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Comparison of Genioplasty using Medpor® and Osteotomy

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2009년 2월 박사학위논문 Comparison of Genioplasty using Medpor® and Osteotomy 박 중 엽

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Medpor®와 골절단술을 이용한 이부성형술의 비교 연구

2009년 2월 25일

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Comparison of Genioplasty using Medpor® and Osteotomy

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이 논문을 치의학 박사학위신청 논문으로 제출함

2008년 10월 일

조선대학교 대학원

치 의 학 과

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국문초록

Medpor®와 골절단술을 이용한 이부성형술의 비교 연구

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본 연구의 목적은 이부성형술 시 적절한 치료계획의 수립 및 예후의 측정을 위해 경조직과 연조직 변화 사이의 상관관계에 대한 예상치가 필요하며, 이러한 예상치를 이용함으로써 경조직과 연조직의 전후방적인 변화량을 측정하여 이부성형술 시 치료 결과를 예측하는 데 있다.

2001년 1월부터 2007년 12월까지 조선대학교 치과병원 구강악안면외과에서 Medpor® (Porex Surgical, USA)를 이용하여 이부성형술을 시행한 환자 중 6개월 이상 추적 가능한 33명의 환자(남자 : 15명, 여자 : 18명 - 평균 나이 : 22세(18~37세), Group A(14명): 골절단술을 시행하여 이부성형술을 시행한 그룹, Group B(19명): Medpor®를 이용하여 이부성형술을 시행한 그룹)를 대상으로 술 전, 술 직후 1주일 이내, 술 후 6개월 측모 두부 방사선 사진으로 이부의 경조직과 연조직의 변화를 투시도를 작성 후 V-ceph program을 이용하여, 전후방적 변화량 및 회귀량을 비교, 분석하여 다음과 같은 결론을 얻을 수 있었다.

1. 골절단술을 시행한 환자의 pogs의 평균 회귀량은 58.59% 이었으며, Medpor®를 이용한 이부성형술을 시행한 환자의 경우 pogs의 평균 회귀량은 14.56% 이었다.
2. 골절단술을 시행한 환자의 Pog에 대한 pogs의 평균 변화율은 92.65%이었다. Medpor®를 이용한 이부성형술을 시행한 환자의 경우 Pog에 대한 pogs의 평균 변화율은 98.72%였다.
3. 위 내용의 결과에 따라 Medpor®를 이용하여 이부성형술을 시행한 환자의 경우에 연조직의 회귀율이 적음을 알 수 있었다.

위의 내용의 결과에 따라 Medpor®를 이용하여 이부성형술을 시행한 환자는 골절단술을 통한 이부성형술을 시행한 환자에 비해 수술 당시 이동량이 술 후에 변화 없이 적용됨을 알 수 있었다.

Ⅰ. Introduction

With the increased demand for aesthetic procedures to correct facial deformities, many orthognathic surgery techniques have been developed. Specific procedures have been introduced to correct depression of the middle face associated with mandibular prognathism. These include procedures affecting the zygomatic bone, infraorbital region, and paranasal sinus. A variety of materials are used for mentum augmentation, including autologous, heterologous, xenogenic, and alloplast materials. While autogenous bone is the ideal material for augmentation, it has shortcomings of requiring a donor area and a high resorption rate. Consequently, various artificial graft materials have been developed, and methods for the efficacious use of these graft materials have been proposed.[1-10] Recently, porous graft materials, such as expended polytetrafluoroethylene (e-PTFE) and porous high-density polyethylene (PHDPE), have been introduced.[7-10]

The host response to a specific artificial graft material depends on its chemical composition, safety, hydrophobicity, surface characteristics, and manufacturing techniques. The ideal implant material should maintain its structural strength and its compatability. It should also be resistant to tissue reactions, absorption, infection, resistance, toxicity, or allergic reactions, and it should be easy to shape, remove, and sterilize. In addition, its thermal and electrical conductivity should be low, and it should be radiolucent.

Medpor® has a long history of use in plastic surgery and craniofacial augmentation procedures. It is the simplest polyethylene synthetic polymer. Polyethylene has the advantage of being elastic and durable. Medpor® is porous, allowing ingrowth of bony and fibrous tissue, while it is also unbreakable and can be shaped using a sharp surgical scalpel. In addition, it can be produced in various shapes, such as sheets, blocks, and preformed shapes, making it useful in oral and maxillofacial reconstructive

surgery. Rubin[11] reported 32 years of experience in craniofacial skeletal reconstruction and the biocompatibility of porous polyethylene.

Although diverse materials have been used in mentum augmentation, Medpor® is not widely used for this purpose. This paper compares treatment outcomes using: density porous polyethylene (Medpor®; Porex Surgical, USA) and osteotomy by measuring the amount of anteroposterior change in the hard and soft tissues.

Ⅱ. Patients and Methods

Thirty-three patients who underwent mentum augmentation and who were followed-up for longer than 6 months, were included in this study. All were treated at the Department of Oral Maxillofacial Surgery of Chosun University Dental Hospital between January 2001 and December 2007. Subjects were self-assigned, based (14 patients) on their preferred treatment to correct their mandibular prognathism, to either Group A, genioplasty using osteotomy (19 patients), or Group B, genioplasty using Medpor®. The study population consisted of 15 men and 18 women with a mean age of 22 years (range 18-37).

Group A (Mentum Augmentation using Osteotomy)

The subjects in Group A underwent genioplasty plus bilateral sagittal split ramus osteotomy of the mandible (BSSRO), genioplasty plus LeFort I osteotomy, or genioplasty alone. All surgical procedures were performed under standard general anesthesia using an intraoral approach (Fig 1). The osteotomy performed depended upon the augmentation volume required. Fixation was achieved with miniplates and screws (Fig 2).

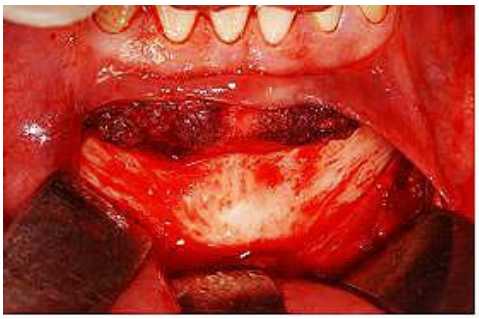

FIGURE 1. Mucoperiosteum elevation after making an anterior vestibular incision.

FIGURE 2. Fixation of the osteotomy with a miniplate and screws.

Group B (Mentum Augmentation Using Medpor®)

Like the subjects in Group A, the subjects in Group B underwent genioplasty plus BSSRO, genioplasty plus LeFort I osteotomy, or genioplasty alone.

Before Medpor® of the appropriate thickness was fitted to the area to be augmented, it was subjected to negative pressure by soaking the implant in an antibiotic solution (in a saline solution of 50 cc diluted with 250mg of amoxicillin). After the material was completely saturated, an intraoral incision was made and Medpor® was fitted onto the mandibular and shaped using a #10 scapel. It was then fixed to the surgical site with miniscrews (Fig 3). To prevent hematoma, a compression dressing was applied after surgery, but a drainage tube was not used.

FIGURE 3. Fixation of the Medpor® to the surgical site with a screw and one-hole plate.

DATA ANALYSIS

To reduce the errors of measuring persons, one orthodontist prepared fluoroscopic imaging and measured them, and another orthodontist reviewed it.

Lateral cephalograms were taken before surgery and postoperatively within 1 week and after 6 months. The changes in the hard and soft tissues of the mentum were evaluated using fluoroscopy and the program V-ceph (CyberMed Inc.). The amount of change in the anteroposterior direction and the amount of relapse were analyzed.

Considering the sella (S) of nasion-to-sella (N-S) as the baseline, a hypothetical line (HP) was rotated in a clockwise direction by 7° . A parallel line was drawn through the hard tissues of the menton. Another line parallel to HP was drawn through the soft tissues of the menton and the vertical distance from HP to these two lines was measured.

Vertical to HP, a line was drawn on S, and the vertical distances to the hard tissue B-point and osseous pogonion (Pog) and the soft tissue labrate inferius (LI) and the mentolabial sulcus (MLS) were measured (Fig 4).

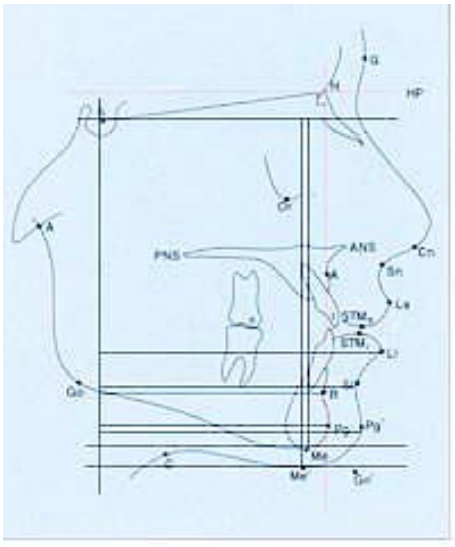

FIGURE 4. Landmarks and standard lines.

STATISTICAL ANALYSIS

The average and standard deviation of all measurements were obtained using a statistical software package (SPSS 15.0, Chicago, IL, USA) program, and the B, t-test was performed to examine the significance between the groups.

Ⅲ. Results

The surgery amount of Group A was average 4.49 mm and the group B was average approximately 7.05 mm (Table 1).

Table 1. ADVANCED HORIZONTAL CHANGES OF TWO GROUPS

	Patients (number)	Mean ± SD(mm)
Group A	14	4.49 ± 1.78
Group B	19	7.05 ± 6.21

In patients subjected to a genioplasty using an osteotomy or Medpor®, the distances between the measurement points before, 1 week after, and 6 months after surgery were measured and compared. The following results were obtained (Table 2).

Table 2. PREOPERATIVE, POSTOPERATIVE, POSTOPERATIVE 6 MONTHS OF OSTEOTOMY, MEDPOR® APPLICATION PATIENTS

Measurement		Osteotomy		Medpor®		T-value	P-value
		Mean	SD	Mean	SD		
1) Pre-op (A)	Pog	51.39	7.92	49.18	5.41	0.95	0.174
	B point	50.16	10.36	44.16	8.02	1.88	0.035
	Me	136.43	4.67	147.23	5.62	-5.85	0.000
	Mes	142.99	7.09	129.59	6.01	5.87	0.000
	Li	68.94	4.37	57.65	3.87	7.84	0.000
	MLS	61.59	8.64	54.21	5.61	2.98	0.003
	Pogs	64.68	9.11	62.28	9.11	0.75	0.230
2) Post-op (B)	Pog	56.47	6.70	56.23	5.20	0.12	0.454
	B point	55.32	8.87	49.82	7.87	1.88	0.035
	Me	139.71	3.52	151.42	6.67	-5.97	0.000
	Mes	145.16	6.12	136.36	5.11	4.50	0.000
	Li	74.52	5.13	61.42	2.13	10.06	0.000
	MLS	69.51	7.47	56.51	9.17	4.34	0.000
	Pogs	69.58	7.36	70.96	5.31	-0.63	0.268

3) B-A	Pog	4.49	1.78	7.05	6.21	-1.49	0.073
	B point	4.70	0.58	5.66	3.58	-0.99	0.165
	Me	3.29	0.45	4.19	9.45	-0.35	0.363
	Mes	3.89	1.53	6.77	5.52	-1.89	0.034
	Li	7.89	0.26	3.77	2.21	6.91	0.000
	MLS	9.76	0.59	2.31	6.59	4.20	0.000
	Pogs	4.16	0.37	6.96	0.37	-21.49	0.000
4) Post-op 6 m (C)	Pog	54.52	2.18	55.58	5.11	-0.73	0.236
	B point	53.89	7.16	49.67	7.16	1.67	0.052
	Me	136.96	1.31	149.66	6.37	-7.32	0.000
	Mes	140.06	9.26	135.25	9.26	1.47	0.075
	Li	71.22	9.03	60.22	6.03	4.20	0.000
	MLS	65.68	7.72	55.47	9.12	3.39	0.001
	Pogs	66.98	7.64	69.99	5.34	-1.33	0.096
5) B-C	Pog	2.63	7.86	0.61	1.29	1.11	0.139
	B point	0.61	0.15	0.15	8.36	0.20	0.419
	Me	2.37	9.04	1.76	2.14	0.28	0.389
	Mes	3.19	2.01	1.01	8.01	0.99	0.165
	Li	2.65	0.24	1.20	3.27	1.65	0.055
	MLS	2.26	1.13	1.04	2.47	1.72	0.048
	Pogs	2.45	5.48	0.97	2.75	1.02	0.158
6) B-C / B-A	Pog	0.59	0.68	0.09	0.12	3.15	0.002
	B point	0.13	0.23	0.03	0.06	1.88	0.035
	Me	0.72	0.68	0.42	0.21	1.82	0.039
	Mes	0.82	0.21	0.15	0.75	3.24	0.001
	Li	0.34	0.02	0.32	0.31	0.21	0.417
	MLS	0.23	0.23	0.45	0.58	-1.33	0.096
	Pogs	0.59	0.56	0.14	0.22	3.19	0.002

*

Pre-op: Pre operation, Post-op: Post operation, Pog: Pogonion, Me: Menton, Mes: soft tissue menton, Li: Labrale inferius, MLS: mentolabial sulcus, Pogs: soft tissue pogonion

The mean and standard deviation of the measurement categories of Group A and B were obtained, and the significance between the two groups was evaluated (Table 2). As shown in Table 2, in cases where patients were performed genioplasty using osteotomy, the mean movement amount of Pog (B-A) was 3.49 mm, the relapse amount (B-C) at the time point 6 months after surgery (C) was an average 2.63 mm. The value of Pogs, the area where patients feel while actually seeing the face after surgery, was analyzed by the identical method on cephalogram, and it was found that the mean movement amount at the time of surgery was 4.16 mm, and the relapse amount 6 months after surgery was approximately 3.25 mm. As the method to obtain the relapse rate, the regressed amount after surgery (B-C) was divided by the amount of movement at the time of surgery, and was calculated as their percentage. The mean relapse rate of Pogs was 58.59%, and it was found to be relatively high.

In cases where patients were performed genioplasty using the Medpor®, the mean relapse rate of Pogs was 14.56%, and it was found to be smaller than that of Group A. In addition, the mean change amount of Pog of patients performed osteotomy was 92.65%, and in cases of patients performed genioplasty using the Medpor®, the mean change rate of Pogs against Pogs was 98.72%.

In the 6) of table 2, value reflected on the postsurgical relapse amount, a statistically significant difference of the two groups at 0.001 significant level (α) was shown. Additionally, B point and MLS showed a significant difference also at 0.05 significant level (α).

Ⅳ. Discussion

For patients treated for chin augmentation using either genioplasty with Medpor® or osteotomy, the predictive value of the correlation of the hard and soft tissues was considered, and the amount of posteroanterior change in the hard and soft tissues was measured to facilitate the prediction of the treatment outcome using lateral cephalograms taken before, within 1 week, and 6 months after surgery. Using the program V-ceph, the amount of anteroposterior change and relapse volume were compared and analyzed.

Bikhazi et al[12] reported that in cases using Medpor®, it was very important to predict the changes in soft tissues induced after surgery to determine the treatment procedure and assess the prognosis. Comparing cephalograms taken immediately and 6 months after surgery, they calculated that the average increase in soft tissue thickness for patients undergoing augmentation genioplasty using Medpor® 7 mm in thickness with no infection or other complications was 4.1 mm one year after surgery for an overall soft tissue augmentation of 58%. Kent et al[13] reported a 57% increase in the soft tissue thickness after augmenting the mentum and maxillary zygomatic body.

In this study, the mean relapse rate of Pogs in patients treated using an osteotomy was 19.83% versus 11.20% for a genioplasty using Medpor®. In patients treated with an osteotomy, the mean change in soft tissue pogonion (Pog) and MLS relative to Pog and the B-point was 0.86, while for patients subjected to genioplasty using Medpor®, the mean change in pogs relative to Pog was 0.98. These results indicated that the patients treated using Medpor® had a smaller soft tissue relapse rate, and the amount of change in the soft tissues was similar to that in the hard tissues. In addition, there were little post surgical complications.

This is the first study to compare genioplasty using Medpor® with

osteotomy by measuring the amount of anteroposterior change in hard and soft tissue. In this study, the mean Pogs relapse rate of patients performed osteotomy was 58.59%, and the mean relapse rate of cases of patients performed genioplasty applying Medpor® was 14.56%. Based on the results of the above content, it was found that in comparison with the cases of patients performed genioplasty applying the Medpor®, the relapse rate of soft tissues was smaller. Based on the results of the above content, it was found that in comparison with the patients performed genioplasty applying the Medpor®, the movement amount at the time of surgery was applied after surgery without changing.

Some of the chief advantages of using Medpor® for genioplasty and augmentation include easy manipulation, easy fixation of implants with metal screws, and availability in diverse shapes and sizes. Also, as animal experiments and human histological studies[5,14,15] have shown, tissue ingrowth into the pores occurs, however, similar to other foreign materials, it is readily infected, and should be handled carefully.

Medpor® can be used for a wide range of indications. However, it should not be used in weight-bearing areas, such as the temporomandibular joint. It is also contraindicated if any of the following conditions are present: inadequate tissue coverage, patients with systemic diseases that result in poor healing, areas that have been irradiated for the treatment of cancer, and/or areas that are exposed to the external environment.

Finally, the following four points should be considered. First, in the analysis of lateral cephalograms, the measurement errors should be reduced by defining reproducible measurement points. Second, a surgical plan designed by referring to the postsurgical stability observed in long-term follow-up studies is required. Third, a comprehensive classification of the effects of the surgical and fixation methods on hard and soft tissues is required. Finally, further analysis in a larger number of cases may be needed to determine the statistical significance of the results.

The ultimate purpose of maxillofacial plastic surgery is not only functional

improvement, but also to achieve balance and harmony of the facial shape. When performed properly after appropriate evaluation, genioplasty using Medpor® is a method that should provide satisfactory results for both patients and surgeons.

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저작물 이용 허락서

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	영어 : Comparison of Genioplasty using Medpor® and Osteotomy				

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 의사 표시가 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.

동의여부 : 동의(○) 반대( )

2009 년 2 월 일

저작자: 박 중 엽 (서명 또는 인)

조선대학교 총장 귀하