

Structural Support and Healing: The Importance of Endodontic Grafts

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Abstract

Objective: In dentistry, grafts are instrumental in promoting tissue regeneration and structural support in various procedures. Materials such as bone grafts, soft tissue grafts, and synthetic substitutes are commonly used to enhance healing and improve outcomes in surgeries. Endodontic surgery uses bone grafting materials more and more frequently these days. This article reviews the most common graft materials used in endodontics and explains the outcomes of these grafts. **Materials and method:** Database system PubMed, Google Scholar, and research gate were used to extract the articles. Only English language studies were accessed. A Boolean search of the PubMed data set was implemented to combine a range of keywords. The following filters were applied: abstract, free full text, full text, clinical trial, systemic review, and review. More studies were also obtained by manual searches and textbooks. **Result:** By using the process, 683 articles and studies were obtained. The most relevant studies were chosen and used in the current review. The selected articles are included in the reference list. **Conclusion:** The utilisation of grafts in periapical surgery within endodontic proves to be a pivotal aspect in promoting tissue regeneration and enhancing treatment outcomes. By providing structural support and aiding in bone regeneration, grafts play a crucial role in ensuring the success of periapical procedures. Their application in this context underscores their significance in facilitating healing and restoring dental health effectively.

Keywords: Bone regeneration, hydroxyapatite, periapical surgery.

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I. INTRODUCTION

A bone graft is defined as a living tissue capable of promoting bone healing, transplanted into a bony defect, either alone or in combination with other materials. A bone substitute on the other hand, is a natural or synthetic material, often containing only a mineralized bone matrix with no viable cells, that is able to achieve a same purpose.(1)

Numerous studies in the past have demonstrated a better outcome with regards to tissue healing following periapical surgery with the aid of regenerative technique using bone graft compared to the same lesions without regenerative techniques.(2) the concept of regenerative therapy entails utilisation of periosteal grafts with the potential to stimulate bone formation. It allows cellular regrowth of defects caused by pathosis or surgical trauma and has resulted in development of grafts, membrane or barrier.(3)

Numerous therapeutic grafting modalities for restoring osseous defects have been investigated. These include autografts, allografts, xenografts, and alloplasts.(4)

II. REVIEW

The ideal bone graft material replacement material should be biologically inert, non-carcinogenic, easily manoeuvrable to fit the osseous defect, and should be structurally stable.(5)(6) Bone grafts may maintain space for new bone formation, provide vital osteogenic cells (osteogenic effect), induce host cells to reconstruct lost bone (osteoinductive effect), and act as a scaffolds on which host osteogenic cells might grow (osteoconductive effect)(7)

Following are the graft materials which are used commonly in endodontic practise:

Autograft: Autografts are obtained from the host and are the gold standard bone replacement grafts because they are osteogenic and induce minimal immune response.(7) the risk of an impervious response is zero, with success rate of more than 95% because they share the same natural birthplace as the existing life form desirable.(8) bone can be harvested from nonessential bones, such as iliac crest, mandibular symphysis, and anterior mandibular ramus.(9)

Allograft: Allograft is harvested from an individual other than the one receiving the graft. there are three types of bone allograft available.(9)

- Fresh or frozen bone
- FDBA
- DFDBA

The most commonly used forms of allograft are freeze-dried bone allograft(FDBA) and decalcified freeze-dried bone allograft(DFBA) many studies showed that healing and new bone formation is more rapid with FDBA after endodontic surgery.(10) FDBA has osteoconductive potential where as DFBA has both osteoconductive and osteoinductive properties.(11) The ability of DFDBA to be osteoconductive and osteoinductive would be influenced by various factors ,such as age of the donor (between 41 -50 years for a man and 51-60 for a woman), the size of the particle and residual calcium level (2%)(12)

Alloplastic material: Alloplastic grafts may be made from hydroxyapatite, a naturally occurring mineral, made from bioactive glass. Hydroxyapatite is a synthetic bone graft, which is most used now due to its osteoconduction, hardness, and acceptability by bone.(9) Hydroxyapatite is found to be a very effective Alloplastic material. In large bone destruction caused by periradicular lesion bone regeneration can be facilitated by effective bone replacing materials like hydroxyapatite.(13) Hydroxyapatite is biocompatible, not immunogenic nor antigenic.(14)

Xenograft: Xenografts are derived from bovine, porcine, and coral sources.(15) They usually possess osteoconductive features with limited resorptive.(11) Positive clinical results have been reported for xenografts in the treatment of endodontic related surgeries.(10)

INTERPRETATION

Hydroxyapatite, a bone graft material in endodontics, closely resembles natural bone structure, aiding in bone regeneration. It's a valuable choice for enhancing bone repair in endodontic procedures. Endodontic surgery performed with bone grafts proved to be successful in extraradicular infection with tunnel defects. Therefore, it is an effective treatment strategy to accelerate bone healing.

REFERENCES

- [1]. Zhao R, Yang R, Cooper PR, Khurshid Z, Shavandi A, Ratnayake J. Bone Grafts and substitutes in Dentistry: A review of current trends and developments. *Molecules*. 2021;26(10):3007.
- [2]. Mirza M. The Rationale for the application of bone grafts in periapical surgery : A Review. *Int J Cur Res Rev*. 2021;13(02):9-12.
- [3]. Chaturvedy V, Chaturvedy S. Regenerative therapy as an adjunct to periapical surgery: A case report *Int J clin Pediatr* 2012;5(1):75-77.
- [4]. Kini, Annapurna & Narayanaswamy, Subhashini. Treatment of periapical lesions using a combination of bone graft and platelet rich fibrin. *RGUHS J Dent. Sciences*. 2013;5 :2.
- [5]. Alnemer NA, Alquthami H, Alotaibi L. The use of bone graft in the treatment of periapical lesions. *Saudi Endod J* 2017; 7:115-8.
- [6]. Jansson L, Ehnevid H, Lindskog S, Blomlöf L. Development of periapical lesions *Swed Dent J*. 1993;17: 85-93.
- [7]. Liu TJ, Zhou JN & Guo LH. Impact of different regenerative technique and materials on the healing outcome of endodontic surgery: a systematic review meta- analysis *International Endodontic Journal* 2021; 54:536-555.
- [8]. Hasasan AH & Bhartiya S. Grafts in dentistry. A review. *IP Journal of otorhinolaryngology & Allied Science*, October-December 2019 ;2(4):90-94.
- [9]. Kumar P, Vinitha B, Fathima G. Bone grafts in dentistry. *J Pharm Bioallied Sci*.2013; 5(Suppl 1): S125-7.
- [10]. Bashutski JD, MS & Wang HL, PHD. Periodontal & Endodontic Regeneration. *JOE* 2009;35 (3):321-328.
- [11]. Titsinides S, Agriogiannis G & Karatzas T. Bone grafting materials in Dentoalveolar reconstruction. A comprehensive review. *Jpn Dent Sci Rev*.2019; 55(1): 26-32.
- [12]. Evrard L. The combined use of particulate Allografts (DFDBA) and Platelet concentrates in oral and maxillo-Facial surgery. *Intechopen*2023; 111848, DOI 10.5772.
- [13]. Sreedevi, PV & Varghese, No & Varughese, Jolly. (2011). Prognosis of periapical surgery using bone grafts: A clinical study. *Journal of conservative dentistry: JCD*. 14. 68-72.
- [14]. Pellegrini GG, Mattiuzzi AS, Pellegrini MA et al. Update on bone grafting material used in dentistry in the bone healing process: Our Experience from translational studies to their clinical use. *Bone- Grafting- Recent Advances with special references to craniotomy facial surgery*. *intechopen* 2018.