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Bone Augmentation In Implant Dentistry

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Abstract
The most common problem in implant dentistry is the absence of sufficient bone to place and support the implant. Various surgical techniques have been tried to augment the bone prior or during the implant placement.

The objective of the present article is to review different augmentation procedures and to evaluate the success of different surgical techniques for the reconstruction of the deficient alveolar bone and the survival/success rates of implants placed in the reconstructed areas.

Key Words
Implants,Bone Morphogenetic proteins,Osteoconduction

Introduction:
Insufficient bone quality or quantity always creates a difficulty in proper placement of the dental implants. Hence the ridge augmentation is always prerequisite for the placement of endosseous implants.Bone augmentation procedures may be carried out sometime prior to implant placement (two-stage procedure), or at the same time as implant placement (one-stage procedure).

Different Augmentation Procedures:

Five main methods have been described to augmentbone volume of deficient sites:

(1)Osteoinductionthrough the use of appropriate growthfactors;

(2) Osteocon duction, in which a grafting material serves as a scaffold for new bone formation

(3)Distraction Osteogenesis, by which a fractureis surgically induced and the two bone fragments are then slowly pulled apart, with spontaneous bone regeneration between the two fragments;

(4) Guided Bone Regeneration (GBR), which allows spaces maintained by barrier embranes to be filled with bone; and

(5) Revascularized Bone Grafts, where a vital bone segment is transferred to it srecipient bed with its vascular pedicle, thus permittingimmediate survival of the bone and no need fora remodelling/substitution process[2].

Osteoinduction with Growth Factors:

Growth factor sare natural cell products that are released or activated when cell division is needed. This action typically occurs duringsuch events as wound healing or tissue regeneration.The bone matrix is rich in growth factors, among which are the bone morphogenetic proteins (BMPs) that are synthesized and secreted by osteoblasts and incorporated into the matrix during bone formation.

The BMPs, released during osteoclastic bone resorption, are capable of inducing differentiation of mesenchymalcells into osteoblasts (osteoinduction), stimulating boneformation in both remodeling and repairing processes. BMPs were recognized in human and in different animal species. Some of these BMPs appear as a valuable alternative for filling of bone defects, thus over coming most shortcomings of bone grafts[1].

Osteoconduction

The most commonmethod for bone augmentation in relation to dental implants includes grafting procedures, with or without coverage by a barrier membrane.
Clinical evidence supports the use of vertical and lateral ridge augmentation procedures to enable dental implant placement, with autogenous grafts widely considered the gold standard for the predictable correction of severe localized ridge deformities. In contrast top articulate autogenous grafts, which require additional materials to ensure space maintenance and graft containment, such as barrier membranes, tentingscrews, and/or graft binders, onlay grafts are self containedand provide an inherent ability to supportthe soft tissue.Constraints in the size of autogenous block grafts from intraoral sites and the morbidity associated with graft harvesting often limit treatment recommendations and patient acceptance in practice. Complications associated with block grafts harvested from thesymphysis or retromolar area, for example, caninclude nerve injury, soft tissue injury, wound dehiscence,and infection. Allogeneic block grafts, in contrast,lack many of the donor site limitations of autogenous block grafts.Allografts are free of many of the limitations and potential complications

associated with autogenous block grafts. Further, histologic findings provideproof-of-principle that allogeneic onlay grafts can undergo incorporation with bone formation andremodeling. This systematic review reveals thatthe current clinical evidence on the effectiveness of allogeneic onlay grafts for ridge augmentation and implant placement remains limited to observational studies only[3,5].

Distraction Osteogenesis

A vertically deficient alveolar ridge may have insufficient bone volume to harbour implants of adequate dimensions, making implant placement difficult orimpossible. To correct this situation, a variety of surgical procedures have been proposed, one among these is Alveolar Distraction Osteogenesis (DO).

Originallyapplied in the orthopedic field, this method has been extended more recently to correct maxillofacial deformities such as those caused by Franceschetti'ssyndrome or hemifacial microsomia. For past few years it is also used for correction of vertical defects of the alveolar ridges.

DO provide an opportunity to obtain a natural formation of bone between the distracted segment and the basal bone in a relatively short time span. DOeliminate the need to harvest bone and requires less operating time. Soft tissues can follow the elongation of the underlying bone (neohistogenesis) and there is a lower risk of infection of the surgical site(0% in this case series). The procedure can be performedmore frequently under local anesthesia, and postoperative recovery generally is favourable. Themore crestal part of the distracted segment appearsto present a significantly lower risk of resorption.Regenerated bone seems to with stand the biomechanical demands of implant loading well[2].

Guided Bone Regeneration

Guided bone regenerative (GBR) procedures have evolved as the integral and predictable component of the implant dentistry.

Clinical studies have shown that a predictable outcome with GBR depends upon several prerequisites: wound stabilization via primary stability of the membrane, space creation and maintenance, keeping undesirable soft tissue cells outside the grafted area, and a sufficiently long healing period[2,4].

Revascularized Bone Grafts

In Revascularized bone Grafts, the bone graft transferred from the donor site to the recipient site retains its blood supply as it is attached to a vascular pedicle from the donor site.

Free revascularized flaps, as comparedwith non-vascularized bone grafts,present some advantages that can besummarized as follows: (a) very limited bone resorption of the graft before and after implant placement; and (b)no need for adequate soft tissue recipientbed. This means that the bonetransplant can survive also in case of hypotrophic, hypovascularized, scarrytissues[2].

Free revascularized flaps, as compared with non-revascularized bone grafts,presents the following disadvantages:(a) the harvesting technique is morecomplicated; (b) the operating time islonger; (c) the morbidity is higher; (d)the hospitalization is longer; (e) the costs are increased; and (f) a specific expertise in microsurgical techniques is mandatory[2].

Conclusion:

On the basis of available data it is difficult to conclude that a particular surgical procedure offered better outcome as compared to another. Hence the judicious use of the available bone augmentation procedures for dental implants depends on the clinician's preference in general and the clinical findings in the patient in particular.
The emphasis should be given on collection of long term data on the performance of dental implants placed inaugmented bone and answer comparative questions to establish the clinical benefits of bone augmentation with respect to alternative treatments as well as survival of implants at the augmented sited.

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