

# Guided bone regeneration procedure using a mixture of micro-macroporous biphasic calcium phosphate and freeze-dried allograft in esthetic region: A case report

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## Introduction

Osseointegration is important in the functional aspect, however, esthetics is also important, especially in the maxillary anterior region. An adequate surgical technique is necessary in maxillary anterior implantation in order to maintain the bone volume and create a satisfactory emergence profile. An esthetic risk assessment<sup>1)</sup> is required for this. To augment the severe bone loss and reconstruct periodontal apparatus, the Guided Bone Regeneration (GBR) has been commonly used. GBR is a surgical procedure that uses barrier membranes to direct growth of new bone at sites having insufficient volumes or dimensions for function or prosthesis placement. The principle of GBR is based on the principles of guided tissue regeneration<sup>2)</sup>. By selectively excluding epithelium and connective tissue with the use of bone grafting and barrier materials, bone is "guided" into the desired position.

GBR consists of bone graft materials and membrane. There are various bone graft materials such as autogenous, allograft, xenograft and synthetic bone graft<sup>3)</sup>. The autogenous bone graft is known to have good osteogenesis, osteoinduction and osteoconduction<sup>4)</sup>. However, it carries the difficulty in having to perform an additional surgery (the donor site and recipient site).

In consequent, synthetic and alloplastic bone graft materials are being developed and applied these days in clinics.

In this case, Micro-macroporous Biphasic Calcium Phosphate (MBCP) (MBCP™, Biomatlante, Sarl, France) and freeze-dried allograft (FDA) (Oragraft®, LifeNet, Virginia beach, Virginia, U.S.A.) were used with an absorbable collagenous bilayer membrane (BioGide®, Geistlich Pharma AG, Wolhusen, Switzerland) in the GBR procedure in the maxillary anterior tooth. They were selected for its successful results and clinical advantages.

The aim of this case was to present a successful GBR procedure using MBCP and FDA stabilized with an absorbable collagenous bilayer membrane in the esthetic region.

## II. Case Report

Age/Sex: 44 years old/Male

C.C: Suffering from severe mobility and pus discharge of left central incisor

Medical Hx: no specific general risk assessment

P.I: Mobility(+++) on left central incisor  
with full probing depth  
with pus discharge

<Probing Chart> (mm)

	Left central incisor	Right central incisor	Right lateral incisor
Buccal(MMD)	445	Full probing depth	433
Palatal(MMD)	435	Full probing depth	433

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(1) Diagnosis: Generalized chronic moderate periodontitis with hopeless tooth on left central incisor

(2) Risk Assessment

The patient had a midline discrepancy shifted to the left of 1mm . A labioversion existed on the left lateral incisor and there was a recessed gingival line (Fig. 2A). The occlusal plane was flat and the contact point position was middle and there was an open embrasure. The patient had a medium smile line. The general risk assessment of this patient fell under high esthetic risk factors. The patient had a healthy and an intact immune system. He was a non-smoker and the patient's esthetic expectation was low. The lip line was medium and the gingival biotype was medium-scalloped and medium thick. The shape of tooth crown was triangular and the infection at implant site had been chronic for he had severe mobility and pus discharge. The bone level at adjacent teeth was  $\leq$  than 5mm to contact point and the restorative status of neighboring teeth was virgin, meaning it was unrestored. The width of the edentulous span was  $\geq$  than 7mm. There was horizontal and vertical bone deficiency (Fig. 2B)

(3) Material & Surgical Procedure

The surgical procedure took place 8 weeks after extraction. An early implantation was performed. The M-D distance was 8mm (Fig. 3A) and B-P width was 6mm (Fig. 3B). Eight weeks after extraction, implant was carefully inserted into bone in the anterior portion (Fig. 4D). The labial plate resorption was grafted with MBCP (0.25g) and FDA (0.25g). The bone graft was covered with an absorbable collagenous bilayer membrane. It was submerged for over 6 months (Fig. 4E).

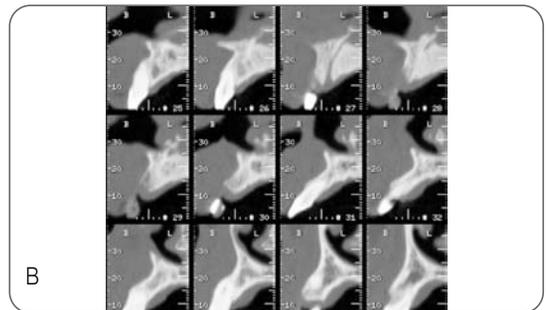


Fig 2. A. Clinical Photograph with temporary restoration.  
B. CT view, extraction after 8 weeks.

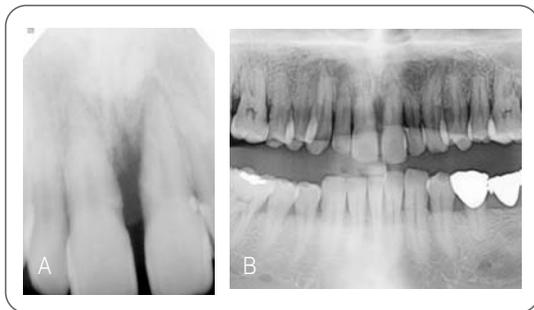


Fig 1. A. Periapical view prior to surgery.  
B. Panoramic view prior to surgery.



A. Labial view showing the M-D distance.



B. Occlusal view.



Fig 3. Preoperative clinical view.

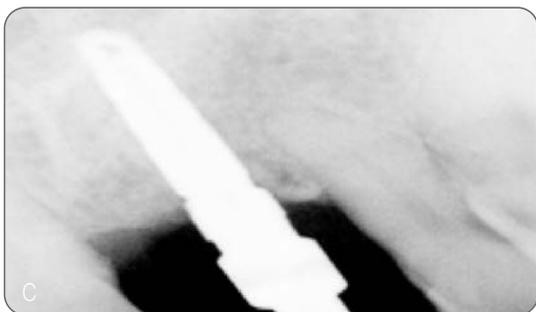
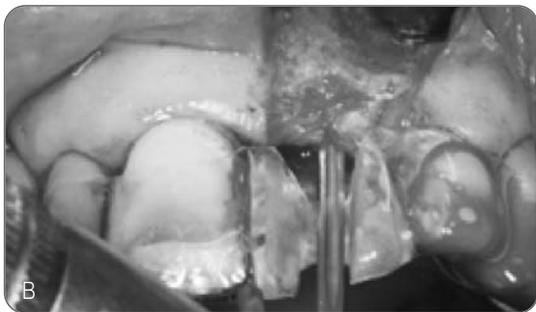
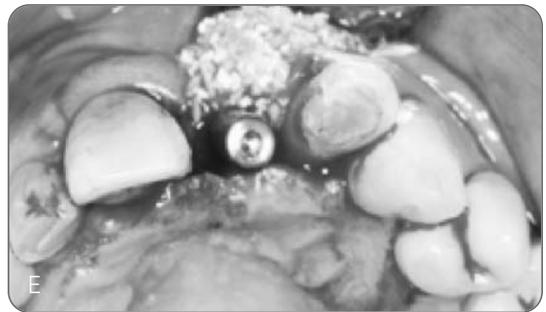
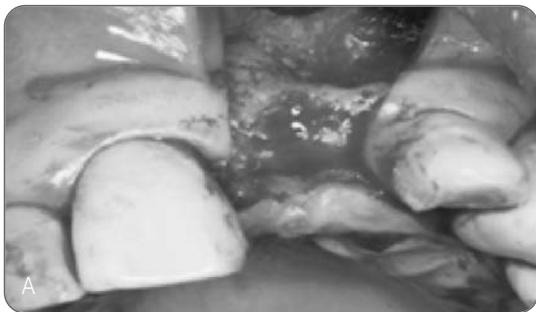




Fig 4. A. Flap elevation of #21 : labial plate resorption can be seen.  
 B. Surgical template as guiding reference.  
 C. Axis of implant. D. Implant inserted.  
 E. Bone graft with membrane. F. Suture.  
 G. Healing at stitch-out.  
 H. Healing after 2 weeks.  
 I. 11 months after prosthesis.

### III. DISCUSSION

Many clinicians contemplate on selecting the proper technique when there is severe bone loss. When selecting an ideal material for GBR, the following requirements must be considered: wound stabilization, space creation and maintenance, protection of underlying blood clot, and the ability to exclude unwanted tissues or cells (connective tissue and epithelium)<sup>9</sup>. Many studies have reported success in using barriers to augment bone prior to or after implant placement<sup>6</sup>. Nonresorbable membranes such as Millipore filter, polytetrafluoroethylene and absorbable membranes such as collagen, polylactic acid, polyglactin 910, glycolide and lactic copolymer are usually used in GBR<sup>7</sup>.

There have been many reports on GBR procedures utilizing collagen membranes. Collagen membranes have been reported to be superior to non-absorbable

membranes with regard to healing. A higher incidence of dehiscence, membrane exposure, and/or premature membrane removal was noted in non-absorbable membranes. Parodi et al.<sup>8</sup> used collagen and bioresorbable collagen sponges and there was an increase of 2.49 mm of bone height. Thus, in this case, bioabsorbable collagen membrane was used due to the fact that it fulfills all of the above advantages.

The autogenous bone graft was not used in this case due to its limitation of additional surgery needed when compared with other bone graft materials. The synthetic and allograft bone substitutes were used instead. In this case, MBCP and FDA were used along with absorbable collagenous bilayer membrane to hold the graft material. MBCP is consisted of a ratio of HA and  $\beta$ -TCP 60 : 40. This is the ideal ratio for bone regeneration. Hydroxyapatite is slow in resorption compared to  $\beta$ -TCP. The HA dissolves slowly in the body and acts as a scaffold until it becomes tissue. The  $\beta$ -TCP has a strong dissolving characteristic which resolves fast and thus, accelerates bone formation. MBCP carries many advantages compared to other bone graft materials in that the total porosity is 70% while the others are 50~70%. The micropores are less than 10 microns, around 20~30% whereas the others are 3~6%. The macropores are larger than 600 microns, around 70~80% while the others are 94~97%. In Gautier et al.'s<sup>9</sup> study, MBCP showed less resorption compared to Injectable Calcium Substitute (IBS). FDA is donated from human tissue. It is predictable and consistent. It is cheaper than other bone graft materials and is provided in various sizes both in freeze-dried and demineralized freeze-dried allograft type. Block et al.<sup>10</sup> used FDA and there was an increase of 5~8 mm of bone height. Sterilized FDA resorbs earlier than MBCP, therefore in consequence, two types of bone graft materials were mixed together. Thus, the bone graft materials including the membrane were selected for the above reasons.

Thus, in order to achieve satisfactory results in the esthetic region, it is important to carefully diagnose and select appropriate bone graft materials prior to surgery. For the above reasons being, MBCP and FDA were used in the esthetic region in this case to achieve successful esthetic results. There was absolutely no adverse effect during healing and the patient showed great satisfaction concerning the harmony between the adjacent periodontal and bony structures (Fig. 5 C,D).

## IV. CONCLUSION

It can be concluded that GBR with ideal bone graft materials such as MBCP and FDA with absorbable collagenous bilayer membrane show successful results in the esthetic region.

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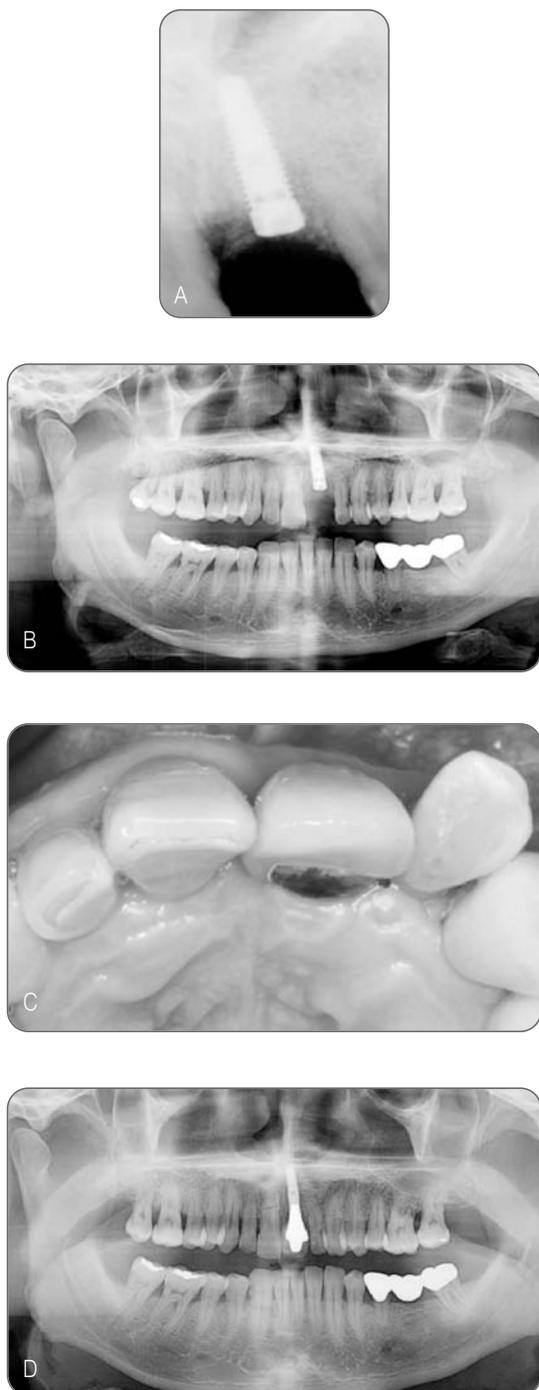


Fig 5. A. Postoperative periapical view.  
 B. 1 month postoperative panoramic view.  
 C. 11 months postoperative clinical view.  
 D. 11 months postoperative panoramic view.

## 심미적 부위에 Micro-macroporous biphasic calcium phosphate와 freeze-dried allograft를 이용한 골재생술: 증례 발표

최정유<sup>1</sup>, 장용주<sup>1</sup>, 엄유정<sup>1</sup>, 정의원<sup>1</sup>, 김창성<sup>1</sup>, 김지환<sup>2</sup>, 김성태<sup>2</sup>, 박영범<sup>2</sup>, 심준성<sup>2</sup>, 문홍석<sup>2</sup>, 최성호<sup>1</sup>

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본 증례는 45세 남자환자가 상악 좌측 중절치가 심하게 흔들리며 고름이 나온다는 주소로 연세대학교치과병원 치주과에 내원하여 골유도 재생술하에 전치부 단일치아를 임플란트로 수복한 증례이다. 임상 및 방사선 분석 결과, 동요도가 심하며 깊은 치주낭을 보여 발치하기로 결정하였다. 발치 2개월후, 임상관찰 결과, 상당한 수평적, 수직적 골소실을 보여 골유도재생술을 계획하였다. 상악 좌측중절치 부위에 Micro-Macroporous Biphasic Calcium Phosphate 및 freeze-dried allograft 골이식재와 차폐막으로는 흡수성 콜라겐 막인 collagenous bilayer membrane을 이용하여 임플란트를 식립 고정하였다. 수술부위는 판막으로 일차 유합 되도록 봉합하였다. 수술부위 연조직 노출은 없었으며 충분한 골량을 유지하였다. 6개월동안 submerged 되었다. 적절한 골이식재료를 사용하여 시행한 골유도재생 술식은 매우 좋은 치유반응 및 환자의 만족도가 매우 높았다. [THE JOURNAL OF THE KOREAN ACADEMY OF IMPLANT DENTISTRY 2009;28(2):89-94]

Key words: 골유도재생술, 상악 중절치, 임플란트, 흡수성 콜라겐