological horizon with the sella–nasion (SN) plane is 6–7°, and the SN plane has a relatively good reproducibility and reliability. Past the hard tissue in the menton, past the line parallel to the HP, past the soft tissue in the menton, and based on the line parallel to the HP, we measured the vertical distance between the HP and two lines of a line vertical to the HP and a line drawn based on S, and by measuring the transverse line to the hard tissue B point, Pog, soft tissue Li, MLS, and Pogs, we calculated the amount of

vertical and transverse change (Fig. 4).

OPERATION

Incision was made through the mucosa of the lower lip; nonetheless, the method extending to the utmost lateral side of the buccal vestibule is of help in accessing the bone exposure and the mental nerve. The incision was extended to both premolar teeth and periosteum was dissected. The mental nerve was assessed, and after inferior and anterior dissection, the lower border of the mandible was exposed and using a reciprocating saw, transverse osteotomy was performed in the inferior B point. Additional myotomy of the digastric or mylohyoid muscle was not performed, and after moving the mentum, it was fixed with a chin plate and a titanium miniplate.

Results

Four male and five female patients underwent genioplasty with BSSRO, and three male and two female patients underwent genioplasty with BSSRO, and Lefort I osteotomy. Only one single female patient underwent genioplasty only (Table 1). Advanced genioplasty with a mean of 4.8 mm was performed in 11 patients, and setback genioplasty with a mean of 3.3 mm in four patients (Table 2).

Table 1. TYPE OF SURGERY

	Male	Female
Genioplasty+BSSRO	4	5
Genioplasty+BSSRO+Lefort I osteotomy	3	2
Genioplasty	none	1
Total	7	8

Table 2. TYPE OF GENIOPLASTY

	No. of patients	mean± SD(mm)
Advancement	11	4.8 ± 1.6
Setback	4	3.3 ± 1.5

Regarding statistical significance at the 95% reliability, using SPSS (SPSS Inc., Chicago, IL), Pog, B point, Li, MLS, and Pogs were significant, the mean regression level of B point was 12.98%, the mean regression level of MLS was 23.05%, and the mean regression level of Pogs was 39.83%, which was measured to be slightly high. The mean amount of change in the Pogs, MLS, and soft tissue Li against Pog and B point was 0.86 (Table 3).

Table 3. HORIZONTAL AND VERTICAL MOVEMENT (mm)

	Preoperative (A)	Postoperative (B)	B–A	6 months postoperative(C)	C–B
Pog	51.39 ± 7.92	56.47 ± 6.70	3.49 ± 1.78	54.52 ± 2.18	2.63 ± 0.86
B point	50.16 ± 10.36	55.32 ± 8.87	4.70 ± 0.58*	53.69 ± 7.16	0.61 ± 0.15*
Me	136.43 ± 4.67	139.71 ± 3.52	3.29 ± 0.45	136.96 ± 1.31	2.37 ± 0.04
Mes	142.99 ± 7.09	145.16 ± 6.12	3.89 ± 1.53	140.06 ± 9.26	3.19 ± 2.01
Li	68.94 ± 4.37	74.42 ± 5.13	7.88 ± 0.26*	71.22 ± 9.03	2.65 ± 0.24*
MLS	61.95 ± 8.64	69.51 ± 7.47	9.76 ± 0.59*	65.68 ± 7.72	2.26 ± 0.13*
Pogs	64.88 ± 9.11	69.58 ± 7.36	8.16 ± 0.37*	66.98 ± 7.64	3.25 ± 1.75*

* $P < 0.05$

Discussion

The motives forpatients undergoing genioplasty are very diverse and complex. Major factors are compensation of functional defect, and social and psychological reasons however, the most important primary reason is aesthetic.[4] Various genioplastic surgical methods have been used to treat patients with maxillofacial deformity. Patients planning to have genioplasty go through surgery with the expectation of improvements in functional, social, and psychological aspects. Aesthetic changes vary depending on the amount of change in hard tissues, and recently, computer programs predicting the maxillofacial change after surgery have provided numerous incentives to patients.[4] Therefore, the purpose of genioplasty is to correct abnormal functions such as mastication and pronunciation, and to achieve superior aesthetic results and stability after surgery. To predict the change in the maxillofacial profile while planning the treatment, the predicted change in facial soft tissues is an important reference while performing surgery.

Previous methods had almost no conception of functional aspects, and that hard tissues must be balanced with soft tissues in the mental area, including adjacent muscles. Regarding the surgical techniques themselves, shortcomings included difficulty in achieving accurate replacement of distal fragments, and stability and fixation during surgery.[5]

Ayoub et al[6] reported that changes in soft tissues are complex, and rather than a 1:1 relationship with skeletal change, they are influenced by the interaction of diverse variables, including the skeleton, dental changes, lip tension, soft tissue thickness, and muscle function. Fanibunda et al[7] demonstrated that the final location of soft tissues after orthognatic surgery is determined by the three-dimensional interrelationship of hard and soft tissues of preoperation. For the final prediction of facial aesthetics, the degree of overbite or overjet, the presence or absence of cleft lip closure, muscles prior to surgery, subcutaneous tissues, and the elasticity of the skin have to be considered.

Busquets et al[8] reported that in a retrognathic patient, the amount of change in Pog was 0.8:1 against the FH plane and 0.4:1 against Li. Scheideman et al[9] stated that in six cases treated with mandibular setback and advanced

genioplasty, the amount of the change in Pog was 0.87:1. In addition, McDonell et al[10] reported that in 15 cases, after advanced genioplasty, the rate of the change in Pog in soft and hard tissues was 0.75:1.

Among bone fragment fixation methods, those which move a bone fragment to a desired site and put it in position mainly involve intermaxillary fixation using stainless steel wires, or a miniplate. Both methods of fixation are effective, although the miniplate method is more reliable, easy to apply, and has been used more widely. With stainless steel fixation using a miniplate, the muscle layer is relatively thick, and in the mental area where blood supply is abundant, little possibility of developing postsurgical complications such as palpation of the metal plate and infection exists. However, complaints of patients' requiring secondary genioplasty or removal of the miniplate, or bone growth on the upper side of the miniplate resulting in the miniplate being buried. Stainless steel fixation using a miniplate may help bone healing by more definite fixation of the displaced bone fragments nonetheless, in areas where the bone is reformed continuously after surgery, the long-term prognosis of the metal plate is uncertain.[4]

Among surgical techniques, soft tissue treatment may influence stability and regression after surgery. Bell et al[11] and Epker et al[12] reported that in soft tissue treatment, in cases when the anterior and posterior periosteum is peeled away completely, the thickness of soft tissue decreases.

In the analysis of cephalometric radiographs, by getting a standardized measurement prior to surgery and after surgery, and defining the measurement sites, the procedures will be reproducible, and thus measurement errors should decrease; the establishment of a surgery plan considering postsurgical safety through long-term follow-ups may be required. In addition, standards are required to subclassify the effects of surgical and fixation methods, and other factors. Pertinent with surgery on hard and soft tissues, and studies using more patients may be needed to improve the measurement of statistical significance.

This study was performed on 15 patients who were available for follow-up, recruited from those undergoing genioplasty in the Department of Oral and

Maxillofacial Surgery at the Chosun University Dental Hospital from January 2001 to December 2006. Cephalometric radiographs were taken prior to surgery, and in a week and 6 months of surgery. Pog, B point, Me, Pogs, MLS, Li and Mes were measured, and the following conclusions were obtained. The average regression level of B point was 12.98%, and the average regression level of Pogs was 39.83% the vertical regression level was not significant the average amount of change in Pogs, MLS, and Li versus Pog and B point was 0.86; and the average amount of change in Mes against Me was 0.66.

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Legends of Figures

Fig. 1. Prior to surgery.

Fig. 2. One week after surgery.

Fig. 3. Six months after surgery.

Fig. 4. At the time of diagnosing dentofacial deformity, a line forming a 6–7° slope to the FH plane or SN plane was used most frequently as the transverse baseline.

저작물 이용 허락서

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논문제목	한글: 골격성 III급 부정교합 환자에서 이부성형술 후 연조직 변화에 관한 연구 영문: Analysis of Soft Tissue Changes after Genioplasty in Skeletal Class III Dentofacial Deformity				

본인이 저작한 위의 저작물에 대하여 다음과 같은 조건아래 조선대학교가 저작물을 이용할 수 있도록 허락하고 동의합니다.

- 다 음 -

1. 저작물의 DB구축 및 인터넷을 포함한 정보통신망에의 공개를 위한 저작물의 복제, 기억장치에의 저장, 전송 등을 허락함.
2. 위의 목적을 위하여 필요한 범위 내에서의 편집·형식상의 변경을 허락함. 다만, 저작물의 내용변경은 금지함.
3. 배포·전송된 저작물의 영리적 목적을 위한 복제, 저장, 전송 등은 금지함.
4. 저작물에 대한 이용기간은 5년으로 하고, 기간종료 3개월 이내에 별도의 의사표시가 없을 경우에는 저작물의 이용기간을 계속 연장함.
5. 해당 저작물의 저작권을 타인에게 양도하거나 또는 출판을 허락을 하였을 경우에는 1개월 이내에 대학에 이를 통보함.
6. 조선대학교는 저작물의 이용허락 이후 해당 저작물로 인하여 발생하는 타인에 의한 권리 침해에 대하여 일체의 법적 책임을 지지 않음.
7. 소속대학의 협정기관에 저작물의 제공 및 인터넷 등 정보통신망을 이용한 저작물의 전송·출력을 허락함.

2008년 8월 일

저작자: 김 수 권 (서명 또는 인)

조선대학교 총장 귀하