

Esthetic Grafting for Small Volume Hard and Soft Tissue Contour Defects for Implant Site Development

Bach Le, DDS, MD,* and Jeffrey Burstein, DDS, MD†

One of the keys to creating an esthetic illusion of a natural tooth is to execute an ideal emergence profile.¹ A critical part of the emergence profile is based on the type of tissue surrounding the tooth and whether any defects in the underlying bone are present. Although different opinions exist as to whether a lack of an attached portion of masticatory mucosa may jeopardize the maintenance of the soft tissue health around dental implants,^{2,3} there are many procedures available to increase the thickness of this tissue. These procedures include inlay grafts⁴ and onlay grafts⁵ which involve harvesting tissue from a new patient donor site⁶ or using acellular dermal matrix grafts like AlloDerm (LifeCell Corporation, Branchburg, NJ).^{7,8} Other options are flap manipulation procedures⁹ such as the vascularized interpositional periosteal-connective tissue flap,¹⁰ and controlled tissue expansion techniques.¹¹ Many other flap designs have been reported including the palatal roll technique, sliding and rotating flaps.^{10,12-16}

Ideally the contour of the gingival tissue on the alveolar ridge is developed before implant placement.^{1,17-19} If needed, soft tissue augmentation to improve the gingival contours can occur at implant placement^{20,21} and, if needed, at the implant uncover stage or even later.^{1,17,22} When bony defects exist before implant placement and

Ridge contour defects around dental implants are caused by underlying bony defects. Although adequate bone may exist to obtain stability of the implant, irregular bony anatomy can result in an unnatural appearance of the final crown. Particulate onlay grafting to support the peri-implant soft tissue along with

tension-free closure while using pedicle papilla regeneration techniques can convert unaesthetic gingival contours into favorable sites. (Implant Dent 2008;17:136-141)

Key Words: dental implants, onlay grafting, papilla regeneration

the implant is placed and restored without consideration for these defects, the result can be an unnatural appearance (Fig. 1). Soft tissue grafting can be advantageous in situations where there is a thin biotype, metal display of the implant collar or as a more predictable method for small vertical augmentation of the soft tissue. However, the majority of small soft tissue deficiencies are represented by an underlying bony defect. Primarily soft tissue grafting to treat these patients has many limitations including increased postoperative sequelae, surgical time, and increased expense with a second surgical site.

Although large volume defects, as seen in a severely atrophic maxilla, are conceptually 1-wall defects (*ie*, knife edge ridge) which require the use of titanium mesh or cortical tentpole grafting techniques,¹² the small volume peri-implant bony defects can be compared with a 3-wall defect which can be corrected with a simple technique using particulate mineralized allograft. The result is the augmentation of small hard and soft tissue labial defects resulting in the functional and cosmetic results desired. Block demonstrated that augmenting the deficient alveolus can be successfully performed using a tunnel-

ing technique²³ to place particulate mineralized allograft in the posterior mandibular ridge. We successfully used this technique to augment the mandibular ridge with excellent results and core biopsies taken from the augmented sites 5 months after placement of the graft revealed adequate viable bone. However, the disadvantage of the tunneling technique is that it is difficult to position the graft coronally into an esthetic position to augment the labial concavity. To avoid the difficulty of placing the graft exactly where it is needed, lateral augmentation of the alveolar process should be done under direct vision to achieve excellent results.²⁴ We have expanded on this concept to treat small hard and soft tissue defects. By using this technique it is possible to create an esthetic result where the coronal soft tissue is supported by bone and, in the majority of cases, this eliminates the need for a subepithelial connective tissue graft. This, in essence, treats the problem at its underlying origin.

SURGICAL TECHNIQUE

This simple procedure to augment small soft and hard tissue defects without taking a connective tissue graft

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Fig. 1. Implant-supported crown shows unnatural ridge contour.

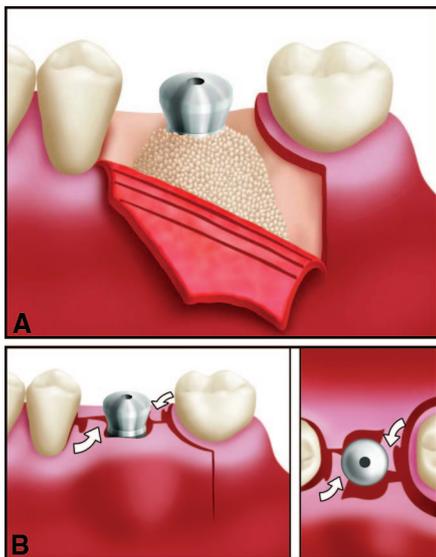


Fig. 2. A, Particulate allograft augmentation of contour defect and release of periosteum to obtain tension-free closure. B, Rotation of pedicled flaps to adapt gingival tissues to implant healing abutment and to augment papillary tissue volume.

involves direct exposure of the labial defect at any stage of implant placement. In Figure 2, A we demonstrate the use of this procedure coincident with implant placement. The technique involves a crestal incision, slightly palatal to the midline, with a full-thickness subperiosteal pouch to the labial of the implant with a small distal vertical release if needed. The human mineralized allograft bone (Puros; Zimmer Dental, Carlsbad, CA), is then placed against the labial bone surface with sufficient volume to correct any contour defect. Resorption and apical migration of the graft material is expected, so it is important to over-correct the defect by 30%. The patient's own blood is used as a coagulant

for better cohesiveness and handling of the graft material. If there is adequate primary stability of the implant, then a single stage protocol is preferred. Before placing the bone it is critical to release and advance the peri-implant soft tissue by scoring the periosteum so that tension-free closure can be obtained around the healing abutment. For a better esthetic result, a large diameter healing abutment is preferred as it acts as a tenting mechanism to support the graft and peri-implant soft tissue. Moderate resorption of graft material can be expected if there is not an adequate tissue seal around the healing abutment and if tension-free closure is not achieved. A variation of Palacci's²⁵ papilla regeneration technique (Fig. 2, B) helps to augment the interdental height and soft tissue papillary volume when an adequate zone of peri-implant keratinized tissue is present (Fig. 2, C).

Two cases (Figs. 3 and 4) in which the labial contour defect is corrected with particulate bone are shown. In Figure 3, mineralized particulate allograft was used in the esthetic zone under direct vision to augment a contour defect. In supporting both of these defects with bone rather than grafting additional soft tissue to the region, we ensure the bony support to maintain the esthetic contour. In addition, we avoid the additional painful donor site incision to the palate.

DISCUSSION

After tooth extraction, socket remodeling can result in loss of up to 40% to 60% of the alveolar ridge width within the first 1 to 2 years.²⁶ Labial ridge deformity can be more severe if there is damage to the buccal plate during tooth removal. Atwood and Coy²⁷ performed clinical and densitometry studies on residual ridges after tooth loss and found that bone resorption activity continues throughout life. As a result, it is anticipated that many patients with tooth loss will have varying degrees of alveolar ridge resorption. This resorption can lead to compromise in the position of the implant fixture. Even when there is adequate bone to place implants, irregular ridge contours can result in an unnatural appearance of the final crown (Fig. 1, A).

In addition, the importance of having adequate labial bone thickness around implants cannot be underestimated. Most mucogingival deficiencies which occur around dental implants result from loss of underlying bone attachment to the fixture. Spray *et al*²⁸ confirmed the need for adequate facial bone thickness after implant placement to minimize labial bone height loss. They determined the ideal facial thickness to be 2 mm. When there was less than 2 mm, vertical bone loss occurred at a greater frequency.

The rationale for use of particulate mineralized allograft to reconstruct small contour defects is to give support to the overlying soft tissue to create a more natural appearance. In addition to improving esthetics, the additional bone thickness provides stability in maintaining labial bone height. The feasibility of using particulate mineralized allograft in a closed tunneling fashion was successfully demonstrated by Block and Degen.²³ Le *et al*²⁹ used particulate mineralized allograft in an open onlay technique to successfully augment 10 consecutive patients with severely atrophic maxillary ridges for implant placement. The bone quality achieved in their patient population was sufficient for successful integration of 41 of 42 implants. These reports show that mineralized allograft can be successful in augmenting atrophic alveolar ridges for implant placement.

The advantage of using an open grafting technique is that it can be performed at the time of implant placement, in a single-stage implant placement protocol. The single-stage protocol minimizes compression and migration of particulate graft material and it allows the bony and soft tissue architecture to develop around the healing abutment during the healing phase. A large diameter healing abutment, in a single-stage placement protocol, provides tenting of the peri-implant soft tissue and results in less apical migration of graft material. This improves the prognosis of safeguarding the width and height of the remaining crestal bone. Grafting at the time of implant placement also takes advantage of the regional acceleratory phenomenon³⁰ that is induced by the

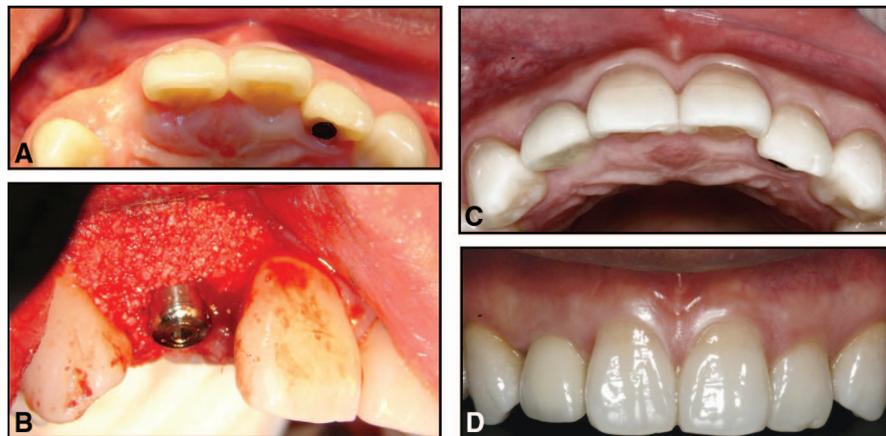


Fig. 3. A, Preoperative view of tooth 7 with labial bone defect. B, Sculpting ridge with particulate graft to correct contour defect. Note overcorrection of defect with graft material in anticipation of some resorption. C, D, 2 years follow-up final restoration.



Fig. 4. A, Preoperative contour defect of tooth 3. Incision made slightly palatal to midline to capture an adequate band of keratinized tissue around the future restoration. B, Buccal contour defect overcorrected with particulate bone. C, Four months after single-stage placement showing excellent improvement in buccal contour. D, E, One year follow-up final restoration.

trauma of implant placement, leading to a reduced healing time.

Some authors^{4,5,8,10-13} advocate the use of connective tissue grafts or acellular dermal matrix grafts for treatment of small volume contour defects. Although good results can be achieved in minor defects, the connective graft is merely replacing missing bone by masking it with soft tissue volume.

Particulate bone graft may be a better alternative because it treats the underlying bone problem to restore the natural support of the tissue architecture. Oftentimes, this negates the need for additional tissue grafting. In addition, the use of readily available allograft material negates the obvious disadvantages of having to harvest autogenous bone or connective tissue. This de-

creases the morbidity, expense and time of the implant procedure.

CONCLUSION

Particulate onlay grafts can be used to convert unhealthy and unaesthetic gingival contours into favorable sites. In reviewing the various techniques used to develop the implant site at the buccal aspect of the ridge, 1 simple technique was demonstrated to improve the peri-implant esthetics at different stages of implant placement. Correction of labial defects is just one of the many factors leading to excellent esthetic results. Just as important are treatment planning and case selection, correct implant placement, proper abutment selection and esthetic fabrication of the final crown.¹⁷ The results shown are at 2 years after grafting. A longer follow-up is needed to evaluate the long-term stability of these grafting techniques described.

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.

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REFERENCES

1. Kois JC. Predictable single tooth peri-implant esthetics: Five diagnostic keys. *Compend Contin Educ Dent.* 2001; 22:199-206.
2. Wennstrom JL, Bengazi F, Lekholm U. The influence of the masticatory mucosa on the peri-implant soft tissue condition. *Clin Oral Impl Res.* 1994;5:1-8.
3. Artzi Z, Tal H, Moses O, et al. Mucosal considerations for osseointegrated implants. *J Prosthet Dent.* 1993;70:427-432.
4. Langer B, Calagna L. The subepithelial connective tissue graft: A new approach to the enhancement of anterior cosmetics. *J Prosthet Dent.* 1980;44:363-367.
5. Seibert J. Reconstruction of deformed partially edentulous ridges, using full thickness onlay grafts. *Compend Contin Educ Dent.* 1983;4:437-453.
6. Sullivan HC, Atkins JH. Free autogenous gingival grafts. 3. Utilization of grafts in the treatment of gingival recession. *Periodontics.* 1968;6:152-160.

7. Harris RJ. A comparative study of root coverage obtained with an acellular dermal matrix versus a connective tissue graft: Results of 107 recession defects in 50 consecutively treated patients. *Int J Periodontics Restorative Dent.* 2000;20:51-59.
8. Cummings LC, Kaldahl WB, Allen EP. Histologic evaluation of autogenous connective tissue and acellular dermal matrix grafts in humans. *J Periodontol.* 2005;76:178-186.
9. Nencovsky CE, Moses O. Rotated palatal flap. A surgical approach to increase keratinized tissue width in Maxillary implant uncovering: Technique and clinical evaluation. *Int J Periodontics Restorative Dent.* 2002;22:607-612.
10. Sclar A. *Soft Tissue and Esthetic Considerations in Implant Therapy.* Surrey, UK: Quintessence Publishing; 2003;163-187.
11. Bahat O. Interrelations of soft and hard tissues for osseointegrated implants. *Compend Contin Educ Dent.* 1996;17:1161-1170.
12. Minsk L. The use of acellular dermal connective-tissue graft for root coverage in periodontal plastic surgery. *Compend Contin Educ Dent.* 2004;25:170-176.
13. Wennstrom JL. Mucogingival therapy. *Ann Periodontol.* 1996;1:671-701.
14. de Trey E, Bernimoulin JP. Influence of free gingival grafts on the health of the marginal gingiva. *J Clin Periodontol.* 1980;7:381-393.
15. Goodacre CJ. Gingival esthetics. *J Prosthet Dent.* 1990;64:1-12.
16. Karlson K. Gingival reactions to dental restorations. *Acta Odontol Scand.* 1970;28:895-904.
17. Garber DA, Belser UC. Restorative-driven implant placement with restoration-generated site development. *Compend Contin Educ Dent.* 1995;1:796-804.
18. Phillips K, Kois JC. Aesthetic peri-implant site development. The restorative connection. *Dent Clin North Am.* 1998;42:57-70.
19. Misch CE. *Contemporary Implant Dentistry.* 2nd ed. St. Louis, MO: CV Mosby; 1999;393-394.
20. Tarnow DP, Eskow RN. Considerations for single-unit esthetic implant restorations. *Compend Contin Educ Dent.* 1995;16:778-788.
21. Shaban M. Soft tissue closure over immediate implants: Classification and review of surgical techniques. *Implant Dent.* 2004;13:33-41.
22. Simion M, Misitano U, Gionso L, et al. Treatment of dehiscences and fenestration around dental implants using resorbable and nonresorbable membranes associated with bone autografts: A comparative clinical study. *Int J Oral Maxillofac Implants.* 1997;12:159-167.
23. Block MS, Degen M. Horizontal ridge augmentation using human mineralized particulate bone: Preliminary results. *J Oral Maxillofac Surg.* 2004;62(9 suppl 2):67-72.
24. Hellem S, Astrand P, Stenstrom B, et al. Implant treatment in combination with lateral augmentation of the alveolar process: A 3-year prospective study. *Clin Implant Dent Relat Res.* 2003;5:233-246.
25. Palacci P, Ericsson I, Engstrand P, et al. *Optimal Implant Positioning and Soft Tissue Management for the Branemark System.* Chicago: Quintessence; 1995;59-70.
26. Johnson K. A study of the dimensional changes occurring in the maxilla following tooth extraction. *Aust Dent J.* 1969;14:241-244.
27. Atwood DA, Coy WA. Clinical, cephalometric, and densitometric study of reduction in residual ridges. *J Prosthet Dent.* 1971;26:280-295.
28. Spray JR, Black CG, Morris HF, et al. The influence of bone thickness on facial marginal bone response: Stage 1 placement through stage 2 uncovering. *Ann Periodontol.* 2000;5:119-128.
29. Le B, Burstein J, Sedghizadeh PP. Cortical tenting grafting technique in the severely atrophic alveolar ridge for implant site preparation. *Implant Dent.* 2008;17:40-50.
30. Frost HM. The regional acceleratory phenomenon: A review. *Henry Ford Hosp Med J.* 1983;31:3-9.

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ID Abstract Translations

GERMAN / DEUTSCH

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Ästhetischer Transplantationsansatz für kleinere Defekte in Hart- und Weichgewebe zum Aufbau einer Implantierungsoption

ZUSAMMENFASSUNG: Defekte in der Leistenkontur im Bereich um Implantate herum werden durch diesen zu Grunde liegende Knochendefekte hervorgerufen. Obwohl eventuell entsprechendes Knochengewebe zur Stabilisierung des Implantats vorhanden sein kann, kann eine von der Norm abweichende Kochenanatomie dennoch zu einem unnatürlichen Erscheinungsbild der abschließenden Überkronung führen.

hren. Eine Partikel-Onlay-Spannung zur Unterstützung des das Implantat umgebenden Gewebes in Verbindung mit Spannungsfreiem Verschluss bei Verwendung von Techniken zur Regeneration der Stielpapille kann wenig ästhetisch erscheinende Zahnfleischkonturen zu gut geeigneten Implantierungsstellen umformen.

SCHLÜSSELWÖRTER: Zahnimplantate, Onlay-Spannung, Papillenregeneration

SPANISH / ESPAÑOL

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Injerto estético en defectos de tejido duro y blando de pequeño volumen para el desarrollo de lugares de implante

ABSTRACTO: Los defectos del contorno de la cresta alrededor de los implantes dentales son causados por defectos óseos subyacentes. A pesar de que podría existir un hueso adecuado para obtener la estabilidad del implante, una anatomía irregular del hueso puede resultar en una apariencia innatural de la corona final. El injerto incrustado de partículas para apoyar el tejido blando periimplante con un cierre sin tensión mientras se utilizan técnicas de regeneración de la papila pedicular puede convertir los contornos gingivales poco estéticos en lugares favorables.

PALABRAS CLAVES: Implantes dentales, injertos incrustados, regeneración de la papila

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Enxerto Estético para Defeitos de Tecido Duro e Mole de Pequeno Volume para Desenvolvimento de Local de Implante

RESUMO: Os defeitos do contorno do rebordo em torno de implantes dentários são causados por defeitos ósseos subjacentes. Embora o osso adequado possa existir para obter a estabilidade do implante, a anatomia óssea irregular pode resultar numa aparência não-natural da coroa final. O enxerto particulado *onlay* para apoiar o tecido mole do periimplante, junto com o fechamento isento de tensão, enquanto se utilizam técnicas de regeneração da papila do pedículo, pode converter contornos gengivais não-estéticos em locais favoráveis.

PALAVRAS-CHAVE: Implantes dentários, enxerto *onlay*, regeneração da papila

RUSSIAN

АВТОРЫ: Bach Le, доктор стоматологии, доктор медицины, Jeffrey Burstein, доктор стоматологии, доктор медицины. *Адрес для корреспонденции: Bach Le, DDS, MD, Oral & Maxillofacial Surgery, USC School of*

JAPANESE / 日本語

インプラントサイト造成のため微小硬組織と軟組織欠損を修正する審美グラフト

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Эстетическая трансплантация для исправления дефектов твердой и мягкой ткани небольшого объема для создания ложа под имплантат

РЕЗЮМЕ. Дефекты контура гребня вокруг зубных имплантатов вызваны дефектами основообразующей костной ткани. Несмотря на то, что может существовать достаточный объем костной ткани для обеспечения устойчивости имплантата, неравномерная костная анатомия может привести к неестественному внешнему виду постоянной коронки. Использование комбинированной вкладки-трансплантата для поддержки мягкой ткани вокруг имплантата и шивание без натяжения с одновременным использованием методов восстановления межзубного десневого сосочка могут превратить неэстетичные десневые контуры в благоприятное ложе.

КЛЮЧЕВЫЕ СЛОВА: зубные имплантаты, вкладка-трансплантат, восстановление сосочка

TURKISH / TÜRKÇE

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implant Yerinin Gelitirilmesi için Az Hacimli Sert ve Yumuşak Doku Kusurlarının Estetik Greftlenmesi

ÖZET: Dental implantların etrafındaki kret kontur kusurları, alta yatan kemiksel kusurlardan kaynaklanır. mplantta stabilite sağlayacak yeterli kemik olsa bile, eer düzensiz kemik anatomisi mevcutsa, son kron doal olmayan bir görüntü alabilir. Pedikül papilla rejenerasyon teknikleri kullanılırken, periimplant yumuşak dokuyu destekleyecek parçacıklı onlay greft yapılır ve gerilimsiz kapamı salanırsa, estetik özelliği olmayan dieti konturları daha estetik hale getirilebilir.

ANAHTAR KELMELER: Dental implantlar, onlay greft, papilla rejenerasyonu

研究概要: 덴탈인플란트 주변의 Ridge Contour Defect (隆線輪郭欠損) は潜在的骨欠損が起因して発生する。インプラントの安定性をはかるのに十分な骨があっても、不均一な骨組織が原因でファイナルクラウンが不自然な見栄えになってしまう場合もある。インプラント周辺軟組織を支えるために tension-free closure を併用した微粒子オンレイグラフトを Pedicle Papilla Regeneration Technique (歯間乳頭形成術) を利用して行えば 審美性に欠ける歯茎形成も望ましいサイトに変換することができる。

キーワード: 덴タル인플란트, 온레이グラフト, 歯間乳頭形成

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CHINESE / 中国語

植體部位發展的小量硬組織和軟組織缺損的美學移植

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摘要: 植體周圍的牙脊輪廓缺損乃因其下骨質缺損所致。雖然現有骨質可能足以維持植體穩定，然而不定期的骨骼解剖可能導致牙冠最後的外觀不自然。顆粒覆蓋式移植以支持植體周圍軟組織搭配無張力縫合，同時再利用蒂頭狀牙齦再造術，可將不美觀的齒齦輪廓轉移到有利的部位。

關鍵字: 牙科植體、覆蓋式移植、乳頭狀牙齦再造

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KOREAN / 한국어

이식 부위 개발을 위한 경조직 및 연조직 결손에 대한 심미적 이식

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초록: 치과용 임플란트 주위의 융선 윤곽 결손은 기존 뼈 결손에 의해 발생한다. 이식물의 안정성을 위해 알맞은 뼈가 존재해야 하나, 불규칙한 골 해부학에 의해 최종 치관의 모양이 부자연스럽게 될 수 있다. 무장력 폐쇄와 함께 임플란트 주위 연부조직을 지지하기 위한 입자중첩이식은, 치간 유두 재생 기술을 이용하여 외관상 좋지 않은 잇몸 융선을 보기 좋게 전환시킬 수 있다.

키워드: 치과용 임플란트, 중첩 이식, 유두 재생

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