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Ole T. Jensen

Surgical Algorithm for Alveolar Bone Augmentation in Implant Dentistry **155**

Len Tolstunov

Replacement of failing and ailing natural teeth with dental implants has become a mainstream treatment option since the discovery of osseointegration by P.-I. Brånemark in the 1960s. The techniques and the variety of methods for alveolar bone reconstruction have evolved to address a restoratively driven approach in implant dentistry. Modern 3D cone-beam computed tomography has helped with the diagnosis and treatment of bone deficiencies to idealize implant positioning. This article focuses on bone augmentation techniques, classified into horizontal and vertical ridge augmentation, and discusses block grafting, guided bone regeneration particulate grafting, distraction osteogenesis, and ridge-split expansion procedures.

Bone Augmentation Techniques for Horizontal and Vertical Alveolar Ridge Deficiency in Oral Implantology **163**

Len Tolstunov, John F. Eric Hamrick, Vishtasb Broumand, Dekel Shilo, and Adi Rachmiel

Bone deficiency is the major obstacle in implant dentistry. Guided bone regeneration (GBR) with particulate bone and barrier membranes has been the primary surgical technique used to regenerate alveolar bone for dental implant therapy. This procedure has been used in implant dentistry for more than 30 years and continues to be developed and refined for more predictable surgical outcomes. This article reviews GBR and alternative ridge expansion procedures and reviews the use of various particulate graft materials. Alveolar distraction osteogenesis, used as an augmentation technique, is also presented.

Biomimetic Enhancement of Bone Graft Reconstruction **193**

Tara L. Aghaloo, Ethan Tencati, and Danny Hadaya

With aging populations and increasing oral rehabilitation, use of dental implants for oral reconstruction is increasing. Adequate hard/soft tissue are required to support use of titanium implants. Bone augmentation is sometimes a necessary procedure to supplement existing alveolar bone. With a wide variety of biomaterials available for clinical use, we focus on the enhancement of bone graft materials, targeting new technologies with potential clinical use. Clinical indications supported by research studies are provided for platelet-rich fibrin, various growth factors, and newly emerging scaffolds. Interestingly, modified biomaterials are being developed and have potential clinical use as more data become available.

Implant Therapy in Alveolar Cleft Sites **207**

R. John Tannyhill III and Maria J. Troulis

Dental implant therapy in the non-cleft patient is familiar to most oral and maxillofacial surgeons. Understanding the differences in surgical treatment planning in the cleft patient versus the non-cleft patient is the key to highly functional and esthetic

long-term outcomes. CBCT and computer-assisted planning, as well as improved technology in grafting and implant materials, result in excellent outcomes. Communication with the restorative team remains of paramount importance in planning treatment.

Complex Dental Implant Cases: Algorithms, Subjectivity, and Patient Cases Along the Complexity Continuum 219

Mark Durham, Marco Brindis, Nicholas Egbert, and Leslie R. Halpern

Algorithms for predictable outcomes, or checklists in health care, have been widely supported due to their highly effective outcomes. This article shares “algorithmic roadmaps” to restore single-tooth, partially edentulous, and fully edentulous complex dental implant cases in the patient population. A review of the current literature is presented to provide systematic assessments followed by criteria in a checklist format that allows the surgeon and restorative dentist to determine whether a removable or fixed implant prosthesis is the best patient option. Several cases have been chosen to illustrate the algorithms the authors used to provide an optimized prognosis for surgical/restorative success.

Single-Implant Treatment 251

Michael S. Block

The replacement of one tooth using one implant involves a set of unique criteria for long-term success. Successful therapy should be based on long-term function and health of the adjacent tissues. Sections of this article examine these critical criteria that when working together can result in successful long-term tooth replacement.

Maxillofacial Reconstruction Using Vascularized Fibula Free Flaps and Endosseous Implants 259

Stavan Y. Patel, Dongsoo D. Kim, and Ghali E. Ghali

Maxillofacial subunit reconstruction using vascularized fibula free flap and endosseous implants is a complex and exciting topic. Use of this technique has profoundly improved patients’ function, form, and quality of life. This article outlines the goals and requirements of reconstruction and patient selection. Current data are examined and issues related to flap selection, irradiation, primary versus secondary implant placement, timing and type of implants, use of virtual surgical planning, soft-tissue management, and prosthesis selection fabrication are discussed. Careful planning, communication, and collaboration between reconstructive surgeons and prosthodontists are critical in achieving optimal and stable long-term outcomes.

Quad Zygoma: Technique and Realities 285

Rubén Davó and Lesley David

Four zygomatic implants may be used in patients with severe maxillary atrophy for rehabilitation with a fixed or removable prosthesis. Immediate loading is also typically performed, providing patients with a less invasive and more efficient solution for rehabilitation. Options for immediate loading are presented. The indications, contraindications, procedure, and complications are reviewed. Appropriate treatment planning and work-up are highlighted, as they are required for success in conjunction with advanced surgical skill. Scientific evidence, although lacking in quantity, suggests that the quad zygoma approach offers a predictable solution for the challenge of severe maxillary atrophy; high implant survival rates are noted.

Managing the Posterior Maxilla with Implants Using Bone Grafting to Enhance Implant Sites 299

Peter E. Larsen and Kelly S. Kennedy

The edentulous posterior maxilla poses challenges to reconstruction. Posterior forces are great, yet bone quality and quantity are diminished. There is frequent loss of bone resulting from ridge resorption as well as sinus pneumatization. There are also advantages of placing implants in the posterior maxilla compared with the anterior maxilla, such as improved hygiene, esthetics and phonetics, and biomechanical load distribution. This article will present strategies and techniques for improving implant support in the posterior maxilla through various grafting techniques.

Titanium Mesh Grafting Combined with Recombinant Human Bone Morphogenetic Protein 2 for Alveolar Reconstruction 309

Alan S. Herford, Isaac Lowe, and Paul Jung

There are several methods of regenerating the maxillary and mandibular ridge to achieve orthoalveolar form with bone grafting procedures, including block onlay grafting and guided bone regeneration. Traditionally, guided bone regeneration has focused on creating a space for bone regeneration to occur. The use of a formed titanium mesh to regenerate alveolar defects was popularized in the 1980s. With the advent of other adjuncts, such as resorbable membranes, and growth factors, such as recombinant human bone morphogenetic protein 2, the predictability of the procedure has increased and a wide variety of defects can be restored using this technology.

Managing Bone Grafts for the Mandible 317

Patrick J. Louis and Somsak Sittitavornwong

Bone grafting has become an integral part of implant dentistry. To achieve a predictable long-term outcome for osseointegrated implants, a sufficient volume and quality of alveolar bone must be present at implant recipient sites. Resorption of the alveolar ridge and postsurgical or post-traumatic defects of the residual alveolar bone can prevent ideal placement of a dental implant. Thus, in many cases, alveolar bone grafting is the real challenge in implant reconstruction. This article will discuss the various techniques and graft materials for alveolar ridge reconstruction of the mandible. It also compares and contrasts these techniques by reviewing the current literature.

Guided Bone Regeneration in Alveolar Bone Reconstruction 331

Istvan A. Urban and Alberto Monje

Guided bone regeneration is an effective alternative for the reconstruction of atrophic ridges. Adequate flap management together with immobilization of the barrier membrane and graft are crucial to ensure successful regenerative radiographic and clinical outcomes. Moreover, tension-free flap closure should be accomplished to guarantee to maximize the effectiveness of guided bone regeneration.

Le Fort I Distraction Osteogenesis of Edentulous Maxillae Combined with Simultaneous Sinus Floor Grafting to Obtain Orthoalveolar Form for Emergence Profile Dental Implant Restorations: Report of Three Patient Treatments Followed for 12 Years 339

Ole T. Jensen

Three edentulous maxillary patients were treated with 9- to 15-mm advances of the maxilla by Le Fort I distraction osteogenesis combined with simultaneous sinus floor

autograft placement. The patients were subsequently treated with 8 implants placed in the molar, bicuspid, and canine regions for complete arch ceramo-metal fixed restorations. Anterior emergence profile esthetics was obtained in 2 patients who had high smile lines. Following final restoration, no maxillary relapse was evident, and no implants were lost. Implant bone levels were stable, although 2 implants had 3 mm of bone loss over the 12-year follow-up period.

Extra-Long Nasal Wall–Directed Dental Implants for Maxillary Complete Arch Immediate Function: A Pilot Study

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Giovanni Nicoli, Simone Piva, Pietro Ferraris, Federico Nicoli, and Ole T. Jensen

Immediate loading of maxillary denture prostheses in the context of severe bone atrophy is complicated by posterior implant placement, sometimes requiring a complex surgical approach as zygomatic or pterygoid implants. To overcome this complexity, the authors developed an extra-long (20–24 mm) 24-degree angulated platform. It was tested on 33 patients, with 24 patients immediately loaded (72.7%) for a total of 115 implants (46% nasal). All delayed loading implants osseointegrated. Eight bilateral and six unilateral sinus grafts were performed. There were no complications during the follow-up period.