



Comparative Evaluation of the Effect of Autogenous Tooth Graft and Autograft as Augmentation Materials on the Crestal Bone Level in Immediately Placed Implants: An In Vivo Study.

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Date of Submission: 15-09-2025

Date of Acceptance: 25-09-2025

I. INTRODUCTION:

Autogenous tooth grafts (ATG) have as modern bone augmentation material during recent years. The ATG procedure makes use of extracted teeth to fill bone gaps due to their anatomical match with the alveolar bone structure (Kim et al., 2010)^[13]. Dentin contains the majority share (70%) of a tooth's structure with high hydroxyapatite content, collagen, and bone morphogenetic proteins (BMPs) that qualify it as a successful bone scaffold (Murata et al., 2012)^[20]. ATG improves bone remodelling and implant integration by using demineralized dentin matrix (DDM) which enhances the combination between bone cells and simultaneously stimulates bone cell development (Jeong et al., 2011)^[14].

The main advantage of ATG is that it reduces the requirement for secondary donor sites, which consequently eliminates donor-site morbidity and lowers surgical difficulties. ATG also stands apart from intraoral or extraoral autografts because it originates from teeth that would be disposed off after extraction. The procedure starts with tooth structure exposure through decalcification to obtain an organic matrix while grafting particles work to increase integration between donor and recipient sites (Kim et al., 2019)^[39]. Bone tissue has demonstrated the ability to form on the ATG scaffold more than on xenografts and alloplastic materials while simultaneously providing rapid healing, according to Sohn et al. (2020)^[45]. Stability of dental implants improves significantly because ATG engages in slow tissue remodelling, which leads to substitution by newly

developed bone, according to Minamizato et al. (2018)^[38].

Although the procedure is commonly practiced in immediate implant placement, few comparative studies were conducted on the efficacy of such autogenous bone grafts when compared with autogenous tooth grafts to maintain crestal bone levels. The autogenous tooth graft has been considered a promising alternative source because of its natural biocompatibility, cost-effectiveness, and avoidance of morbidity at the donor site (Murata et al., 2012)^[20]. This clinical investigation aims at exploring how such augmentation materials affect crestal bone levels, implant stability, and general treatment outcomes in immediate post-extraction implant placement. This current research with clinical evidence seeks to determine if autogenous tooth grafting can effectively be used in replacement of the bone graft commonly carried out in implantology procedures (Kim et al., 2014)^[26].

The application of autogenous tooth graft (ATG) presents itself as a novel solution to substitute conventional bone graft materials used in implant dentistry. The innovative procedure makes use of extracted teeth as a natural graft material where the mineral content of dentin closely matches that of alveolar bone. The tooth component dentin, amounting to about 70%, comprises hydroxyapatite with collagen and non-collagenous proteins that function excellently as both an osteoconductive and osteoinductive bone regenerative material (Kim et al., 2014)^[26]. The growth factors included in autogenous tooth grafts comprise bone morphogenetic proteins (BMPs),



transforming growth factor-beta (TGF-β), and insulin-like growth factors (IGFs), which significantly contribute to bone remodelling and osteogenesis processes (Kawahara et al., 2015) [27]. ATG functions as an acceptable bone graft replacement for standard autografts since it offers beneficial biological properties in situations that demand rapid implant placement and alveolar ridge preservation.

Aim of Study:

The aim of the study was to evaluate and compare the crestal bone loss associated with autogenous tooth graft and autograft as augmentation materials in an immediately implant placement in the posterior region.

Objectives:

1. To evaluate the crestal bone loss associated with an immediately placed implant in the posterior region augmented with an autogenous tooth graft.
2. To evaluate the crestal bone loss associated with an immediately placed implant in the posterior region augmented with autograft.
3. To compare the crestal bone loss associated with an immediately placed implant in the posterior region augmented by autogenous tooth graft and autograft.

II. METHODOLOGY/ MATERIALS & METHODS:

Study design:

This study was designed to evaluate and compare the crestal bone loss associated with autogenous tooth graft and autograft as augmentation materials in an immediately implant placement in the posterior region using pre-operative CBCT and post-operative CBCT. The study was conducted in the Department of Prosthodontics, Crown and Bridge, Maxillofacial Prosthodontics and Oral Implantology, I.T.S Dental College, Hospital and Research Centre, Greater Noida (U.P).

Sample selection:

Source of Data:

The patients for the study were selected from OPD, Department of Prosthodontics, Crown and Bridge, Maxillofacial Prosthodontics and Oral Implantology, I.T.S dental college, hospital and research centre, Greater Noida (U.P). This present study was performed to evaluate and compare the crestal bone loss associated with autogenous tooth graft and autograft as augmentation materials in an

immediately implant placement in the Mandibular posterior region.

Sample Size:

A total number of 20 implant sites in posterior mandible are selected, 10 for each group and the sites are selected in accordance with below mentioned inclusion and exclusion criteria (Table-2)

GROUP 1: Contain 10 implant sites placed with an autogenous tooth graft.

GROUP 2: Contain 10 implant sites placed with an autograft.

TABLE 1: DISTRIBUTION OF SAMPLES (n=20)		
GROUPS	SAMPLE SIZE	GRAFT MATERIAL
GROUP A	10	AUTOGENOUS TOOTH GRAFT
GROUP B	10	AUTOGRAFT

Study Methods/Tools

Materials and tools

Instruments for examination:

- Mouth mirror (GDC dental, India)
- Periodontal probe (GDC dental, India)
- Tweezer (GDC dental, India)
- Kidney tray
- Gloves
- Mouth mask

Materials for preoperative/postoperative/follow up radiographical assessment:

- CBCT machine and CBCT software

Instruments for Implant placement:

- Sterile drape
- Surgical gloves
- Mouth mirror
- Probe
- Tweezer
- Sterile metal suction tip
- Bard parker blade and holder
- Elevators
- Extraction forceps
- Local anaesthesia (2% adrenaline 1:80000)
- 2ml disposable syringe



- Kidney tray
- Stainless steel bowl
- Sterile gauze
- Normal saline
- Tungsten bur
- Bone well
- Grinder for grinding teeth
- Bone scraper
- Dentin Cleansing Kit (0.5M of NaOH with 20% Ethanol)
- Implant hand piece (NSK)
- Physiodispenser (NSK)
- Adin surgical kit (Adin implant system ltd, Israel)
- Adin implants (Adin implant system ltd, Israel)
- Implant hex driver (Adin implant system ltd, Israel).

Armamentarium for wound closure:

- Silk sutures
- Bp blade (GDC dental, India)
- Bp handle (GDC dental, India)
- Needle holder (GDC dental, India)
- Scissors (GDC dental, India)

Software used for measurement of crestal bone height and bone density:

- CBCT software

Methodology

Selection of the Patients:

The study was conducted in the department of Prosthodontics, Crown and Bridge, Maxillofacial Prosthodontics and Oral Implantology, I.T.S. Dental College, Hospital and Research Centre, Greater Noida (U.P.)

- A detailed medical and dental history was taken prior to the intra oral examination to assess the condition of the edentulous space and mucosa overlying it.
- After an explanation of the proposed study criteria, the participants were asked to sign consent prior to the surgery.

Step 1-Preoperative CBCT:

- A preoperative CBCT was taken for all 20 patients.
- A total of 20 implants was placed in 20 patients in the posterior region using 2 different graft materials to fill up the jumping distance.

Step 2-Tooth Extraction:

- Before surgery, all patients were prescribed with Amoxicillin 500mg.
- Local anaesthesia was injected by nerve block or local infiltration using 2% lignocaine HCL (1:80,000 adrenaline)
- Atraumatic extraction of the teeth was performed using and forceps.
- After extraction, to confirm the eligibility of the surgical site, the alveolar wall integrity was checked using UNC-15 probe.

Step 3-Chairside preparation of fresh mineralized tooth graft: Group A (n=10)

Dental implants were placed with an autogenous tooth graft.

- After harvesting the mutilated tooth, it was scaled, and caries was removed using a round carbide bur.
- The teeth were powdered using a tooth grinder.
- Clean teeth, including crown and root, was dried by air syringe and put into a sterile chamber of the tooth grinder.
- Particulate teeth from the drawer were immersed in basic alcohol for 10 minutes in a small, sterile glass container.
- The basic ethanol cleanser consists of 0.5 M NaOH and 20% alcohol (v/v) for defatting and dissolving all organic debris, bacteria, and toxins from the tooth particulate.
- The cleanser's effectiveness was demonstrated by its ability to dissolve all organic debris from tooth particulate, including dentin tubules.
- After decanting the basic alcohol cleanser, the particulate was washed in phosphate-buffer saline.
- The saline was decanted, leaving wet particulate tooth ready to graft into freshly extracted sockets, and an implant was placed.
- All patients were prescribed standard antibiotics and anti-inflammatory regimen.



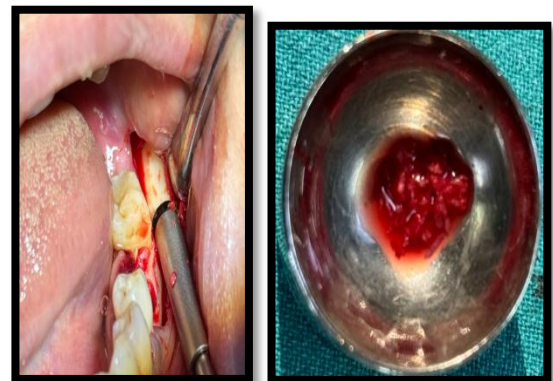
PRE-OPERATIVE INTRA ORAL PICTURE OF MANDIBLE



PRE-OPERATIVE INTRA ORAL PICTURE OF MANDIBLE



TOOTH EXTRACTED, CLEANED AND GRINDED



CHAIRSIDE HARVESTING OF AUTOGRAFTS

Chairside harvesting of Autografts: Group B (n=10)

Dental implants were placed with autograft material-

- Mutilated teeth were extracted with dental forceps.
- Harvesting the autograft from the selected donor site using a bone scraper.
- Dental implants were placed with autograft.
- Autograft was used as the grafting materials in a freshly extracted socket.
- All patients were prescribed standard antibiotics and anti-inflammatory regimen

Step 4- Post-operative CBCT:

- A post-operative CBCT was taken immediately after implant placement in all patients.
- A post-operative CBCT was taken for all 20 patients after six months.

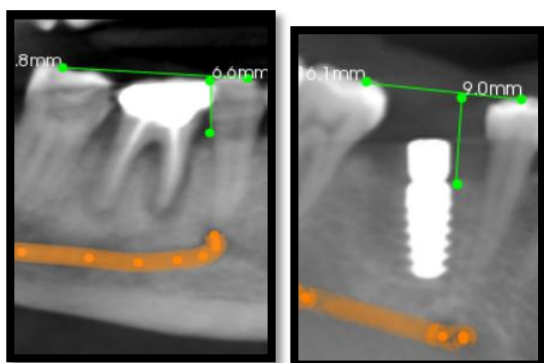
Step 5- Parameters to be measured:

Crestal bone loss is measured and Compared using CBCT

To measure the crestal bone loss, difference between the crest bone levels were measured from occlusal level to bone crest using pre-operative CBCT (for the targeted tooth site) and post-operative CBCT (for the implant site)

Autogenous tooth graft Group A (n=10)

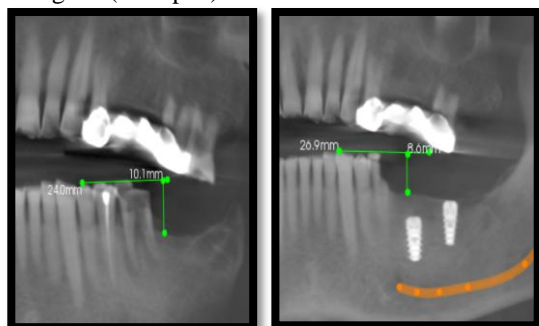
Pre-operative CBCT & post-operative CBCT was taken for all 10 patients were compared using CBCT software for autogenous tooth graft (Group A).



CRESTAL BONE LEVEL ARE MEASURED WITH PRE-OPERATIVE AND POST-OPERATIVE CBCT AUTOGENOUS TOOTH GRAFT

Autograft Group B (n=10)

- Pre-operative CBCT & post-operative CBCT was taken for all 10 patients were compared using CBCT software for autogenous bone graft (Group B).



CRESTAL BONE LEVELS ARE MEASURED WITH PRE-OPERATIVE AND POST-OPERATIVE CBCT FOR AUTOGRAFT

III. RESULTS:

In the intergroup comparison of mean changes in bone levels from pre-treatment to post-treatment, Group A (tooth graft) showed a pre-operative bone height of 9.720 ± 0.352 mm and a post-operative height of 9.990 ± 1.390 mm, resulting in a mean change of 0.270 ± 1.259 mm. This change was found to be non-significant, with a P-value of 0.789. In contrast, Group B (bone graft) had a pre-operative bone height of 9.600 ± 0.659 mm and a post-operative height of 9.740 ± 1.394 mm, yielding a mean change of 0.140 ± 0.835 mm. These results suggest that while both groups experienced an increase in bone height following treatment, the differences in mean changes between the two groups were not statistically significant,

indicating similar outcomes in bone level changes for both tooth grafts and bone grafts.

IV. CONCLUSION:

This study found autogenous tooth graft (ATG) and autograft effectiveness to be comparable to the location of the crestal bone level during immediate implant placement in the posterior mandible. Although autografts have been regarded as the gold standard by virtue of their osteogenic, osteoinductive, and osteoconductive characteristics, autogenous tooth grafts have proven to be viable alternatives with their own advantages. The study results indicated that there were no statistically significant differences in bone height changes between those two groups, so ATG could be used safely as a reliable substitute for conventional autografts.

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