Dental Implants After Reconstruction with Free Tissue Transfer

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Most contemporary techniques for reconstructing composite defects of the oral cavity resulting from oncologic resections, or avulsive traumatic injuries, typically involve some type of free tissue transfer via microvascular techniques. The ability to transfer composite tissue flaps or free flaps from distant sites to the head and neck by microvascular techniques revolutionized oral cavity reconstruction. Free tissue transfer allows immediate, 1-step reconstruction of complex defects that previously required multistaged efforts with less-than-ideal results and has demonstrated an increased success in reconstruction of large defects compared with nonvascularized grafting techniques.[1,2] Although a variety of flaps that provide excellent esthetic and functional reconstructions are available, dental rehabilitation remains challenging. For a dental prosthesis to be effective, one should remember the basic principles that make it successful, including retention, stability, and support. When natural anatomy has been altered due to ablative surgical procedures, trauma, or a congenital abnormality, some of these basic principles for prosthesis success are compromised. To reestablish the loss of contours and some of the basic principles, the use of sophisticated reconstructive methods and adjunct osseointegrated implants has been advocated. To have acceptable results, extensive planning and understanding should exist among all team members. The degree of success is in direct relationship to the location and extent of the mandibular resection, amount of adjacent soft tissue removed in the surgical procedure, and the presence or absence of natural teeth.[3]

The imported tissue lacks many of the characteristics of the native tissue it is replacing and rarely recapitulates the anatomy perfectly (**Fig. 1**). In addition, patients who have undergone reconstruction often suffer from significant trismus secondary to scarring and radiation fibrosis. The maximum size of the opening, not infrequently less than 20 mm, makes conventional prosthetic techniques inadequate (**Fig. 2**).

For these reasons, traditional dental restorative techniques are typically insufficient, and dental implants are required to provide stabilization and retention of prostheses. Similarly, the flaps themselves often do not provide the ideal site for implant placement. Reports on the success of endosseous implants placed in conjunction with free flaps often focus solely on the successful integration of the fixture while paying less attention to the prosthetic outcome. The primary impediments to implant placement and long-term maintenance in flaps imported as microvascular transfers are the characteristics of the soft and hard tissues. This article describes site development and prosthetic

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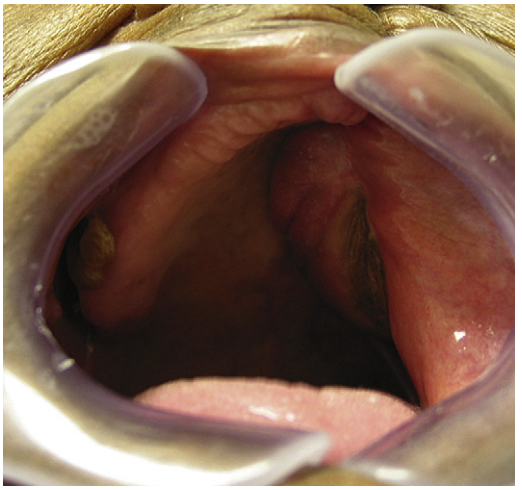

Fig. 1. Bulky rectus flap used to reconstruct maxillectomy defect provides closure of defect but precludes any prosthetic rehabilitation.

techniques that can be applied in an attempt to overcome some of these shortcomings of free flap reconstructions for oral cavity defects.

RADIATION AND OSSEOINTEGRATION

Before discussing specific surgical and prosthetic maneuvers that can be performed to develop the physical site for implant placement and maintenance, mention should be made of the potential role of hyperbaric oxygen (HBO) therapy in the site preparation for patients who have received radiation therapy. Although it is beyond the scope of this article to completely review the controversy surrounding the role of HBO therapy, readers should be aware of the questions surrounding its use. More extensive reviews are available.[4,5]

Frequently, oncologic patients who require free tissue transfer for reconstruction also qualify for multimodality therapy, including radiation and/or chemotherapy. Radiation therapy may have been administered before, or after, the resection and reconstruction. Radiation therapy has known consequences on the response of soft tissue and bone to surgical wounding. In addition, long-term effects on the mucosa and salivary function affect the maintenance of natural dentition as well as integrated implants. Based primarily on the work of Marx and colleagues,[6–8] prophylactic HBO therapy has been recommended before extraction of teeth for the prevention of osteoradionecrosis (ORN) and is also promoted for the treatment. The role of HBO in the treatment of established ORN has come under increased scrutiny after a double-blind placebo-controlled trial, which was halted early because the hyperbaric treatment arm was fairing worse than the placebo treatment arm.[9] Similar findings were demonstrated by Gal and colleagues,[10] who found worse outcomes in patients undergoing surgical treatment for established ORN, including resection and free tissue reconstruction, than those patients who received HBO therapy. Similarly, the role of prophylactic HBO therapy in preventing ORN is increasingly being questioned, and still more controversial is the role of HBO in the irradiated patient who is to undergo implant placement.

Fig. 2. Patient after reconstruction of segmental mandibulectomy defect followed by radiation therapy presenting with significant scarring and fibrosis and a maximum interincisal opening of less than 10 mm.

After the introduction of the concept of osseointegration and its promotion as a potential technique for dental rehabilitation of the oncologic patient, questions were raised regarding the need for prophylactic HBO therapy. Several investigators have attempted to answer the question of whether or not a protocol incorporating HBO administration before and after dental implant placement (typically 20 dives and 10 dives following, with each dive consisting of 90 minutes at 2.4 atm) increases the chances of successful integration and whether or not it aids in long-term maintenance. Initially, Marx's work on a prophylactic protocol of HBO before dental extractions in irradiated patients was extrapolated to irradiated patients scheduled for implant placement. Granstrom's[11] work concluded that administering HBO increased the success rate of integration in all sites studied, and hence it should be administered. The study, however, included a heterogeneous population with a significant number of extraoral fixtures and a minority of intraoral implants. Other investigators including Eckert and colleagues[12] who reported a 99% implant survival rate for 89 implants placed in irradiated mandibles without HBO therapy have argued against routinely administering HBO before implant placement. Overall, the reported rate of ORN has been less than 5% in patients who did not receive HBO therapy before implant placement in oral sites.[13] Similarly, Schoen and colleagues[14] demonstrated no difference in their prospective study of patients undergoing placement of dental implants