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To understand the biological basis of osseointegration, one has to understand the 2 main sides of the implant–host interaction: tissue and biomaterial characteristics. This article addresses osseous tissue characteristics and the potential role of soft tissues in the osseointegration of dental implants. Successful integration is driven by an inflammatory process. Protein adsorption is key for tissue integration with biomaterials. Osseointegration dynamics relate to the in vivo lifetime of the implant. Understanding this biology is important; it opens the door to putting aside heuristic methods and replaces them by methods that produce solutions to achieve a specific biological goal.

Cone Beam Computed Tomography Scanning and Diagnosis for Dental Implants
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Cone beam computed tomography (CBCT) has become an important new technology for oral and maxillofacial surgery practitioners. CBCT provides improved office-based diagnostic capability and applications for surgical procedures, such as CT guidance through the use of computer-generated drill guides. A thorough knowledge of the basic science of CBCT as well as the ability to interpret the images correctly and thoroughly is essential to current practice.

Simple Bone Augmentation for Alveolar Ridge Defects
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Dental implant procedures, both surgical placement and preimplant bone augmentation, have become an integral aspect of the oral and maxillofacial surgeon’s practice. The number of dental implants placed each year continues to increase as a result of increasing patient exposure and awareness of dental implants, the increased functional and esthetic dental demands of general practitioners and patients, the overall increase in age of the US patient population, and expanded insurance coverage of dental implant–related procedures. This article outlines relevant surgical procedures aimed toward reconstructing alveolar ridge defects to restore intra-arch alveolar discrepancies before restoration-driven dental implant placement.

Complex Bone Augmentation in Alveolar Ridge Defects
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The current gold standard for bone grafting is autogenous bone, due to its biocompatibility, lack of antigenicity, osteoconductive, and osteoinductive properties. Radiography using cone-beam computed tomography for complex defects is useful in determining the amount of bone available and what bone augmentation technique
will be needed. Many options for treatment of alveolar ridge defects are available, including varying surgical techniques as well as bone graft options.

Maxillary Sinus Bone Augmentation Techniques
Vincent Carrao and Isabelle DeMatteis

Maxillary sinus expansion and atrophy can be difficult to overcome for patients who require functional dental prostheses. One solution for this problem is sinus augmentation and implant placement. Patients are evaluated and diagnosis is ascertained, leading to development of a treatment plan and surgical strategy. The surgeon decides on a surgical technique and grafting material, based on ultimate success, stability, and function as they relate to the goals. Complications can occur during an operation or during the postoperative healing phase. Dealing with these complications can be challenging; however, solving these problems positively affects the overall outcome and success.

Prosthodontic Considerations in Post-cancer Reconstructions
Piriya Boonsiriphant, Joel A. Hirsch, Alex M. Greenberg, and Eric M. Genden

The restoration of function after oncologic surgery of the oral cavity constitutes one of the major challenges facing head and neck oncology. Within the general objective of securing esthetic as well as functional reconstructions, dental rehabilitation is crucial for achieving a good outcome. Adequate dental rehabilitation allows the patient to chew food and considerably improves speech and swallowing. These reconstructions will be driven biologically or prosthodontically following surgical design and outcome.

Treatment of the Edentulous Patient
George Shelby White

For decades, the edentulous population has been unrecognized in its need to be treated in an effective manner. The debilitating condition affects quality of life. Implants have provided a strategy for developing a standard of care. The McGill consensus statement provided evidence that 2 implants supporting a mandibular overdenture should be the first choice in the treatment of edentulism. Success in implementing this standard of care into an institution’s curriculum depends on a close collaboration between the surgeon and the restoring dentist and an understanding of biomechanics and bone biology.

Dental Extraction, Immediate Placement of Dental Implants, and Immediate Function
Ole T. Jensen

Immediate function requires adequate implant stability and prosthetic stability, particularly when multiple implants are loaded. Factors to consider for immediate implants into extraction sites are thickness of socket walls, thickness of gingival drape, optimal position of the implant, and patient factors such as hygiene and smoking cessation.

Esthetic Implant Site Development
Bach Le and Brady Nielsen

Bony support is critical for creating and maintaining esthetic and natural-appearing peri-implant soft tissue profiles. A variety of techniques has been shown to be
effective for augmenting bone and soft tissue. Ideal implant position and angulation is critical for a natural-appearing outcome. Achieving an ideal esthetic result in the compromised site is often elusive and in many cases, impossible. This article reviews techniques available for esthetic implant site development. A review of the recent literature discovers the most effective techniques for achieving esthetic results.

**Hard and Soft Tissue Surgical Complications in Dental Implantology**

**Shahid R. Aziz**

This article discusses surgical complications associated with the placement of dental implants, specifically focusing on how they occur (etiology), as well as their management and prevention. Dental implant surgical complications can be classified into those of hard and soft tissues. In general, complications can be avoided with thorough preoperative treatment planning and proper surgical technique.

**Digital Technologies for Dental Implant Treatment Planning and Guided Surgery**

**Alex M. Greenberg**

Oral and maxillofacial surgeons now have extraordinary imaging, software planning, and guide fabrication technologies at their disposal to aid in their case selection, clinical decision making, and surgical procedures for dental implant placement. Cone beam CT has opened a new era of office-based diagnostic capability and responsibility. Improved clinical experiences and evidence-based superior outcomes can be provided with confidence to patients when CT-guided dental implant surgery is used.