Cortical Tenting Grafting Technique in the Severely Atrophic Alveolar Ridge for Implant Site Preparation

Bach Le, DDS, MD,* Jeffrey Burstein, DDS, MD,† and P. Parish Sedghizadeh, DDS, MS‡

Objectives: *Alveolar ridge augmentation using intraoral autogenous block grafts to augment localized alveolar ridge defects before implant placement is a predictable method. However, large severely atrophic edentulous segments may require extraoral donor sites. The purpose of this study was to evaluate the effectiveness of using intraoral cortical block grafts in combination with particulate human mineralized allograft, in a "tenting" fashion, to augment large atrophic alveolar ridge defects for implant placement.*

Materials: *This prospective case study evaluated augmentation in 10 consecutive patients with severely resorbed alveolar ridges missing a minimum of 4 adjacent teeth. Before augmentation, all grafted sites were deemed inadequate for placement of a standard 4-mm-diameter implant. Horizontal ridge augmentation was performed using autologous membranous cortical bone grafts from an oral donor site to tent out the soft tissue matrix and periosteum for the adjacent particulate allograft. The ridges were clinically evaluated 4 to 5 months after augmentation, and 42 implants were placed at that time.*

Results: *Implants were successfully placed at all grafted sites 4 to 5 months after the original graft date. Clinical evaluation of the grafted sites upon re-entry revealed uniform ridge anatomy. All edentulous segments had at least 2 implants placed of at least 4.0 mm diameter. In all, 42 implants were placed into grafted sites in the 10 patients. Implants were checked for osseointegration by using a counter torque of 35 N·cm. One implant failed to integrate. Mean follow-up was 22 months after implant placement. All augmented ridges had retained their functional and esthetic integrity at 1 year after original augmentation.*

Conclusion: *Tenting of the periosteum and soft tissue matrix using a cortical bone block maintains space and minimizes resorption of the particulate allograft volume. In addition, bridging the cortical blocks with particulate bone avoids unaesthetic ridge defects between cortical block grafts in larger ridge defects. The result was a more uniform and esthetic alveolar ridge, capable of maintaining an implant-supported prosthesis. The technique offers predictable functional and esthetic reconstruction of large-volume defects without extensive amounts of autogenous bone. This offers a superior functional and esthetic result than with either cortical or particulate grafting alone. (Implant Dent 2008;17:40–50)*

Key Words: bone graft, large-volume defect, tent-pole

Alveolar ridge augmentation using autogenous block grafts is a predictable method to augment localized alveolar ridge defects for implant placement. Large atrophic edentulous segments present a more challenging scenario in reconstruction, because there is a limited supply of intraoral donor bone. Extraoral donor sites are an option, but present an obstacle to patient treatment acceptability because of increased costs and morbidity. The purpose of this case study was to evaluate the effectiveness of using particulate human mineralized allograft in combination with an intraoral cortical block graft, in a "tenting" fashion, to augment large intraoral alveolar ridge defects for implant placement.

Many authors have reported on the use of autogenous bone,[1–11] allografts,[12,13] xenografts,[14–16] and alloplastic[17,18] onlay grafts to augment the width of the atrophic ridge for placement and successful integration of endosseous implants. Autogenous bone, considered to be the gold standard for grafting hard-tissue defects, can be classified by its embryologic origin. Membranous bones, including the calvarium, ramus, and symphysis, are formed by intramembranous ossification. This process involves embryonic mesenchymal cells differentiating into osteoblasts, which can synthesize an osteoid matrix that mineralizes to form hard bone. Bone is also formed by endochondral ossification of cartilage at the epiphyseal surface of long

*Assistant Clinical Professor, Department of Oral and Maxillofacial Surgery, USC School of Dentistry, Los Angeles, CA.
†Former Chief Resident, Department of Oral and Maxillofacial Surgery, USC School of Dentistry, Los Angeles, CA.
‡Assistant Clinical Professor, Division of Diagnostic Sciences, Oral and Maxillofacial Pathology, USC School of Dentistry, Los Angeles, CA.

ISSN 1056-6163/08/01701-040
Implant Dentistry
Volume 17 • Number 1

DOI: 10.1097/ID.0b013e318166d503

bones. Two examples of endochondral bones used for intraoral grafting are the iliac crest and tibial plateau.

In reviewing the literature on graft survival,[19,20] it can be found that membranous bone grafts had retained greater than 80% of their original volume and had been replaced by new bone whereas iliac (endochondral) bone had undergone 65% to 88% resorption. In addition to the higher resorption rate of iliac crest grafts, other disadvantages include the high costs of hospitalization, risk of general anesthesia, and morbidity of the procedure.[4,7,21] Conversely, mandibular symphysis and ramus bone seem to undergo less resorption because of the thick cortical layer and their rigid structure.[4,7,22] Other advantages of intraoral donor sites include conventional access for surgeons familiar with intraoral anatomy, reduced anesthesia and operative time because of close proximity of donor and recipient sites, and no cutaneous scars.[22–24] It can be done ideally as an outpatient surgery, thereby decreasing the overall costs of the procedure.

In addition to obtaining an optimal bone source for grafting, it is critical to adhere to surgical principles for predictable success. These include primary tension-free wound closure, promoting angiogenesis by perforating the cortical graft site, and rigidly fixating the block graft for stability. In addition, creating adequate space for bone regeneration by surgically expanding the soft tissue matrix can help prevent resorption of the graft material.[25]

To reconstruct large edentulous defects there is only a limited amount of intraoral bone available for grafting. Block and Degen[13] have reported on the use of particulate allograft alone to successfully augment partially edentulous segments for implant placement through a minimally invasive tunneling technique. However, the high resorption rates associated with this technique are likely because of natural tissue contraction. Furthermore, graft migration is a potential problem because retention of the particulate graft is difficult, particularly in the anterior maxilla, where there is no bony shelf to maintain the graft material. In addition, direct visualization of the defect, especially in the esthetic areas, can be challenging with this tunneling technique. Using an open approach in the severely resorbed maxilla makes it possible to place the bone exactly where it is needed with less chance of migration.

A major limitation to reconstructing large-volume bone defects is the contraction of the "soft tissue matrix," leading to resorption of the bone graft. Surgical control of the expanded soft tissue volume prevents resorption of graft material[9] by maintaining a space between the periosteum and bone. In our cases, the cortical block grafts serve as a tenting mechanism for separating the periosteum and overlying gingiva from the underlying native bone. The slow resorption of the cortical membranous block is ideal for maintaining the ridge contour. This provides space for human mineralized particulate allograft (Puros; Zimmer Dental, Carlsbad, CA) to act as an osteoconductive scaffold for new bone formation between the cortical blocks. This concept makes it possible to graft large segments without the need to harvest bone from extraoral sites.

The hypothesis we evaluated was whether minimal autogenous intraoral cortical block grafts interposed with human mineralized bone could be used to restore large-volume defects resulting in sufficient bone quantity and quality after 4 months to allow for subsequent osseointegration of endosseous implants.

Materials and Methods

Patients selected for this procedure had less than 4 mm of bone width determined by preoperative examination and imaging studies and were missing a minimum of 4 consecutive teeth involved in the grafted segments. Before ridge augmentation, all ridges were too narrow for placement of a 3.3-mm implant. All patients had adequate vertical height for implant placement and were considered healthy for outpatient general anesthesia. Smokers, patients with diabetes, and any medically compromised patients were excluded from this series. After prosthodontic consultation for implant restorations, patients were scheduled for bone grafting procedures.

Topical anesthesia was placed over the edentulous ridge and up to 9 mL of 2% lidocaine with 1:100,000 epinephrine was given as blocks and infiltrations in the maxilla and mandible. To access the thin maxillary ridge, a crestal incision with vertical releases were used in the posterior as necessary (Figs. 1, A; 2, A; and 3, A). In the anterior maxilla, subperiosteal dissection was carried up to the anterior nasal spine to obtain adequate release for passive primary closure.

To access the mandibular ramus, incisions along the oblique ridge helped gain adequate exposure. In large edentulous segments, multiple grafts were taken sequentially from only one side of the mandibular ramus. The grafts were adapted to the ridge (Figs. 1, B; 2, B; and 3, B) and separated by 1 cm with particulate human mineralized allograft material (Puros) with a 500-μm particle size. The particulate graft was compressed firmly between the cortical grafts to

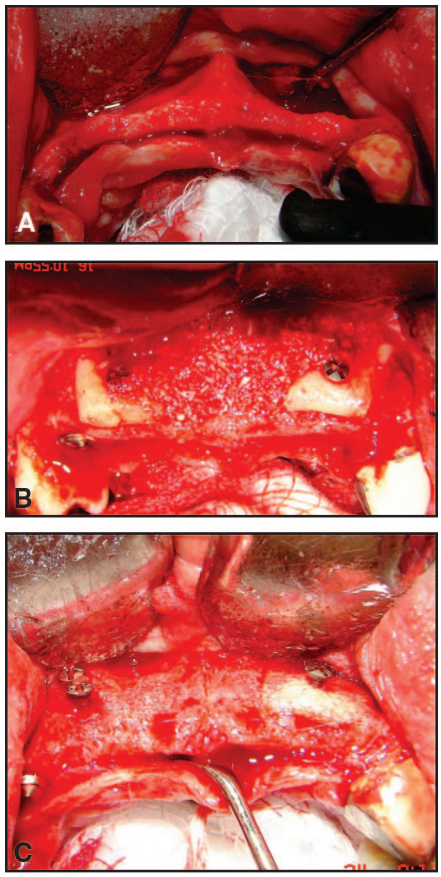

Fig. 1. (A) Preoperative Defect. (B) Particulate allograft adapted between cortical block graft which are place 1.5 cm apart. (C) Good incorporation of particulate graft and cortical onlay grafts resulting in uniform alveolar ridge 4 months postoperatively.

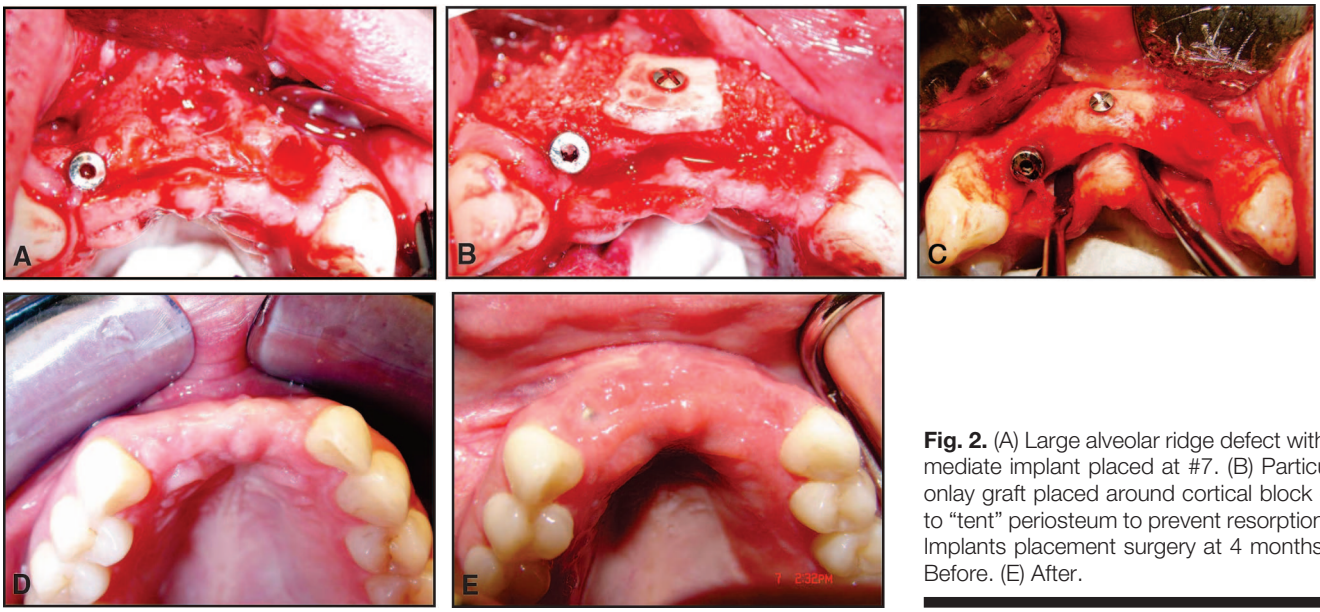

Fig. 2. (A) Large alveolar ridge defect with immediate implant placed at #7. (B) Particulate onlay graft placed around cortical block graft to "tent" periosteum to prevent resorption. (C) Implants placement surgery at 4 months. (D) Before. (E) After.

form a compact and dense graft held by a coagulum of the patient's blood. The defect was overcorrected with particulate material in anticipation of future graft resorption. A resorbable membrane (Ossix Plus; OraPharma, Warminster, PA) was carefully placed over all grafted sites. Primary closure over the entire graft was obtained with interrupted resorbable sutures.

Postoperatively, all patients were instructed on a soft diet, and the patient prosthesis was adjusted to avoid impingement on the grafted site, and, when possible, to create positive tissue architecture. All patients were placed on postoperative antibiotics of penicillin 500 mg for 7 days (for penicillin allergic, clindamycin 300 mg for 7 days) and a chlorhexidine mouth rinse for 1 week. After 4 to 6 months, the grafted sites were uncovered (Figs. 1, C and 2, C) and screws removed. A total of 42 implants were placed in patients with a mean age of 49.9 years (range, 32–68 years) with a mean follow-up of 14 months (range, 6–24 months). Thirty-five implants were placed (Fig. 3, C) in cortical grafted areas and the remaining 7 were placed into particulate grafted areas (Puros). A total of 31 implants were placed as a single-stage protocol and 11 were placed as a 2-stage protocol. Eight implants were Biomet3i (Palm Beach Gardens, FL) and 34 were Straumann implants (Straumann, Basel, Switzerland). All implants were allowed a waiting period of 4 months before the restorative phase began. Implant integration was confirmed by successful counter torque test of 35 N·cm. Pre- and postoperative defects were evaluated at both the bony and soft tissue levels (Fig. 2, D and E). Additional allograft material was added to improve the final bone- and soft-tissue contours as necessary to affect esthetic outcome.

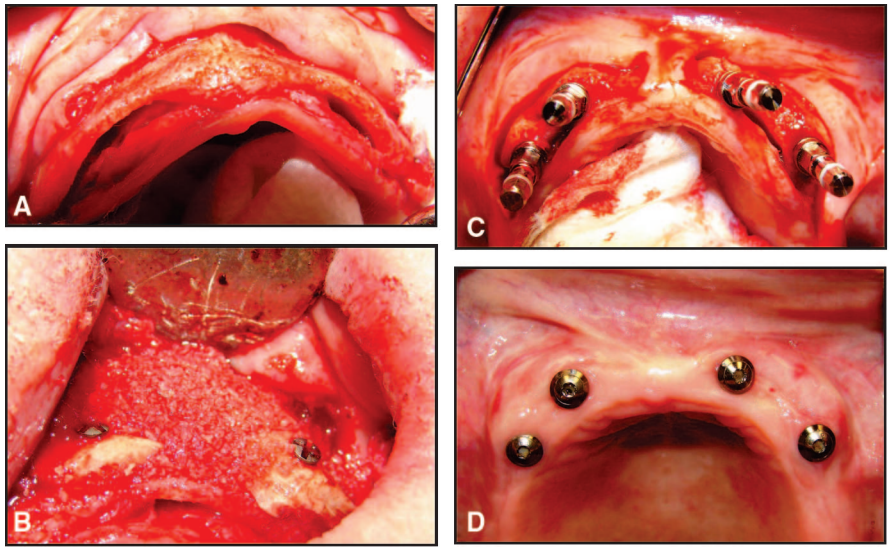

Fig. 3. (A) Severely resorbed knife-edge ridge. (B) Mineralize particulate bone used to bridge cortical bone grafts. (C) Implants placement at 4 months. (D) Implants 3 months after placement with thick uniform alveolar ridge.

Results

Ten (4 men and 6 women) consecutive patients with severe alveolar ridge atrophy underwent surgery (Table 1). The mean age of patients was 49.9 years (range, 32–68 years). Nine patients had grafts placed to the maxilla and 1 patient had grafts to augment a partially edentulous posterior mandible. Of the 9 patients with grafts to the maxilla, 5 were completely edentulous with severe resorption of the maxillary alveolar ridge. In all cases, adequate tension-free closure over the graft was achieved, and the incisions healed uneventfully. There were no postoperative wound infections. At the 2-month follow-up check all ridges were firm to palpation, and at 4 to 5 months after ridge augmentation, a full-thickness periosteal reflection was used to expose the reconstructed alve-

Table 1. Patient Demographic Characteristics

Patient No.	Patient Age (y)*/Sex	Diagnosis	Sites of Implant Placement	Follow-up (Time From Initial Grafting) (mo)†
1	63/Female	Complete edentulism	3, 5, 7, 10, 12, 14	32
2	52/Male	Partial edentulism	18, 19, 20, 21	32
3	33/Male	Partial edentulism	12, 13, 14, 15	26
4	53/Male	Complete edentulism	3, 5, 7, 10, 12, 14	22
5	32/Female	Partial edentulism	6, 7, 10	20
6	38/Female	Partial edentulism	10, 12, 13, 14	20
7	62/Female	Complete edentulism	5, 7, 10, 12	19
8	68/Female	Complete edentulism	5, 7, 10, 12	19
9	34/Male	Partial edentulism	6, 7, 10	16
10	64/Female	Complete edentulism	5, 7, 10, 12	14

Total no. implants was 42.

* Mean age 49.9 years (range, 32–68 years).

† Mean follow-up time 22 months (range, 14–32 months).

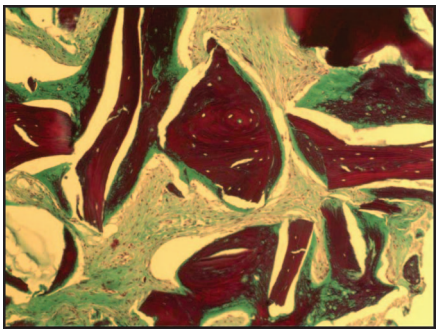

Fig. 4. Trichrome stain shows nice bone reversal lines.

olar ridge. All screws were removed, and the ridge width was clinically evaluated to be larger than 6 mm at all sites of implant placement. A total of 42 implants were placed into the grafted ridges at locations determined by the restoring dentists preoperatively. Thirty-eight implants were placed in the maxilla and 4 were placed in the mandible. Thirty-seven implants were placed using a single-stage protocol. Only 5 implants required uncovering. After 3 to 4 months of integration, all implants were tested for integration by successful resistance to a counter torque of 35 N·cm. One implant placed in the particulate grafted region failed to integrate and was successfully replaced in an adjacent site. Thirty-five implants have been successfully restored in 8 patients with a mean follow-up of 22 months (range, 14–32 months) from placement. The remaining 2 patients are currently undergoing restorative treatment. Follow-up examinations have indicated stable and healthy peri-implant tissue and bone levels.

The specimen harvested from the particulate graft consisted of dense viable bone, which could be classified as type 1 or type 2 bone (Figs. 1, C and 2, C). The osseous tissue has been deposited in a lamellar fashion and exhibits osteocytes within lacunae. The trichrome stain (Fig. 4A) shows nice bone reversal lines indicating active remodeling.

Discussion

Many authors have reported on the use of autogenous bone grafts[1–11] to restore bony defects and allow for the correct positioning of implants. However, when treating the severely atrophic alveolar ridge, it is common to encounter large-volume defects that must be fully reconstructed to create an esthetic and functional result. With these large-volume defects, it has been necessary to obtain bone from extraoral sources. The authors prefer intraoral membranous donor bone over endochondral extraoral sites because of the increased resorption, high cost, and increased morbidity of the latter.[4,19,20,21] In addition, we have found that by appropriately spacing autogenous cortical block grafts, interposed by particulate graft, it is possible to augment a large, severely atrophic ridge with less need for autogenous bone. This technique involves expanding the soft tissue volume and using the cortical bone grafts as "cortical tent poles" for the surrounding particulate graft. This helps prevent the soft tissues from contracting around the particulate graft, and subsequently, displacing it or causing physiologic resorption.[9] This soft tissue maintenance concept was confirmed by the clinical observation that the particulate bone graft material resorbed no further than the level of the cortical bone grafts (Figs. 1, C and 2, C). Although longer follow-up is needed to evaluate whether this is a permanent result, our short-term outcome demonstrates improved esthetic and functional results.

In addition to restoring the hard tissue defect, the particulate bone preserves and augments the soft tissue architecture that was lost to years of resorption. This allows an option for implant placement and creates a better esthetic result. Soft-tissue contour typically follows underlying bony architecture. Any ridge augmentation through bone grafting must provide the foundation to reconstruct the hard tissue defects to affect the soft tissue architecture.

In this series of patients, 41 of 42 implants (97.6%) placed integrated. The 1 implant that failed to integrate was placed in the posterior maxilla in a completely edentulous patient who also underwent a simultaneous maxillary sinus lift procedure. This implant was eventually replaced successfully in an adjacent site.

Postoperative wound infection or dehiscence was not observed in this patient series. This can be attributed to the meticulous reflection of tissue flaps and a tension-free closure. This was achieved by releasing the perios-

teal flaps from the nasal spine in addition to scoring the periosteum in all maxillary cases. The author finds this step to be critical in avoiding wound dehiscence and subsequent graft resorption.

Conclusion

In our small patient series, this technique has allowed us to restore large-tissue defects in a predictable manner. Long-term follow-up is needed to evaluate the stability of graft retention, especially in the particulate grafted area. Our preliminary report indicates that using this technique allows for the successful reconstruction of large defects in the patients selected.

Disclosure

The authors claim to have no financial interest, directly or indirectly, in any entity that is commercially related to the products mentioned in this article.

References

1. Buser D, Dula K, Hirt HP, et al. Lateral ridge augmentation using autografts and barrier membranes. *J Oral Maxillofac Surg.* 1996;54:420-432.
2. Buser D, Dula K, Belser UC, et al. Localized ridge augmentation using guided bone regeneration. II. Surgical procedure in the mandible. *Int J Periodont Restor Dent.* 1995;15:11-29.
3. Buser D, Dula K, Hess D, et al. Localized ridge augmentation with autografts and barrier membranes. *Periodontol 2000.* 1999;19:151-163.
4. Misch CM. Comparison of intraoral donor sites for onlay grafting prior to implant placement. *Int J Oral Maxillofac Implants.* 1997;12:767-776.
5. Rasmusson L, Meredith N, Kahnberg KE, et al. Effects of barrier membranes on bone resorption and implant stability in onlay bone grafts. An experimental study. *Clin Oral Implants Res.* 1999;10:267-277.
6. Proussaefs P, Lozada J, Rohrer MD. A clinical and histologic evaluation of a block onlay graft in conjunction with autogenous particulate and inorganic bovine material: A case report. *Int J Periodont Restor Dent.* 2002;22:567-573.
7. Misch CM, Misch CE. The repair of localized severe ridge defects for implant placement using mandibular bone grafts. *Implant Dent.* 1995;4:261-267.
8. Keller EE, Tolman DE, Eckert S. Surgical-prosthodontic reconstruction of advanced maxillary bone compromise with autogenous onlay block bone grafts and osseointegrated implants: A 12 year study of 32 consecutive patients. *Int J Oral Maxillofac Implants*. 1999;14:197-209.
9. Marx RE, Shellenberger T, Wimsatt J, et al. Severely resorbed mandible: Predictable reconstruction with soft tissue matrix expansion (tent pole) grafts. *J Oral Maxillofac Surg.* 2002;60:878-888.
10. Thor A. Reconstruction of the anterior maxilla with platelet gel, autogenous bone and titanium mesh: A case report. *Clin Implant Dent Relat Res.* 2002;4:150-155.
11. Simion M, Jovanovic SA, Tinti C, et al. Long-term evaluation of osseointegrated implants inserted at the same time or after vertical ridge augmentation: A retrospective study on 123 implants with 1–5 years follow-up. *Clin Oral Implants Res*. 2001;12:35-45.
12. Doblin JM, Salkin LM, Mellado JR, et al. A histologic evaluation of localized ridge augmentation utilizing DFDBA in combination with e-PTFE membranes and stainless steel bone pins in humans. *Int J Periodont Restor Dent.* 1996;16:121-129.
13. Block M, Degen M. Horizontal ridge augmentation using human mineralized particulate bone: Preliminary results. *J Oral Maxillofac Surg*. 2004;62(suppl 2): 67-72.
14. Fugazzotto PA. Report of 302 consecutive ridge augmentation procedures: Technical considerations and clinical results. *Int J Oral Maxillofac Implants*. 1998; 13:358-368.
15. Araujo MG, Sonohara M, Hayacibara R, et al. Lateral ridge augmentation by the use of grafts comprised of autologous bone or biomaterial. An experiment in the dog. *J Clin Periodontol*. 2002;29: 1122-1131.
16. Friedmann A, Strietzel FP, Maretzki B, et al. Histological assessment of augmented jaw bone utilizing a new collagen barrier membrane compared to a standard barrier membrane to protect granular bone substitute material: A randomized clinical trial. *Clin Oral Implants Res.* 2002;13:587-594.
17. Kent JN, Quinn JH, Zide MF, et al. Alveolar ridge augmentation using nonresorbable hydroxyapatite with or without autogenous cancellous bone. *J Oral Maxillofac Surg.* 1983;41:629-642.
18. Mentag PJ, Kosinski T. Hydroxyapatite-augmented sites as receptors for replacement implants. *J Oral Implantol*. 1989;15:114-123.
19. Smith JD, Abramson M. Membranous vs. endochondral bone autografts. *Arch Otolaryngol*. 1974;99:203-205.
20. Zins JE, Whitaker LA. Membranous vs endochondral bone autografts: Implications for craniofacial reconstruction. *Plast Reconstr Surg*. 1983;72:778-785.
21. James JD, Geist ET, Gross BD. Adynamic ileus as a complication of iliac bone removal. *J Oral Maxillofac Surg.* 1981;39:289-291.
22. Proussaefs P, Lozada J, Kleinman A, et al. The use of ramus autogenous block grafts for vertical alveolar ridge augmentation and implant placement: A pilot study. *Int J Oral Maxillofac Implants*. 2002; 17:238-248.
23. Montazem A, Valauri DV, St Hilaire H, et al. The mandibular symphysis as a donor site in maxillofacial bone grafting: A quantitative anatomic study. *J Oral Maxillofac Surg*. 2000;58:1368-1371.
24. Gungormus M, Yavuz MS. The ascending ramus of the mandible as a donor site in maxillofacial bone grafting. *J Oral Maxillofac Surg*. 2002;60:1316-1318.
25. Wang HL, Lakshmi B. "PASS" principles for predictable bone regeneration. *Implant Dent*. 2006;15:8-16.

Reprint requests and correspondence to:
Bach Le, DDS, MD
Oral and Maxillofacial Surgery
USC School of Dentistry/LA County
Medical Center
2010 Zonal Ave.
Los Angeles, CA 90089
Phone: (323)-226-5013
Fax: 323-226-5241
E-mail: burstein@usc.edu or
leb97201@yahoo.com

GERMAN / DEUTSCH

AUTOR(EN): Bach Le, DDS, MD, Jeffrey Burstein DDS, MD, P. Parish Sedghizadeh, DDS, MS. *Schriftverkehr: Bach Le, DDS, MD, Gesichts- und Kieferchirurgie (Oral & Maxillofacial Surgery), USC zahnmedizinische Fakultät/ medizinisches Zentrum des Stadtbezirks LA (USC School of Dentistry/LA County Medical Center), 2010 Zonal Avenue, Los Angeles, CA 90089. Tel.: (323) 226-5013, Fax: 323-226-5241. eMail: burstein@usc.edu oder leb97201@yahoo.com*

Kortikale Zeltstangen-Transplantierungstechnik bei Vorliegen eines schwer atrophischen alveolären Kamms zur Vorbereitung von Implantierungsstellen

ZUSAMMENFASSUNG: Zielsetzungen: Die Anreicherung des alveolären Kamms über intraoral applizierte autogene Blocktransplantate, die lokal zum Aufbau von Defiziten im alveolären Kammbereich genutzt werden, stellt eine vorhersagbar gute Methode im Vorfeld einer Implantierungsbehandlung dar. Es kann allerdings erforderlich werden, dass stark atrophische zahnlose Bereiche zusätzlich mittels extraoraler Transplantationsbereiche aufgefüllt werden. Die vorliegende Studie zielte darauf ab, die Effizienz bei Anwendung intraoraler Kortikalblocktransplantate in Verbindung mit menschlichem mineralisiertem Partikelallotransplantat zu ermitteln und zu bewerten. Hierbei wurde ein zeltartiger Aufbau vorgesehen, um die großen atrophischen Defekte im alveolären Kammbereich zur Implantierung vorzubereiten. ***Materialien und Methoden:*** Diese retrospektive Fallstudie nahm eine Bewertung des Anreicherungsverhaltens bei 10 aufeinander folgenden Patienten vor, die mit einem jeweils stark resorbierten alveolären Kamm und einem Minimum von mindestens 4 nebeneinander liegenden fehlenden Zähnen behandelt wurden. Vor der Aufbaubehandlung wurden alle zur Transplantierung vorgesehenen Einsatzbereiche als unzureichend für die Implantierung eines Standardimplantats von 4 mm Durchmesser angesehen. Autologes, membranöses Kortikalknochentransplantat mit Spendeursprungsstelle im Mundraum wurde zur Anreicherung des horizontalen Kamms verwendet, um sowohl Weichgewebsmatrix als auch Knochenhaut für das daneben angeordnete Partikelallotransplantat zeltförmig auszuweiten. Die Kammbereiche wurden 4 bis 5 Monate nach erfolgter Aufbaubehandlung klinisch untersucht und bewertet. Zu diesem Zeitpunkt wurden insgesamt 42 Implantate eingepflanzt. ***Ergebnisse:*** Bei allen mit Transplantat aufgebauten Stellen erwies sich die nach 4 bis 5 Monaten nach dem ursprünglichen Transplantierungsdatum durchgeführte Zahnimplantierung als erfolgreich. Die klinische Bewertung der transplantierten Bereiche bei Neuöffnung ergab eine einheitliche Anatomie der betroffenen Leisten. Bei allen zahnlosen Segmenten konnten mindestens 2 Implantate mit einem Minimum von 4,0 mm Durchmesser eingepflanzt werden. Gesamt wurden bei 10 Versuchspersonen 42 Implantate in die transplantierten Bereiche eingesetzt. Über ein entgegengesetzt ausgerichtetes Drehmoment von 35 N-CM wurden die betreffenden Implantate auf ihre Knochengewebsintegration hin überprüft. Bei einem der Implantate schlug die Integration fehl (1/42). Nach Implantatsetzung betrug der durchschnittliche Nachverfolgungszeitraum 12 Monate. Ein Jahr nach der ursprünglichen Aufbaubehandlung hatten alle angereicherten Leistenbereiche ihre funktionale sowie ästhetische Integrität zurück erlangt. ***Schlussfolgerung:*** Die zeltartige Ausdehnung von Knochenhaut und Weichgewebsmatrix über ein Kortikalknochentransplantat erhält den freien Raum und sorgt für eine Minimierung der Volumenresorption des Partikelallotransplantats. Außerdem verhindert die Überbrückung kortikaler Blocktransplantate mit Partikelknochengewebe unästhetische Kammdefekte zwischen den einzelnen Kortikalknochentransplantaten, wenn an größeren Kammdefekten gearbeitet wird. Es ergibt sich ein einheitlicher aussehender und ästhetischerer alveolärer Kamm, der aufgrund seiner Struktur in der Lage ist, eine Implantatgestützte Prothese zu tragen. Die vorgestellte Technik ermöglicht eine vorhersagbar gute funktionale und ästhetische Wiederherstellung großvolumiger Defekte, ohne dass dabei übermäßig große Mengen an zu transplantierendem autogenem Knochengewebe erforderlich sind. Damit ergibt sich gegenüber der Einzelverwendung von entweder kortikalem Transplantat oder Partikeltransplantat ein eindeutig besseres funktionales und ästhetisches Ergebnis.

SCHLÜSSELWÖRTER: Knochengewebstransplantat, großvolumige Defekte, Zeltstangen-Technik

SPANISH / ESPAÑOL

AUTOR(ES): Bach Le, DDS, MD, Jeffrey Burstein, DDS, MD, P. Parish Sedghizadeh, DDS, MS. *Correspondencia a: Bach Le, DDS, MD, Oral & Maxillofacial Surgery, USC School of Dentistry/LA County Medical Center, 2010 Zonal Avenue, Los Angeles, CA 90089. Teléfono: (323) 226-5013, Fax: 323-226-5241. Correo electrónico: burstein@usc.edu or leb97201@yahoo.com*

Técnica de injerto cortical "poste de la carpa" en la cresta alveolar severamente atrofiada para la preparación del lugar del implante

ABSTRACTO: Objetivos: El aumento de la cresta alveolar usando injertos intraorales de bloques autógenos para aumentar lo defectos de la cresta alveolar antes de la colocación del implante es un método esperado. Sin embargo, grandes segmentos edentulosos severamente atróficos podrían requerir lugares adicionales fuera de la boca como donantes. El propósito de este estudio es evaluar la eficacia en el uso de injertos de bloques corticales dentro de la boca en combinación con alógrafos con partículas mineralizadas humanas al estilo de una "carpa", para aumentar los grandes defectos alveolares atróficos para la colocación del implante. ***Mate-***

riales y Métodos: Este estudio retrospectivo evaluó el aumento en 10 pacientes consecutivos con crestas alveolares severamente reabsorbidas con una la falta mínima de 4 dientes adyacentes. Antes del aumento, todos los lugares del injerto fueron considerados inadecuados para la colocación de un implante común de 4 mm de diámetro. Se realizó el aumento horizontal de la cresta usando injertos de hueso cortical con membrana autóloga de un lugar de la boca como donante para usar sobre la matriz de tejido blando y el perióstomo del alógrafo adyacente de partículas. Las crestas fueron evaluadas clínicamente 4 a 5 meses después del aumento y se colocaron 42 implantes en dicho momento. ***Resultados:*** Los implantes se colocaron exitosamente en todos los lugares del injerto 4 a 5 meses después de la fecha del injerto original. Las evaluaciones clínicas de los lugares del injerto luego de la reentrada revelaron una anatomía uniforme de la cresta. Todos los segmentos edentulosos tenían por lo menos dos implantes colocados de por lo menos 4,00 mm de diámetro. En total, se colocaron 42 implantes en los lugares injertados en los diez pacientes. Los implantes fueron evaluados para determinar su integración ósea usando una contra torsión de 35 N-CM. Un implante no logró integrarse (1/42). El seguimiento medio fue de 12 meses después de la colocación del implante. Todas las crestas aumentadas retuvieron su integridad funcional y estética luego de 1 año del aumento original. ***Conclusión:*** El recubrimiento estilo "carpa" del periostio y la matriz de tejido blando usando un bloque de hueso cortical mantiene el espacio y minimiza la reabsorción del volumen del alógrafo de partículas. Además, conectar los bloques corticales con hueso de partículas evita defectos poco estéticos entre los injertos corticales de bloque en grandes defectos de la cresta. El resultado fue una cresta alveolar más uniforme y estética, capaz de mantener una prótesis soportada con un implante. La técnica ofrece una reconstrucción funcional y estética de los defectos de gran volumen sin cantidades extensas de hueso autógeno. Esto ofrece un resultado funcional y estético superior que con solamente un injerto cortical o de partículas.

PALABRAS CLAVES: injerto de hueso, defecto de gran volumen, poste de la carpa

PORTUGUESE / PORTUGUÊS

AUTOR(ES): Bach Le, Cirurgião-Dentista, Médico, Jeffrey Burstein, Cirurgião-Dentista, Médico, P. Parish Sedghizadeh, Cirurgião-Dentista, Mestre em Ciência. *Correspondência para: Bach Le, DDS, MD, Oral & Maxillofacial Surgery, USC School of Dentistry/LA County Medical Center, 2010 Zonal Avenue, Los Angeles, CA 90089. Telefone: (323) 226-5013, Fax: 323-226-5241, e-Mail: burstein@usc.edu ou leb97201@yahoo.com*

Técnica de Enxerto Cortical "Pau-de-Barraca" no Rebordo Alveolar Gravemente Atrófico para Preparo do Local de Implante

RESUMO: Objetivos: O aumento do rebordo alveolar usando enxertos de bloco autógeno intra-oral para aumentar defeitos localizados do rebordo alveolar antes da colocação de implante é um método previsível. Contudo, grandes segmentos desdentados gravemente atróficos podem exigir áreas doadoras extra-orais. O propósito deste estudo é avaliar a eficácia do uso de enxerto de bloco cortical intra-oral em combinação com enxerto aloplástico mineralizado humano particulado, de modo "expandido", para aumentar grandes defeitos do rebordo alveolar atrófico para a colocação de implante. ***Materiais e Métodos:*** Este estudo de caso retrospectivo avaliou o aumento em 10 pacientes consecutivos com rebordos alveolares gravemente reabsorvidos com falta de no mínimo 4 dentes adjacentes. Antes do aumento, todos os locais enxertados foram considerados inadequados para a colocação de um implante-padrão de 4 mm. O aumento do rebordo horizontal foi realizado usando-se enxertos de osso cortical membranoso autólogo de uma área doadora oral para excluir a matriz de tecido mole e o periósteo para o enxerto aloplástico particulado adjacente. Os rebordos foram clinicamente avaliados 4–5 meses após o aumento e 42 implantes foram colocados naquela ocasião. ***Resultados:*** Os implantes foram colocados com sucesso em todos os locais enxertados 4 a 5 meses após a data do enxerto original. A avaliação clínica dos locais enxertados por ocasião do novo acesso revelou anatomia uniforme do rebordo. Todos os segmentos desdentados tiveram pelo menos dois implantes colocados de pelo menos 4.0 mm de diâmetro. No total, 42 implantes foram colocados em locais enxertados nos dez pacientes. Os implantes foram checados quanto à osseointegração usando-se um contratorque de 35 N-CM. Um implante deixou de integrar (1/42). O acompanhamento médio foi de 12 meses após a colocação do implante. Todos os rebordos aumentados tinham retido sua integridade funcional e estética 1 ano após o aumento original. ***Conclusão:*** A expansão do periósteo e da matriz de tecido mole usando-se um bloco do osso cortical mantém espaço e minimiza a reabsorção do volume do enxerto aloplástico particulado. Além disso, ligar os blocos corticais com osso particulado evita defeitos não-estéticos do rebordo entre os enxertos de bloco cortical em defeitos maiores do rebordo. O resultado foi um rebordo alveolar mais uniforme e estético, capaz de manter uma prótese suportada por implante. A técnica oferece reconstrução previsível e estética de defeitos de grande volume sem quantidades extensas de osso autógeno. Isso oferece um resultado funcional e estético superior àquele com enxerto cortical ou particulado apenas.

PALAVRAS-CHAVE: enxerto ósseo, defeito de grande volume, pau-de-barraca

RUSSIAN / РУССКИЙ

АВТОРЫ: Bach Le, доктор стоматологии, доктор медицины, Jeffrey Burstein, доктор стоматологии, доктор медицины, P Parish Sedghizadeh, доктор стоматологии, магистр естественных наук. *Адрес для корреспонденции: Bach Le, DDS, MD, Oral & Maxillofacial Surgery, USC School of Dentistry/LA County Medical Center, 2010 Zonal Avenue, Los Angeles, CA 90089. Телефон: (323) 226-5013, Факс: 323-226-5241, Адрес*

электронной почты: burstein@usc.edu или leb97201@yahoo.com

Кортикальная методика имплантации «Tent-pole» для подготовки места имплантации в случае сильно атрофированного альвеолярного гребня

РЕЗЮМЕ: **Цели.** Увеличение альвеолярного гребня с использованием внутриротовых аутогенных блочных трансплантатов для исправления локальных дефектов альвеолярного гребня перед установкой имплантата является обычным методом. Однако для крупных, сильно атрофированных сегментов с отсутствием зубов могут потребоваться внеротовые донорские участки. Цель данного исследования – оценить эффективность использования внутриротовых кортикальных блочных трансплантатов в сочетании с минерализованными корпускулярными донорскими «шатровыми» аллотрансплантантами для наращивания сильно атрофированного альвеолярного гребеня перед установкой имплантата. **Материалы и методы.** Данное ретроспективное исследование оценивает увеличение гребня у 10 неотобранных пациентов с сильно резорбированными альвеолярными гребнями, потерявших как минимум 4 соседних зуба. До увеличения альвеолярного гребня все места установки имплантата были признаны неподходящими для стандартного имплантата диаметром 4 миллиметра. Увеличение ширины альвеолярного гребня было осуществлено при помощи трансплантатов из собственной кортикальной кости пациента, развившейся из мезенхимы, взятой из донорского участка ротовой полости для покрытия матрицы мягких тканей и надкостницы, для установки прилегающего корпускулярного аллотрансплантата. Было проведено клиническое обследование альвеолярных гребней через 4–5 месяцев после их увеличения, одновременно с этим было установлено 42 имплантата. **Результаты.** Имплантаты были успешно установлены на всех подготовленных местах для имплантации через 4–5 месяцев после даты первой операции. Клинический осмотр всех мест для имплантации после восстановления показал однородную анатомию альвеолярного гребня. На все сегменты, в которых отсутствовали зубы, было установлено минимум по 2 имплантата диаметром не менее 4 миллиметров. Всего десяти пациентам было установлено 42 имплантата в нарощенных местах. Была проведена проверка оссеоинтеграции имплантатов при помощи измерения бокового сдвига протезного базиса зубов, величина которого составила 35 N-CM. Один имплантат не прижился (1/42). В среднем, период наблюдения составил 12 месяцев после установки имплантата. Все увеличенные альвеолярные гребни восстановили свою функциональную и эстетическую целостность в течение 1 года после первоначального увеличения. **Вывод.** Покрытие надкостницы и матрицы мягких тканей с использованием кортикальных костных блоков сохраняет пространство и минимизирует резорбцию объема корпускулярного аллотрансплантата. Кроме того, соединение кортикальных блоков при помощи корпускулярной кости позволяет избежать эстетических дефектов альвеолярного гребня между трансплантатами кортикальных блоков при больших дефектах альвеолярного гребня. В результате был получен более однородный и эстетичный альвеолярный гребень, способный удерживать протезы, устанавливаемые с опорой на имплантат. Методика позволяет добиться прогнозируемой функциональной и эстетической реконструкции дефектов большого объема без обширных участков аутогенной кости. Таким образом, может быть достигнут превосходный функциональный и эстетический результат, который не мог быть получен при использовании лишь одной (кортикальной или корпускулярной) имплантационной методики.

КЛЮЧЕВЫЕ СЛОВА: костный трансплантат, дефекты большого объема, «tent-pole»

TURKISH / TÜRKÇE

YAZARLAR: Diş Hekimi, Dr. Bach Le, Diş Hekimi, Dr. Jeffrey Burstein, Diş Hekimi, Dr. P Parish Sedghizadeh. *Yazýþma için: Bach Le, DDS, MD, Oral & Maxillofacial Surgery, USC School of Dentistry/LA County Medical Center, 2010 Zonal Avenue, Los Angeles, CA 90089 ABD. Telefon: (323) 226-5013, Faks: 323-226-5241, E-posta: burstein@usc.edu veya leb97201@yahoo.com*

Ýmplant Yeri Hazýrlanmasýnda Ciddi Atrofili Alveoler Krette Kortikal "Çadýr Direði" Greft Tekniði

ÖZET: **Amaçlar:** Lokalize alveoler kret defektlerinin augmentasyonunda implant yerleştirme işleminden önce intraoral otojen blok greftleri uygulaması yoluyla alveoler kret augmentasyonu yapılması, sonuçları önceden tahmin edilebilen bir yöntemdir. Ancak, geniş ve ciddi şekilde atrofiye uğramış dişsiz segmanlar, ekstra oral donör yerlerini zorunlu kılabilir. Bu çalışmanın amacı, geniş ve atrofili alveoler kret defektlerinin implant yerleşimi için augmentasyonunda intraoral kortikal blok greftlerinin partikül halinde insan mineralize allogrefti ile birlikte "çadır" şeklinde kullanılmasının etkinliğini değerlendirmektir. **Gereç ve Yöntem:** Bu retrospektif çalışma, ciddi şekilde rezorbe olmuş alveoler krete sahip ve en az 4 adet yan yana diş eksikliği olan ardışık 10 hastada augmentasyonu değerlendirdi. Augmentasyon öncesinde tüm greft yerleri, standart 4 mm çapındaki implantların yerleştirilmesi için yetersiz bulunmuştu. Bir oral donör yerinden alınan otolog membranlı kortikal kemik greftleri, yandaki partiküllü allogreft için yumuşak doku matrisi ve periosteum çadır gibi uygulanarak yatay kret augmentasyonu

yapıldı. Kretler, augmentasyondan 4–5 ay sonra klinik olarak değerlendirildi ve o tarihte 42 implant yerleştirildi. **Bulgular:** Orijinal greft tarihinden 4–5 ay sonra tüm greft yerlerinde başarıyla implantasyon yapıldı. Greft yerlerine tekrar girişte yapılan klinik değerlendirmede, eş dağılımlı kret anatomisi gözlendi. Tüm dişsiz segmanlara, en azından 4.00 mm çapında en az iki implant yerleştirilmişti. On hastadaki greft yerlerine toplam 42 implant yerleştirildi. Ters torklu 35 N-CM kullanılarak implantlarda osseointegrasyon kontrol edildi. Bir implantta entegrasyon başarısızlığı görüldü (1/42). Ortalama takip, implantasyondan sonra 12 aydı. Augmentasyon yapılan tüm kretler, orijinal augmentasyondan sonraki 1 yıl içinde işlevsel ve estetik bütünlüklerini korudu. **Sonuç:** Kortikal kemik bloğu kullanılarak periosteum ve yumuşak doku matrisinin çadırlanması, aralığı muhafaza eder ve partiküllü allogreft hacminin rezorpsiyonunu minimuma indirir. Ayrıca, kortikal blokların partiküllü kemik ile köprülenmesi, daha geniş kret defektlerinde kortikal blok greftleri arasında estetiksel olmayan kret defektlerini önler. Bunun sonucunda, implant tarafından desteklenen bir protezi muhafaza edebilecek nitelikte daha eş dağılımlı ve estetik bir alveoler kret oluşur. Bu teknik, büyük miktarda otojen kemik kullanılmadan büyük hacimli defektlerin işlevsel ve estetik bir şekilde yeniden yapılandırılmasını sağlar. Böylece, tek başına kortikal veya partiküllü greftleme yöntemlerine karşın daha üstün işlevsel ve estetik sonuçlar elde edilir.

ANAHTAR KELÝMELER: kemik grefti, büyük hacimli defekt, çadır direği

JAPANESE / 日本語

重度萎縮歯槽隆線インプラント部位埋入前処置を目的とした皮質“テントポール”グラフト術

共同研究者氏名： 共同研究者氏名: バク•リ（Bach Le）DDS, MD, ジェフリー•バースタイン（Jeffrey Burstein） DDS, MD, Pパリッシュ•セッジザーデ（P Parish Sedghizadeh） DDS, MS

研究概要：

目的： インプラント埋入前処置のため、局部歯槽隆線欠損修正に口腔内自家骨ブロックグラフトを使用した歯槽隆線増大術は予知性を備えている。ただし広範囲に重度萎縮がみられる無歯顎部分には口腔外ドナーサイトを要する可能性がある。当研究目的は、インプラント埋入に備え広範囲重度萎縮歯槽隆線修正のために口腔内皮質ブロックと顆粒状人体粉砕自家骨の混合素材を“テント様式”で囲んで使用した治療法効果を評価するものである。

研究素材と方法： 当研究は最低4本の隣接歯欠損に加え、歯槽隆線に重度の組織吸収が見られる10名の一貫した患者のケーススタディを振返り評価したものである。増大術前のグラフト部位は直径4ミリのスタンダードインプラント埋入に不十分という診断を受けている。水平面歯槽隆線増大術は口腔内ドナーサイトから採取した自家膜皮質骨グラフトを使用して行われ、隣接する微粒子自家骨を支えるために軟組織マトリックスと骨膜をテント方式で囲った。歯槽隆線は増大術後4ヶ月から５ヶ月で臨床評価され、その時点で42本のインプラントが埋入された。

結果： オリジナルグラフトが行われた日を起点に4ヶ月から5ヶ月後にはすべてのグラフト部位にインプラント埋入が成功した。リエントリー時点でのグラフト部位臨床評価では均質な歯槽隆線生体構造が確認されている。すべての無歯顎部分には直径4.0ミリのインプラントを最低2本埋入した。合計で10名の患者のグラフト部位に42本のインプラントが埋入された。カウンタートルク35 N-CMを使用してインプラントのオッセオインテグレーション検査を行ったところ、1本のインプラントが骨結合に失敗した。(1/42). 中間フォローアップ検査はインプラント埋入から12ヶ月後に行った。増大術を行った歯槽隆線はオリジナル増大術後1年目の時点ですべて機能性ならびに完全な審美性を維持している。

結論： 皮質骨ブロックを使用して骨膜と軟組織マトリックスをテント様式で囲う方法はスペースを維持しながら微粒子自家骨吸収量を最低限にとどめる。さらに皮質ブロックと微粒子骨をつなぐことで、広範囲重度歯槽隆線における皮質ブロックグラフト間に審美性を損なう歯槽隆線欠陥を防ぐことができる。その結果インプラントサポート義歯維持が可能な、より優れた均質性と審美性に重点をおいた歯槽隆線が得られる。この増大術は大量の自家骨を必要とせずに、予知性だけでなく機能性と審美性を備えた広範囲欠損修正を提供し、皮質または自家骨のみを利用したグラフトより機能性と審美性の面でさらに優れた結果が得られる。

キーワード： ボーングラフト, 広範囲重度欠陥, テントポール

ご質問の宛先： Bach Le, DDS, MD, Oral & Maxillofacial Surgery, USC School of Dentistry/LA County Medical Center, 2010 Zonal Avenue, Los Angeles, CA 90089

電話：(323) 226-5013 FAX: 323-226-5241 電子メールburstein@usc.edu または leb97201@yahoo.com

CHINESE / 中国語

植體部位準備之嚴重萎縮齒槽骨牙脊皮質「帳蓬柱」移植術

作者：Bach Le DDS、MD；Jeffrey Burstein DDS、MD；P Parish Sedghizadeh DDS、MS

摘要：

目的：在植體植入前利用口腔內自體骨塊移植的齒槽骨牙脊豐隆以增加局部齒槽骨牙脊缺損，是一項可預測的方法。然而，大範圍嚴重萎縮的缺牙部分可能需要口腔外供給部位。本研究旨在評估利用口腔內皮質塊狀移植結合微粒狀人體礦物化同種異體移植效度，以「暫時固定」的方式來提高植體植入的大範圍萎縮齒槽骨牙脊缺損。

資料與方法：此回顧式病例研究評估 10 名至少缺少 4 顆鄰近牙齒且具有嚴重再吸收齒槽骨牙脊的連續患者的增高狀況。在增高之前，所有移植部位都視爲不適合植入 4 mm 直徑的標準植體。利用取自口腔內供給部位的自體膜狀皮質骨移植來進行水平牙脊豐隆，以拔除鄰近微粒異體移植的軟組織基質與骨膜。增高後，利用臨床評估牙脊 4 – 5 個月，並於該時間植入 42 顆植體。

結果：在原始移植日後 4 – 5 個月，植體成功植入所有移植部位。重新進入時的移植部位的臨床評估發現一致的牙脊解剖結構。所有缺牙部分都至少植入兩顆直徑至少 4.0 mm 的植體。在 10 名患者的移植部位合計植入 42 顆植體。利用 35 N-CM 的反扭力檢查骨整合。一顆植體整合失敗 (1/42)。植體植入後平均追蹤 12 個月。所有增高牙脊於原始增高後 1 年仍保有其機能性與美學整合。

結論：利用皮質骨塊暫時固定骨膜與軟組織基質，能維持空間並讓微粒同種異體移植量的吸收降到最低。此外，以微粒骨質銜接皮質骨塊能避免較大牙脊缺損的皮質塊移植之間的非美學牙脊缺損。結果是較一致且有美感的齒槽骨牙脊，能維護植體支持的義齒。此技術提供大量缺損可測測的機能與美學重建，不需擴大使用自體骨量。這比單純皮質或微粒移植能提供更優異的功能與美學結果。

關鍵字：骨移植、大量缺損、帳棚柱

通訊方式： Bach Le, DDS, MD, Oral & Maxillofacial Surgery, USC School of Dentistry/LA County Medical Center, 2010 Zonal Avenue, Los Angeles, CA 90089
電話： (323) 226-5013 傳真：323-226-5241 電郵信箱：burstein@usc.edu 或 leb97201@yahoo.com

KOREAN / 한국어

임플란트 부위 준비 시 상당히 위축된 치조제에 대한 피질 "거즈심 기둥(Tent-Pole)" 이식술

저자: 바흐 르(Bach Le), 구강외과 의사(DDS) 겸 의학박사(MD), 제프리 버스타인(Jeffrey Burstein), 구강외과 의사(DDS) 겸 의학박사(MD), 피 패리쉬 세지자데(P Parish Sedghizadeh), 구강외과 의사(DDS) 겸 석사(MS)

초록

목적: 예상되는 방법으로는 임플란트 이식 전 치조제 결함을 확대 국부화하기 위해 구강 내 자가골 차단 이식을 이용한 치조제 확대가 있다. 그러나 상당히 위축된 무치 부분은 구강 외에 제공 부위가 필요할 수도 있다. 본 연구의 목적은 "거즈심(tent)" 형태의 인간의 입상 광물질 동종이식과 병행하여 구강 내 피질 차단 이식의 유효성을 검증하고, 임플란트 이식을 위한 위축성의 치조제 결함을 증대하는 것이다.

재료 및 방법: 후향 증례 연구에서 최소 4개의 인접한 치아가 소실되어 재흡수된 치조제를 한 10명의 일련의 환자들을 대상으로 확대를 평가하였다. 확대 전 모든 이식된 부위는 일반적인 4 mm 지름의 임플란트를 이식하기에 적절하지 못한 것으로 간주되었다. 수평적 치조제 확장은 제공 부위의 자가막 피질 골 이식을 연조직 기질 및 인접한 입자성 동종이식용 골막에 거즈를 끼워 벌려서 실시되었다. 치조제는 확장 후 4-5개월에 임상적으로 평가되었고, 42개의 임플란트가 이 때에 안착되었다.

결과: 임플란트는 첫 이식이 있은 지 4 - 5개월 후에 모든 이식된 부위에 성공적으로 안착되었다. 재진입 시 이식된 부위에 대한 임상적 평가는 균일 치조제 해부학을 나타냈다. 모든 무치 부위에는 최소 4.0 mm 지름으로 적어도 두 개의 임플란트가 안착되어 있었다. 모두에서, 10명의 환자들을 대상으로 이식된 부위에 42개의 임플란트가 안착되었다. 골융합에 대해 35 N-CM의 역토크(counter-torque)를 사용하여 임플란트를 확인하였다. 한 개 임플란트가 융합에 실패하였다 (1/42). 평균 추적 조사는 임플란트 안착 후 12개월 후였다. 모든 확대된 치조제는 최초 확대 후 1년째에 기능적, 미용적으로 통합이 이루어졌다.

결론: 피질골 차단을 이용하여 골막과 연조직 기질에 거즈를 끼워 벌리는 것은 공간을 유지하고 입자성 동종이식 양의 재흡수를 최소화한다. 게다가, 피질 차단제와 입자성 골을 연결함으로써 대형 치조제 결함 중 피질 차단 이식간의 미적이지 못한 치조제 결함을 예방한다. 그 결과는 임플란트를 지지하는 보철물을 유지할 수 있는 보다 균일한 미용적 치조제였다. 본 기술은 다량의 자가골이 없이도 많은 결함을 기능적이고 미용적으로 재건이 가능하도록 해준다. 피질이나 입자성 이식만 하는 것보다 월등하게 기능적, 미용적으로 좋은 결과를 제공한다.

핵심 단어: 골 이식, 다량의 결함, 거즈심 기둥(tent-pole)

연락처: Bach Le, DDS, MD, Oral & Maxillofacial Surgery, USC School of Dentistry/LA County Medical Center, 2010 Zonal Avenue, Los Angeles, CA 90089
전화: (323) 226-5013 팩스: 323-226-5241 이메일: burstein@usc.edu 또는 leb97201@yahoo.com