

Original Research

Basic knowledge about Bone Grafting amongst Dental Professionals: A Qualitative analysis

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ABSTRACT:

Aim of the Study: The purpose of the study was to assess the knowledge of various dental professionals (graduate and post-graduate) for the usage of bone grafts in various surgical processes in dentistry. **Methodology:** A questionnaire-based survey was conducted amongst 100 Dental professionals which consisted of 30 female and 70 male dentists over a period of 1 year. The survey group consisted of around 45 specialist dentists. The questions consisted of their viewpoints about bone grafts, indications, contraindications as well as success rates of the grafts they use in their clinical practice. **Results:** It was seen that many general dentists were not accustomed to do bone grafting procedures and they refer it to specialty dentists (which comprised of 34% of survey clinicians) as these procedures are technique sensitive. Almost half of clinicians (45%) would prefer synthetic bone substitute especially hydroxyapatite ceramic material to avoid bone graft surgery which is solely based upon their patient preference. **Conclusion:** Armed with proper information, the general dentist can be a better judge of the techniques and materials used as well as to prepare the clinician for counseling patients on the surgical procedures to be performed.

Key words Bone graft, Bone substitutes, Biomaterials.

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INTRODUCTION

Bone defect area can occur in the oral cavity as a result of diverse factors such as; tooth extraction, periodontal disease, trauma, cyst, tumor and infection. The key aims of the treatment planning in these cases are renovation of esthetic and functional rehabilitation. The triumph of different types of prosthetic and implant therapy is reliant on the

available bone quality and quantity. Currently numerous types of bone graft substitutes are available which enable the treatment planning and may also confuse the user. Consequently, for a proper selection and positive application, a clear understanding of biological requirements of the bone defect site and physico-chemical properties of bone graft substitutes is vital.¹ The inadequate quantity of bone is due to

tooth loss which results in quick resorption of alveolar bone due to lack of intraosseous stimulus by periodontal ligament (PDL) fibers, for example, pneumatization of maxillary sinus following tooth loss. Bone grafting is a surgical procedure that substitutes missing bone with material from patient's own body, synthetic or natural substitute. Bone grafting is conceivable because bone tissue has the capability to regenerate completely if provided the space into which it has to expand. As natural bone nurtures, it usually replaces the graft material totally, ensuing in a fully integrated region of new bone.² The kinds of bone grafts most often used in dentistry include autologous bone grafts, allografts, xenografts and alloplastics. Autologous bone grafts originate from donor sites in the patient's own body and have osteoconductive and osteoinductive properties. Autologous bone grafts also comprise of osteogenic cells that decrease the bone healing time.³ Allografts are alternative type of bone graft in which the bone is taken from another donor of the same species, and are characteristically obtained from human cadavers and then subjected to processing.⁴ Xenografts comprise of bone tissue taken from a various species and have osteoconductive properties and reserve the original bone mineral structure, which is further complex than that of synthetic materials, i.e., alloplastics.⁵ Alloplastic bone substitutes may be ceramic, hydroxyapatite, tricalcium phosphate or calcium sulfate.⁶

Classification of bone grafts based on material groups:

- a. Allograft-based bone graft involves allograft bone, used alone or in combination with other materials (e.g., Grafton, OrthoBlast).
- b. Factor-based bone graft are natural and recombinant growth factors, used alone or in combination with other materials such as transforming growth factor-beta (TGF-beta), platelet-derived growth factor (PDGF), fibroblast growth factors (FGF), and bone morphogenic protein (BMP).
- c. Cell-based bone grafts use cells to generate new tissue alone or are added onto a support matrix, for example, mesenchymal stem cells.
- d. Ceramic-based bone graft substitutes include calcium phosphate, calcium sulphate, and bioglass used alone or in combination; for example, OsteoGraf, ProOsteon, OsteoSet.
- e. Polymer-based bone graft uses degradable and nondegradable polymers alone or in combination with other materials, for example, open porosity polylactic acid polymer.⁷

Dental surgeons anticipating replacement via either repair or regeneration should contemplate the options in bone replacement graft materials, growth enhancers, and barriers in terms of their anticipated ultimate biologic impact at the endpoint of the

surgical procedure. depending on the procedure, there may be adjustments between percentage of vital bone, volume augmentation, and speed of healing, versus the ease of the procedure. It can be intimidating to complete these errands in an area of the mouth where there is trauma from food and masticatory muscles, bacteria, and saliva—challenges that can be more complicated in a non- or poorly compliant patient. Having a improved understanding of the materials and the results that can be probably achieved with them can aid the appropriately trained surgeon formulate for these surgical endeavors.⁸

AIM OF THE STUDY

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METHODOLOGY OF THE STUDY

A questionnaire-based survey was conducted amongst 100 Dental professionals which consisted of 30 female and 70 male dentists over a period of 1 year. The survey group consisted of around 34 specialist dentists. The survey form included self-explanatory and open-ended formatted questions and in English language. The survey form was sent by Email and the responses which were received were entered in a Microsoft Excel sheet. Later descriptive statistics were carried out amongst variables. The questions consisted of their viewpoints about bone grafts, indications, contraindications as well as success rates and challenges faced with respect to the grafts they use in their clinical practice.

RESULTS

It was seen that many general dentists were not accustomed to do bone grafting procedures and they refer it to specialty dentists (which comprised of 34% of survey clinicians) as these procedures are technique sensitive. Mostly oral surgeons, periodontists as well as prosthodontists utilizes bone grafting procedure commonly as they handle bulk of Implant procedures. Vertical bone defects usually account for the cause of maximum corrective bone graft procedures followed by horizontal bone defects as well as fenestrations. Autologous bone is considered mostly for bone graft procedures due to its osteoconduction, osteoinduction, and osteogenesis-inducing properties. However, autologous bone grafts occasionally have significant drawbacks, such as increased postoperative morbidity, the need for a second surgery, and the lack of sufficient bone mass at the donor site. Almost half of clinicians (45%) would prefer synthetic bone substitute especially hydroxyapatite ceramic material to avoid bone graft surgery which is solely based upon their patient preference. (Table 1) Other most common artificial substitute preferred was tri-calcium phosphate. It may be assumed that patients choose minimally invasive treatment alternatives if

applicable. Amongst the remaining 66% of general dentists, around 41.2% dentists were aware of bone grafting procedures to enhance implant placement. However, these days alloplastics are being considered by dentists whereas allografts weren't considered as the main bone graft in patients. Xenografts were considered only by 4% clinicians.

Table 1- Survey characteristics of the study

1.	Specifications of the dental surgeons in the survey Male dentists -70% Female dentists -30% Graduate dentists -66% Post-graduate dentists-34%
2.	Choice of bone grafts preferred Natural -55% Synthetic -45%
3.	Bone grafting procedures awareness amongst general dentists Awareness optimal -41.2% Awareness sub-optimal-58.8%
4.	Preference of synthetic bone graft substitute Hydroxyapatite ceramic -52% Tri-calcium phosphate -40% Others -8%
5.	Type of natural bone graft preferred Autologous-72% Allograft-24% Xenograft-4%

DISCUSSION

Amid natural types, the usage of autogenous bone graft is the gold standard treatment option. Other natural products are also accessible such as bovine bone that has been treated properly so as to be suitable for bone grafting. Though, the natural bone graft suffers from some drawbacks, mostly the need for second surgery, imperfect supply, and high resorption rate.⁹ This started the idea of preparation of synthetic materials for bone grafting that has undergone extensive studies during last few decades. Currently, the biomimetic concepts received major attention where the aim is to reproduce the nature by mimicking bone structural components and arrangement. The use of nanoscale bioceramic biomaterials in composite form with addition of other natural or synthetic polymers attracting more attention.¹⁰ From chemical aspect, inorganic calcium phosphate-based biomaterials have shown great

advantages in bone tissue engineering. Recent advances in production of nanomaterials should also be stated, as nano-based biomaterials have shown improved physico-biological behavior compared to micron-based counterpart.¹¹ From the physical aspect, the particle size, porosity, mechanical properties, and biodegradation profile of biomaterials should be well-thought-out. Preferably, the type of bone grafting materials should show comparable porosity and mechanical properties (compressive strength, Young's modulus, tensile strength, density, and fracture toughness) to that of recipient site.¹² Mostly bone grafts are anticipated to resorb and be replaced by natural bone over several months. So, the biodegradation profile should also be matched with clinical necessities at the surgical site.¹³ The psychological aspect and the patient level of cooperation are also other important factors that effect the prognosis of bone grafting treatment. The application of bone grafting procedure in patient with extreme age, smoking habit, diabetes, physical or mental disabilities, and those undergoing radiotherapy should be reinforced with extreme care along with a reasonable explanation to avoid complications.¹⁴ Diverse factors may contribute to fiasco of bone grafts that include inappropriate selection of biomaterials, mechanical failure, disparity in modulus of elasticity between biomaterials and recipient site, corrosion, very fast/slow degradation, patient-related factors, technical failure and iatrogenic factors. Thus, the proper precautions should be thought off considering general and specific characteristics of biomaterials together with patient's related factors to evade failure and further complications.¹⁵ In our study, it was noted that general dentists need to be equipped with more knowledge about the procedures as well as types of bone grafts to be utilized to augment the bone structure.

CONCLUSION

The subject of bone grafts for numerous regenerative procedures is complex and unclear for the surgeon, let alone the restorative dentist and patient. Equipped with appropriate information, the general dentist can be a better judge of the techniques and materials used as well as to prepare the clinician for counseling patients on the surgical procedures to be performed at the specialist's office or be the motivation to additional search of simple bone grafting procedures that can be done in the general practice.

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