

## Bone Regeneration Using Hydroxyapatite Crystals for Periapical Lesion

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**Abstract:** Bone defects are tricky and weakening for the whole periodontium. They need to be managed early and tactfully. In today's dentistry many new materials have been discovered which claim non surgical bone regeneration. Although success has been reported, but it takes time for the bone to regenerate fully. The conventional way of bone grafts hence cannot be neglected and still stands strong as a treatment option. This article is based on one such material wherein the advantages of a bone graft (xenograft) have been utilized for a quick recovery of the patient.

**Keywords:** Graft, Bone Regeneration, Surgical Endodontics, Root Canal therapy, Hydroxyapatite.

### I. Introduction

Periapical pathology is best managed by a good endodontic treatment, with success rates of 48% to 98%<sup>1</sup>. However there may be lack of healing due to persistent intraradicular infection residing in previously uninstrumented canals, dentinal tubules, or in the complex irregularities of the root canal system. When endodontically treated teeth fail to show periapical healing and the substance of the tooth is worth preserving, periapical surgery should be considered as a therapeutic option. The aim of this surgical procedure is to eliminate the infected periapical tissues by resecting the diseased root apex and sealing the root tip with a retrograde filling, thus allowing the tissues to heal.

Bone grafting to repair osseous defects has been attempted for centuries. The major advantage of these hydroxyapatite implants are<sup>2</sup>: it offers the potential of an unlimited supply of bone substance, absence of donor site morbidity and decreased operative time. To achieve bone regeneration of the osseous defects of endodontic origin, various bone grafts are being used which are bio-resorbable, bioactive, natural hydroxyapatite crystals.

The bone grafts containing hydroxyapatite get more rapidly incorporated into the host bone, because its surface already incorporates the biological apatite. This is one of the rationales for employing bovine bone as a substitute material. Hydroxyapatite serves as a passive scaffold or creeping substitution which gets slowly resorbed in bony cavity. The aim of this study was to assess the efficacy of the material in regeneration of bone by osteoconduction and compatibility of the material with the host tissue.

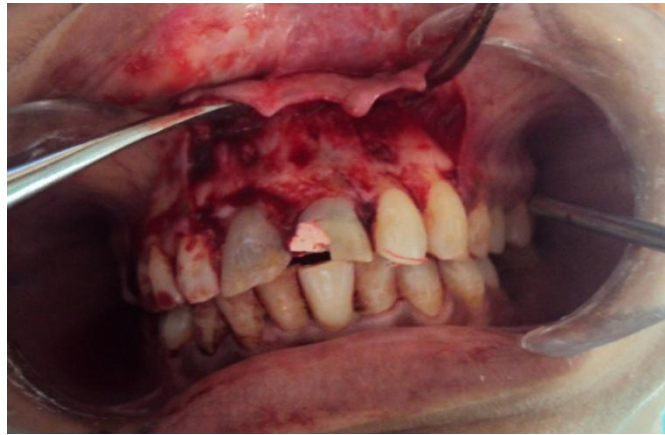
### II. Case Report

A 27 year old woman reported to the department of Conservative Dentistry And Endodontics, with complaints of recurrent discharge of pus in relation to the upper anterior tooth and mobility. History revealed trauma to the region ten years back. On clinical examination 11 and 21 were found discolored with Elli's class 111 fracture with 21. The teeth exhibited grade 1 mobility, and no tenderness to percussion or pain on palpation. Teeth were tested for the vitality; 11, 12 and 21 were found non vital. Radiographic examination revealed a periapical radiolucency with hazy borders in relation to 11 12 and 21. [Figure 1]



**Figure 1:** PreOperative Picture; Fracture and Discolouration of Maxillary Central Incisors.

The root canal therapy was initiated for 11 12 and 21. And a calcium hydroxide dressing was placed in all the canals for a period of two weeks. The patient was prescribed with antibiotics and analgesics. This procedure was repeated for another two weeks. As the discharge did not stop a surgical intervention was planned upon. Oral prophylaxis was done; blood investigations and pre surgery medications were prescribed to the patient. A trapezoidal full mucoperiosteal flap was raised extending from the mesial margin of 13 to distal margin of 21, using crevicular and vertical incisions. [Figure 2].



**Figure 2:** Flap Raised in relation to 11 12 21 22 23

The granulomatous tissue was excised and the area was curettaged. The necrotic bone was removed and the margins were filed to remove the sharp edges. The root canals were obturated, apicectomy was done and a class 1 cavity was prepared for a retrograde filling. Slight bleeding was induced in the bony cavity and hydroxyapatite crystals were compressed around the surrounding sound bone, layer by layer, till the bony defect was filled completely [Figure 3].



**Figure 3:** Bone Graft placed

The flap was approximated and sutured back by interrupted sutures. [Figure 4]



**Figure 4:** Sutured Flap.

Patient was given post operative instructions and was prescribed with an analgesic anti-inflammatory combination along with a course of antibiotic for 5 days. Chlorhexidene mouthwashes were advised, and the patient was recalled for a 24 hr check up. The sutures were removed after 7 days. The patient was kept on recall for 5 months, and esthetic rehabilitation was done for the patient. [Figure 5]



**Figure 5:** Esthetic Rehabilitation

### **III. Discussion**

The inflammation at the tooth apex of a long standing nature is characterized by the presence of a granulomatose tissue predominantly infiltrated with lymphocytes, plasma cells and macrophages<sup>3</sup>. These complex dynamic characteristics of pathogenesis of apical lesion are a real clinical challenge for a multi-step sequence of clinical treatment seeking optimal healing results.

The decision to perform periapical surgery is based on factors decided by the clinical presentation of the symptomatic tooth and the needs of the patient. Failure of endodontic treatment is most commonly caused by the presence of bacteria within the root canal system with resultant apical leakage<sup>4</sup>. Surgical endodontic success rates have dramatically improved over the years with the developments of newer materials and techniques. Previously cited success rates of 60% to 70% have now increased to more than 90% in many studies.

Bone substitute materials are employed primarily to serve as fillers and scaffolds, to facilitate bone formation and wound healing. The xenografts (anorganic –bovine one) show great similarity to natural bone and helps in bone regeneration. The hydroxyapatite crystals have many advantages as a biomaterial<sup>5</sup>. It is extremely biocompatible and does not stimulate as foreign body reaction, when placed in contact with fresh bone surface. The new bone is deposited directly onto the surface of hydroxyapatite without intervening fibrous tissue. Hydroxyapatite does not simulate osteogenesis, but is osteoconductive<sup>6</sup>, that is, when placed next to a viable bone, an advancing front of new bone grows into the porous matrix.

Hydroxyapatite derived from a xenogenic bone has several advantages over other bone grafts<sup>7</sup>.

1. No donor site is required.
2. Ultimate supply of material.
3. Easy procedure.
4. No risk of transmission of disease.

### **IV. Conclusion**

The correct placement of a bone graft and its compaction can bring a faster and better healing response after a Periapical surgery and curettage.

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