CONE BEAM COMPUTED TOMOGRAPHY ASSISTED IMMEDIATE IMPLANT PLACEMENT IN ANTERIOR MAXILLA AND MANDIBLE

Dissertation Submitted to

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CERTIFICATE

This is to certify that this dissertation titled **"CONE BEAM COMPUTED TOMOGRAPHY ASSISTED IMMEDIATE IMPLANT PLACEMENT IN ANTERIOR MAXILLA AND MANDIBLE"** is a bonafide record of work done by **Dr.B.Saravanan** under our guidance and to our satisfaction during his postgraduate study period **2010-2013.**

This Dissertation is submitted to **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY,** in partial fulfillment for the award of the Degree of **MASTER OF DENTAL SURGERY – ORAL AND MAXILLOFACIAL SURGERY, BRANCH III.** It has not been submitted (partial or full) for the award of any other degree or diploma.

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ABSTRACT

Aim :

The aim of this study is to evaluate the accuracy of cone beam computed tomography and clinical outcome of immediately placed implants in anterior maxilla and mandible.

Materials and methods:

This is a prospective study conducted on patients who reported to the department of oral and maxillofacial surgery in Ragas Dental College, Chennai. A total of 10 patients with unsalvageable upper and lower anterior teeth were included in the study. The accuracy of cone beam computed tomography is assessed by comparing tooth and bone dimensions and clinical outcome was evaluated by radiographically by 3 month, 6month.

Results:

The percentage of accuracy of cone beam computed tomography in assessing the width of the teeth is 98%, length of the teeth is 99.06%, labial bone thickness is 88.98% and palatal bone thickness is 97.14%. The clinical outcome is evaluated by Albrektsson's criteria, where the mean marginal bone loss was 0.3 mm,9.09 % had periimplant radiolucency around implants, 9.09% had infection, all the implants exhibited good osseointegration and were asymptomatic.

Conclusion:

The implants placed into the extraction sockets will heal predictably and therefore cause reductions in the number of surgical interventions and in the total span of treatment time. In the present study, we got 98% accuracy in width of the tooth, 99.06% in measuring the length of the tooth, 88.98% in measurement of labial bone thickness and 97.14% in palatal bone thickness in the cone beam computed tomography by comparing clinically.

Keywords:

Cone beam computed tomography, Immediate implant placement, Extraction socket.

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INTRODUCTION

The earliest possible restoration to achieve proper form and function is a hallmark of all surgical specialties. Treatment of complete or partial tooth losing anterior maxilla and mandible can involve difficult functional, esthetic and psychological problems, especially in young patients with otherwise good dentition. The prosthetic treatments that have been used i.e. removable or fixed partial dentures, or composite retained onlay partial dentures, have the risk of complication, most of these treatments include the sacrifice of healthy tooth substance of the adjacent teeth. In order to overcome these problems associated with conventional prosthesis, implants came into existence. Implant by definition means any object or material, such as an alloplastic substance or other tissue, which is partial or completely inserted into the body for therapeutic, diagnostic, prosthetic, or experimental purposes". After loss of teeth, loss of bone occurs both in width and height resulting in various esthetic and functional complications. The implant supported prosthesis can overcome these problems and has proved to be a significant addition

to restorative dentistry. Dr P-I Branemark in 1952 and his coworkers demonstrated the ability of natural bone to accept titanium during its remodeling stages leading to osseointegration, which propelled dentistry into a new age of reconstructive dentistry. This concept was initially conceived as a two-stage system in which titanium was given a length of time to osseointegrate into the native bone without the stress of function. The ability to permanently replace missing teeth with a function and appearance close to that of the natural dentition has never been greater. With more than 3 decades of evidence to support the clinical use of osseointegrated dental implants, it is possible to confidently resolve that the implants are predictable and provide patients with long- term functional tooth replacement. This is the remarkable accomplishment, considering the many challenges and stresses that the oral environment and forces of mastication present for dental implants.

Cone- beam computerized tomography (CBCT) is a medical image acquisition technique based on a cone- shaped X-ray beam centered on a two- dimensional (2D) detector. The source- detector

system performs one rotation around the object producing a series of 2D images. The images are reconstructed in a three- dimensional (3D) data set using a modification of the original cone- beam algorithm developed by FELDKAMP et al[8]. Dedicated CBCT scanners for the oral and maxillofacial (OMF) region were pioneered in the late 1990's independently by ARAI et al. in Japan and MOZZO et.al In Italy. Since then there has been a great interest in this new imaging technique in the Oral and maxillofacial surgery region by different research groups. The cone beam computed tomography has proved to be an efficient pre-operative diagnostic tool in the measurement of the width of the alveolar bone, width and length of the tooth. According to the traditional Branemark protocols, a 12- month healing period after tooth extraction is recommended before implant placement. In addition, a subsequent healing period of 3 to 6 months is indicated after implant fixture placement. In most instances, this translates to 1-2 years from the start of treatment to completion of the restoration. This often leaves the patient with the missing tooth or teeth with an extended period of time[45].

Attempts to shorten the overall length of treatment have focused on three approaches:

- Shortened or immediate loading subsequent to implant placement;
- Alteration of the surface of the implant fixture to promote faster healing; and
- Immediate placement of the implant after extraction of the natural tooth.
- An optimal availability of existing bone to allow primary stability of the titanium device.

For successful osseointegration the requirement is the sufficient quantity and quality of osseous tissue for the stabilization of the implant.

Data and reports on the first two approaches have been favorable, but with limitations, especially in terms of duration of the time period. Immediate implant placement post- extraction has resulted in initiation of prosthetic treatment in as little as 3 to 6

months[45]. Animal and human studies have demonstrated attainment of osseointegration of implants following such therapy at a light microscopic level. Immediate implant placement techniques report survival rates of 94 to 100% over a varying healing period of 3 months to 7 years[45]. Apart from reducing the time period and the number of surgical interventions, other advantages of immediate implant placement in the extraction socket has been suggested, such as better implant survival rates, better esthetics, maintenance of the hard and soft tissues at the extraction site, and higher patient satisfaction compared with delayed(late) placed implants.[36] Alveolar ridge resorption after tooth extraction may considerably reduce the residual bone volume and compromise the favorable positioning of implants required for optimal restoration. This is even more pronounced at the anterior maxilla, where ridge resorption often creates an unfavorable palate-labial discrepancy between the implant and the prosthesis. Following the correct clinical indications, the immediate placement of the implants into the extraction sockets avoids this undesirable resorption. Frequently, however, compromised

teeth that are indicated for extraction are involved with infectious conditions, which conventionally contraindicate their immediate replacement with endosseous dental implants.[47]

The present study was therefore undertaken to evaluate the accuracy of cone beam computed tomography and clinical outcome of immediately placed implants in anterior maxilla and mandible.

AIMS AND OBJECTIVES

1. To assess the accuracy of cone beam computed tomography by comparing the tooth and socket dimensions in cone beam computed tomography and clinically.
2. To evaluate the clinical outcome of immediately placed implants.

REVIEW OF LITERATURE

Marvin werbitt et al 1992[42] in their study have concluded that an intact extraction socket is not necessary for the successful integration of a titanium implant fixture and an implant installation can be done in conjunction with bone grafting and guided bone regeneration to enhance esthetic result.

Gerry M.Raghobar et al 1996[25] have evaluated the applicability of intra-orally harvested autogenous bone grafts for the augmentationof the narrow maxillary alveolar ridge to enable insertion of implants for single tooth replacement. The authors concluded that augmentation of local alveolar defects in the maxilla with intra orally harvested autogenous bone grafts appears to be a reliable method to enable implant placement.

Sarment DP et al 2003[57] found out that placement of dental implants requires precise planning that accounts for anatomic limitations and restorative goals. Diagnosis can be made with the assistance of computerized tomographic (CT) scanning, but transfer of planning to the surgical field is limited. Recently, novel CAD/CAM techniques such as stereolithographic rapid prototyping have been developed to build surgical guides in an attempt to improve precision of implant placement. However, comparison of these advanced techniques to traditional surgical guides has not been performed. The goal of his study was to compare the accuracy of a conventional surgical guide to that of a stereolithographic surgical guide.

Botticelli D et al 2004[11] in their study found that the marginal gap occurred between the metal rod and bone tissue following implant installation in an extraction socket may predictably heal with new bone formation and defect resolution. Also the marginal gaps in buccal and palatal or lingual locations were resolved through new bone formation from the inside of the defects and substantial bone resorption from the outside of the ridge.

Edger Grageda 2004[23] has given a full description of the growth factors involved in the regulation of bone remodeling ; also the growth factors that may be participants and have been quantified in the use of PRP.

Arau'jo MG et al 2005[6] found that marked dimensional alteration occur in the edentulous ridge after three months of healing following the extraction of the tooth. The placement of the implant in the fresh extraction site failed to prevent the remodeling that occurred in the walls of the socket. The resulting height of the buccal and lingual walls at three months was similar at implants and edentulous sites and vertical bone loss was more pronounced at the buccal than at the lingual aspect of the ridge. The authors suggest that the resorption of the socket walls that occurs following tooth removal must be considered in conjunction with implant placement in fresh extraction sockets.

Pretorius et al 2005[54] in their histomorphometric study have noted the healing pattern of the bone defect created adjacent to titanium and hydroxyapatite coated implants covered with non resorbable and resorbable

membranes in combination with different filler material and have found that the autogenous bone is the gold standared in grafting and both DFDB and biocoral have comparable results. Also DFDB had issues like possibility of disease transmission in spite of sterilization, both DFDB and bicorol were resorbable and gradually replaced by bone by 18 months. The graft and the membranes contributed to the restablishment of the original volume. Thus they concluded that bony defect is not a contraindication for the placement of an implant.

James Ruskin et al 2005[29] in their clinical study have concluded that modern implant surfaces provide more predictable integration at all time intervals, making the implant a predictable treatment foundation for the long term restoration of missing teeth. When the predictability of the endodontically treated teeth versus implants as foundations for restorative dentistry is compared, there is an advantage for implants. This is most likely related to their obvious resistance to dental caries, periodontal disease and structural deficiencies. Immediately placed implants have numerous advantages over delayed placement techniques, including maintenance of the existing gingival embrasure form and marginal contour, preservation of the existing bone, reduced surgical procedures, and shorter treatment times. The long- term ability of the implant to retain a crown is superior to that of natural tooth, particularly one that is endodontically treated and supporting a post and core.

Michael S. Block 2005[43] have reviewed the literature for treatment of teeth with external resorption secondary to avulsive injuries and illustrated treatment of patients with teeth following different clinical scenarios to develop a predictable course of therapy. Immediate grafting of the extraction site to repair labial bone loss, and immediate implant placement with provisionalization were performed on teeth with external resorption following injury through the growing period, external resorption treated with a delayed approach after tooth extraction. Based on review of the literature, the authors have concluded that the decision to place dental implants to replace teeth with external resorption can be timid depending on the location and type of the resorption, with excellent esthetic results.

Ali Hassani et al 2005[3] in their study quantified the amount of bone graft material placed in the anterior palate site. Twenty- one fixed cadavers, dentulous and edentulous maxilla, were studied. Osteotomies were performed in monocortical fashion, 2 mm from the bone crest and parallel to the tooth axis and 3 mm from the incisive foramen at the midline. The bur penetration was indicated by radiographic index. The amount of corticocancellous block was then measured with displacement volumetric technique. Based on the results of the study, the authors concluded that the anterior region of the palate can be reliably selected as the donor site in the oral and maxillofacial reconstructive, implantol.ogy, and periodontal regeneration procedures.

Chen ST et al 2005[15] in their study to compare the efficacy of combinations of membranes and autogenous bone grafts at immediate implants have concluded that vertical defect height and horizontal defect depth reduction at defects adjacent to immediate implants may be achieved without the use of membranes and/ or bone grafts.

Botticelli D et al 2006[12] have studied the healing of marginal defects tat occurred at implants placed in the fully healed ridge or in the fresh extraction socket. The authors have concluded that the process of bone modeling and remodeling at an implant placed in fresh extraction socket differs from resolution of marginal defects that may occur following implant installation in a healed ridge.

Arau' Jo MG et al 2006[5] have tested the hypothesis that 'osseointegration' may be lost as a result of the physiological modeling that occurs following tooth extraction and implant installation. Seven beagle dogs were used for the study. The third and fourth premolars in both quadrants of the mandible were used as experimental teeth. Buccal and lingual full thickness flaps were elevated and distal roots were removed. Implants were installed in the fresh extraction socket. Semi- submerged healing of the implant sites was allowed. In five dogs, the experimental procedure was first performed in the right side of the mandible and 2 months later in the left mandible. In two dogs, the premolar sites on both side of the mandible were treated in one surgical session and biopsies were obtained immediately after

implant placement. All biopsies were processed for ground sectioning and stained. The authors noted that the void existed between the implant and the socket walls at surgery was filled at 4 weeks with woven bone that made contact with the SLA surface. In this interval, the buccal and lingual bone walls underwent marked surface resorption and the height of the thin buccal hard tissue walls was reduced. The process of healing continued, and the buccal bone crest shifted further in the apical direction. After 12 weeks, the buccal crest was located>2 mm apical of the marginal border of the SLA surface. The authors concluded that the bone to implant contact that was established during the early phase of socket healing following implant installation was in part lost when the buccal bone wall underwent continued resorption.

Arau' Jo MG et al 2006[1] in their present experiment have evaluated whether modeling of the alveo lar ridge that occurs following tooth extraction and implant placement was influenced by the size of the hard tissue walls of the socket, and would continue after the first four weeks of the healing, i.e. once most of the effect of the surgical trauma had overcome. The authors in their study found that implant placement failed to preserve the hard tissue dimension on the ridge following tooth extraction. The buccal as the lingual bone walls ere resorbed. At the buccal aspect, there was some marginal loss of osseointegration.

Nardy Casap et al 2007[49] have shown that successful immediate implantation can be done in the debrided infected alveoli provided complete removal of all contaminated tissue is done and the controlled regeneration of the alveolar defect is performed. A total of 30 implants were immediately placed into debrided infected sites in 20 patients. The pathology at the receptacle dentoalveolar sockets varied, and included sub- acute periodontal infection, perio- endo infection, chronic periodontal infection, chronic peri-apical lesion, and a periodontal cyst. The significant advantage of this treatment approach over delayed implantation is the preservation of alveolar ridge, which allows for more ideal positioning of the implants. Also there is shorter waiting period until final restoration.

Siegenthaler DW et al 2007[61] in their study on thirty four immediately placed implants concluded that for those implants where primary stability was achieved, the immediate implant placement performed at extraction sockets exhibiting peri- apical pathology did not lead to an increased rate of complications and rendered an equally favorable type of tissue integration of implants in both groups. Implant placement in such sites can, therefore, be successfully performed.

Lang NP et al 2007[37] in their multicenter randomized controlled clinical trail have compared the clinical and patient- based outcomes of immediately placed cylindrical and tapered screw shaped implants. Outcome parameters included implant survival, need for GBR, initial implant stability,

soft and hard tissue healing, aesthetic outcomes, morbidity and operator's, assisstant's and patient's perception of the procedure. They have demonstrated that tapered or standard cylindrical implants yielded clinically equivalent short- term outcomes after immediate implant placement into the extraction socket.

Chen ST et al 2007[16] in their prospective controlled clinical study has evaluated the healing of marginal defects adjacent to implants in extraction sockets grafted with inorganic bovine bone using a non- submerged protocol and assessed the soft tissue and radiographic outcomes of treatment over an observation period of 3 years following restoration of the implants. Thirty immediate transmucosal implants in maxillary anterior extraction sites of 30 patients randomly received Bio-Oss, Bio- Oss and resorbable collagen membrane or no graft (control). The authors in their study concluded that bovine bone graft (Bio- Oss) significantly reduced horizontal resorption of buccal bone. There is a risk of mucosal recession and adverse soft tissue esthetics with immediate implant placement. However, the risk may be reduced by avoiding a buccal position of the implant in the extraction socket.

Juodzbalys G et al 2007[32] have evaluated clinically and radiographically the esthetic outcome of immediate implant placed into extraction sockets using the simultaneous guided bone regeneration (GBR) technique. 12 patients with 14 titanium screw- shaped implants (13- 16 mm length and 4.3 or 5 mm diameters) were placed in the extraction sockets.

Defects after implant placement were recorded, and then filled up with deprotienized bovine bone mineral, bio- absorbable collagen membrane, and absorbable pins. The defect was again reevaluated at second stage surgery. Clinical and radiographic parameters of the peri- implant conditions were assessed at the moment of prosthesis placement and at 1- year follow- up. The authors have concluded that careful evaluation of potential extraction sites before immediate implant installation promotes optimal implant esthetics. Extraction sites with compromised soft tissue and bone volume can be successfully corrected using guided bone regeneration and connective tissue graft.

Joseph Y.K. Kan et al 2007[31] have described different scenarios of facial osseous defects when the osseous- gingival relationship exceeds 3 mm and evaluated the effects of the morphology of the compromised facial bone on gingival dynamics after immediate tooth replacement and guided bone regeneration. The implant success rate and peri- implant bone change were also reported. 23 patients treated consequently with the mean age of 39.5 years (range, 25 to 63 years) underwent immediate tooth replacement and guided bone regeneration in sockets with facial bony defects exceeding 3 mm. facial bony defects were categorized into V-, U-, and Ultra- U (UU) - shaped. The patients were evaluated clinically and radiographically at one year after implant placement. The authors observed that U- and UU- shaped defects showed significantly higher frequency and magnitude of facial gingival

recession (>1.5 mm) when compared with V- shaped defects 1 year after immediate tooth replacement and guided bone regeneration. The authors concluded that it is important to identify the type of facial bony defect during diagnosis and treatment planning, so that appropriate treatment can be prescribed. The combination of delayed implant placement after staged reconstruction of unfavorable U- and UU- shaped labial extraction socket defects should be considered in areas of high esthetic concern.

Nils Claudius Gellrich et al 2007[44] in their clinical study have shown that autologous bone grafts harvested from the zygomatic buttress are suited for reconstruction of bony alveolar crest defects in the anterior maxillary region. It shows minimal donor site morbidity; provide good quality bone for successful osseointegration of dental implants. The cost to benefit ratio is good and the complication rate is low.

Stephen L. Wheeler 2007[64] has reviewed the treatment planning concepts and surgical techniques that have lead to complications during implant reconstruction in the anterior maxilla. The author has observed that treatment planning recommendations based on clinical studies have lead to a significant decrease in functional and esthetic complications in the anterior maxilla. These involve surgical placement and spacing of implants, along with timing and grafting considerations. Thus the author has concluded that research and clinical results indicate that cautious timing of site preparation

and implant placement, along with important concepts of implant spacing, can significantly reduce complications within the esthetic zone.

L. Schropp et al 2008[36] in their review article have focused on the clinical outcome of immediate or early implant placement on the basis of the current literature and have pointed out factors, which may have special significance when an implant is placed in the fresh or recent extraction socket and have advocated criteria for patient selection and choice of surgical and prosthetic procedures.

Monish Bhola et al 2008[45] in their review article have focused on the important clinical considerations when selecting patients for immediate implant placement, and have discussed the advantages and disadvantages of this mode of therapy.

Botticelli D et al 2008[13] in their study have demonstrated that immediate implants that were loaded after five to seven months had a high success rate. No implant was lost and the mean treatment bone level at the implants was maintained or even improved during the five year interval. The plaque and mucositis scores were low at baseline. Implant sites located adjacent to the teeth showed bone gain during the initial period while sites that were facing edentulous zones lost some bone.

Cafiero C et al 2008[17] in their twelve month prospective cohort study have evaluated the clinical and radiographic outcomes of immediate trans-

mucosal implant placement into fresh maxillary and mandibular molar extraction sockets. The authors have showed that immediate trans- mucosal implant placement represented a predictable treatment option for the replacement of mandibular and maxillary molars lost due to reasons other than periodontitis including vertical root fractures, endodontic failures and caries.

Evans CDJ et al 2008[24] have reviewed the esthetic outcomes of single tooth immediate implant placements and have determined the factors that may influence the results. The authors have concluded that immediate implant placement requires very careful case selection and high surgical skill levels if esthetic outcomes are to be achieved. Long- term prospective studies on tissue stability and esthetic outcomes are needed.

Pommer B et al 2008[53] in their clinical study of evaluation of current recommendations for the location of the harvest zone with respect to the course of mandibular incisive canal have concluded that applying new safety recommendation and proper patient selection in chin bone harvesting could reduce the altered postoperative tooth sensitivity due to injury of the mandibular incisive nerve.

Patrick J. Louis et al 2008[52] have evaluated the magnitude of ridge augmentation with titanium mesh, overall graft success, anatomic location of ridge defects and their relationship to mesh exposure. The retrospective study evaluated 44 patients who received mandibular or maxillary reconstruction with autogenous particulate bone graft and titanium mesh for the purpose of

implant placement. Autogenous bone graft was harvested from the iliac crest, tibia and mandibular symphysis. The authors concluded that porous titanium mesh is a reliable containment system used for reconstruction of the maxilla and the mandible. This material tolerates exposure very well and gives predictable results.

Donos N et al 2008[28] have evaluated various augmentation techniques like the barrier membranes, bone grafts and split osteotomy and concluded that the various augmentation techniques resulted in similar implant survival between augmented and pristine sites.

Abushahba F et al 2008[7] in the study to evaluate the effect of gap width and graft placement on bone healing around implants placed into simulated extraction sockets in the mandibles of four beagle dogs suggested that the autogenous bone graft and Bio- Oss played an important role in the amount of hard tissue fill and osseointegration occurring within marginal bone defects around implants.

Serino G et al 2008[59] in their study on 20 patients have shown that the use of a bioabsorbable synthetic sponge of polylactide- polyglycolide acid did not interfere with the formation of new bone in the alveolar sockets and that the characteristics of the 3- month newly formed bone seemed to be optimal for dental implants insertion. The authors based on the biocompatibility, safety and characteristics of this material; have suggested

that the material is suitable for filling alveolar sockets following extractions, to prevent volume reduction and collapse of the overlying soft tissue flaps.

Seok- Woo Chang et al 2009[58] have compared the osseointegration of immediate implants in dogs in infection- free sites and in sites with peri-radicular lesions which were removed by simulated peri- radicular surgery. Peri- radicular surgeries were performed to remove intentionally induced peri-radicular lesions, followed by teeth extraction and immediate implant placement with or without membranes. In the control group, implants were placed at healthy extraction sockets. The authors in their pilot study have showed that immediate implant placement might be successful in extraction sockets with periradicular lesions despite the lower bone- implant contact of the experimental groups.

Karl- Erik kahnberg et al 2009[35] have studied the outcome of implant placement in fresh extraction sockets with simultaneous use of particulate bone graft material. Forty implants placed in fresh extraction sockets in 26 patients. All implants were osseointegrated at the time of abutment connection. He showed radiographic examination reveals only 0.13 mm mesially and 0.19 mm distally

Neves FS et al 2012[48] have evaluated the effect of scan mode of the cone beam computed tomography (CBCT) in the preoperativedental implant measurements. Completely edentulous mandibles with entirely resorbed alveolar processes were selected for this study. He

found out that both modes provided real measures, necessary when performing implant planning; however, half scan mode uses smaller doses, following the principle of effectiveness.he believed that this method should be used because of the best dose-effect relationship and offer less risk to the patient.

Shiratori LN et al 2012[60] evaluated the accuracy of cone-beam computed tomography (CBCT) for measuring the buccal bone volume around dental implants. The results showed that for the three points of the implants, no statistically significant difference in the measurements was obtained from the plaster model and CBCT images.

Ritter L et al 2012[55] Virtual wax-ups based on three-dimensional (3D) surface models can be matched (i.e. registered) to cone beam computed tomography(CBCT) data of the same patient for dental implant planning. Thereby, implant planning software can visualize anatomical and prosthetic information simultaneously. The aim of his study is to assess the accuracy of a newly developed registration process. He concluded that registration of 3D surface data and CBCT data works reliably and is sufficiently accurate for dental implant planning. Thereby, barium-sulfate scanning templates can be avoided and dental implant planning can be accomplished fully virtual.

González-Martín O et al 2012[27] evaluated on the base of cone beam computed tomography (CBCT) fractal dimension, bone quality changes surrounding the apical portion of immediate implants placed under higher insertion torque utilizing an undersized drilling technique, an undersized

drilling resulting in high insertion torque would seem to induce no adverse changes in radiographic bone quality after 6 months of follow-up. The most favorable entity of drilling undersizing and its effect on peri-implant bone remodeling, should be evaluated on a larger patient population.

Weitz J et al 2011[69] evaluated the accuracy of a surgical template-aided implant placement produced by rapid prototyping using a DICOM dataset from cone beam computer tomography (CBCT).). On the basis of CBCT scans (Sirona® Galileos), a total of ten models were produced using a rapid-prototyping three-dimensional printer. On the same patients, impressions were performed to compare fitting accuracy of both methods. From the models made by impression, templates were produced and accuracy was compared and analyzed with the rapid-prototyping model. Whereas templates made by conventional procedure had an excellent accuracy, the fitting accuracy of those produced by DICOM datasets was not sufficient. Deviations ranged between 2.0 and 3.5 mm, after modification of models between 1.4 and 3.1 mm. The findings of this study suggest that the accuracy of the low-dose Sirona Galileos® DICOM dataset seems to show a high deviation, which is not useable for accurate surgical transfer for example in implant surgery.

Dawood A et al 2012[18] investigated the possibility of reducing patient X-ray dose in the course of implant site evaluation. He concluded that there is potential to reduce patient dose very significantly in CBCT examinations for implant site evaluation.

Fuster-Torres MÁ et al 2011[24] determined bone density in designated implant sites using cone beam computed tomography (CBCT) and to evaluate possible correlations between age, gender, insertion torque measurements, and resonance frequency analysis (RFA) values. He concluded bone density measurements using preoperative CBCT may be helpful as an objective diagnostic tool. These values, in conjunction with RFA values and insertion torque measurements, can provide the implant surgeon with an objective assessment of bone quality and may be especially useful where poor-quality bone is suspected

Luk LC et al 2011[41] compared the relative accuracy of the ridge-mapping method against that of standard computed tomography(CT).

Miyamoto Y et al 2011[44] evaluated the influence of labial alveolar bone thickness and the corresponding vertical bone loss on postoperative gingival recessions around anterior maxillary dental implants. Using cone beam computed tomography (CBCT) scanning, the temporal changes of three-dimensional images of alveolar bone were monitored to determine hard and soft tissue outcomes of two different implant placement techniques: delayed two-stage and immediate placement.

González-García R 2012[26] assessed the reliability of the cone-beam computed tomography (CBCT) as a tool to pre-operatively determine radiographic bone density (RBD) by the density values provided by the system, analyzing its relationship with histomorphometric bone density expressed as bone volumetric fraction (BV/TV) assessed by micro-CT of bone biopsies at the site of insertion ofdental implants in the maxillary bones.

MATERIALS AND METHODS

This is a prospective study conducted on patients who reported to the department of oral and maxillofacial surgery in Ragas dental college, Chennai. A total of 10 patients with unsalvageable upper and lower anterior teeth were included in the study. The tooth and socket measurements are pre operatively measured by cone beam computed tomography and clinical outcome was evaluated by radiographically by 3 month, 6month.

For evaluation following criteria were considered:

A. Implant stability (evaluated clinically by using instruments on each side of implants to determine if mobility is present)
B. The accuracy of Cone Beam Computed Tomography is evaluated by comparing the clinical quantity of bone and dimensions of tooth to be extracted and alveolar socket.
C. The clinical outcome of implants placed which is evaluated by Albrektsson's criteria[17.]

- Absence of persistent subjective complaints, such as pain,foreign body sensation, and/or dysesthesia
- Absence of periimplant infection with suppuration
- Absence of mobility
- Absence of continuous radiolucency around the implant.
- Marginal bone loss around implants

Selection criteria:

The patients were selected on the basis of inclusion and exclusion criteria

Inclusion criteria:

A. Patients requiring extraction of maxillary and mandibularanteriors (canine to canine) due to one or more of the following reasons :

1. Fracture of the teeth – vertical and horizontal.

2. Failed endodontic procedures.

3. Resorption of roots – internal and external

B. Age/sex :15 to 60 years (Males & females)

C.Site: Maxillary and mandibular anteriors (Canine to canine)

D. Patients who are co-operative motivated and hygiene conscious are included.

Exclusion criteria:

A. Unfavourable position of the natural tooth (proclined/crowded/rotated)
B. Patients with poor oral hygiene practice.
C. Tooth with big periapical lesions.

Software utilized:

Reconstructed axial, coronal and sagittal views using Primary reconstruction modalities as well as Integrated, Primary reconstruction software and associated tools of the Case stream Health Inc, and KODAK DENTAL IMAGING SOFTWARE (KDIS 3D – 6.12-10.0,2007 and 2.4.10,2011) was

employed to measure linear measurements at axial, coronal and sagittal section created for the purpose.

Materials and equipment/Armamantarium:

A. Root form endosteal threaded implant,selective integrated surface (sand-blasted & acid etched surfaced) were used.

B. Surgical Armamentarium for Stage I & stage II surgery

1. Surgical Guide Drill: Conventional (No. 4 or No.5) round bur was used to initiate the bone drilling.
2. Surgical Twisted Drills: Surgical twist drills of various diameters ranging 2.0mm to 4.2mm were used in sequence to prepare the site.
3. Depth gauge/Paralleling pin : These gauges were used to obtain parallel preparation and to guide the direction of drilling preparation. They were also used to measure the depth of the surgical preparation for implant placement.
4. Physio-dispenser and Reduction hand piece with internal irrigation : used for bone drilling.
5. Hex rachet : Hex rachet was used to engage the fixture insertion tools to screw the implant in its proper position.
6. Standard Diagnostic Tools :Mirror, probe, tweezers, tooth tissue holding forceps, needle holder and scissor were used.

7. Extraction instruments : Periosteal elevator, periotomes, extraction forceps

In order to prevent infection all surgical procedures were performed under strict aseptic conditions with greatest attention paid for preservation of implant bed. The baseline clinical examination consisted of a thorough medical and dental history, general and oral health status, assessment of future implant site. The available vertical,mesio distal and labiolingual, tooth and socket dimensions was evaluated by Cone Beam Commuted Tomography.

Intra oral periapicalradiographs were done to evaluate priorly.

SURGICAL TECHNIQUE:

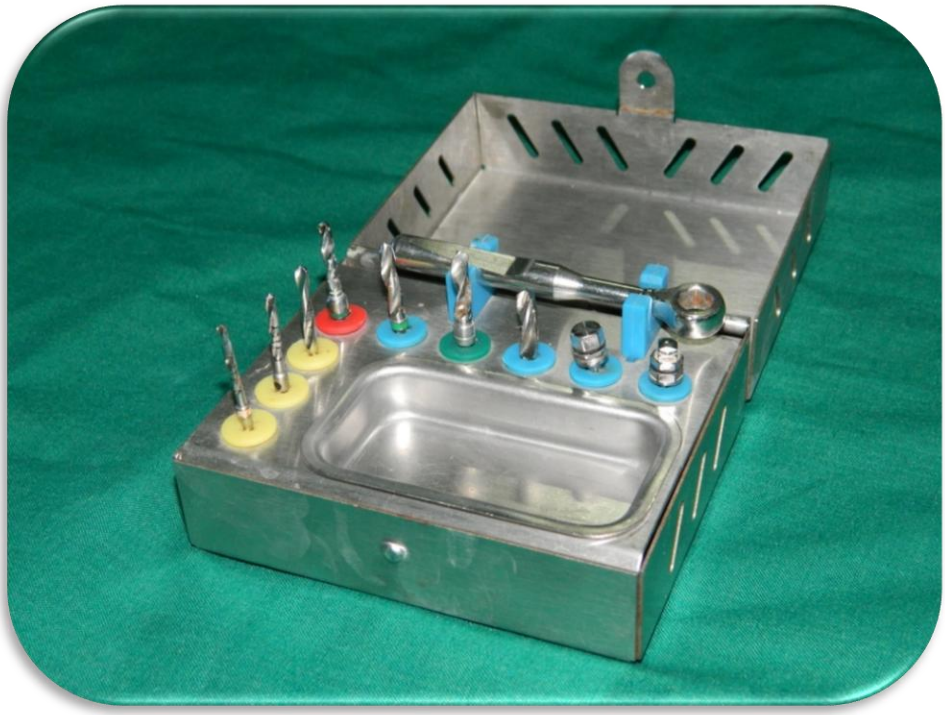
1. A pre-operative conebeam computed tomography is taken, width of buccal and palatal bone, approximate width and length of tooth is measured.
2. The implant dimensions is selected such that it is 1-1.5mm larger than the tooth to be replaced.
3. Local anesthesia was achieved using 2% lignocaine with 1:80,000 adrenaline.
4. After adequate periosteal reflection atraumatic extraction of the tooth is done using periotome and extraction forceps without damaging the buccal and palatal shelf.
5. The preparation of the extraction socket is with osteotomes (bone expanders) in maxillary region and drills in the mandibular region.

6. Implant is placed in such a way that the implant touches all the bony walls of the extraction socket.
7. Healing cap is placed
8. The surgical site is sutured with 3 -0 braided black silk suture.
9. The implant is evaluated 3months, 6months, and one year post-operatively.

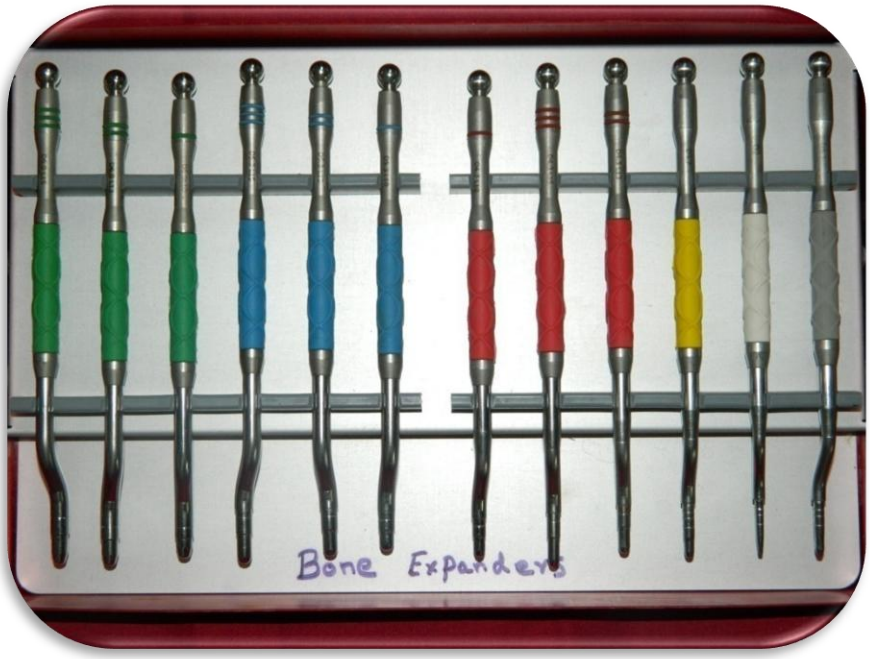
ARMAMENTARIUM

Surgical Instruments

Physiodispenser



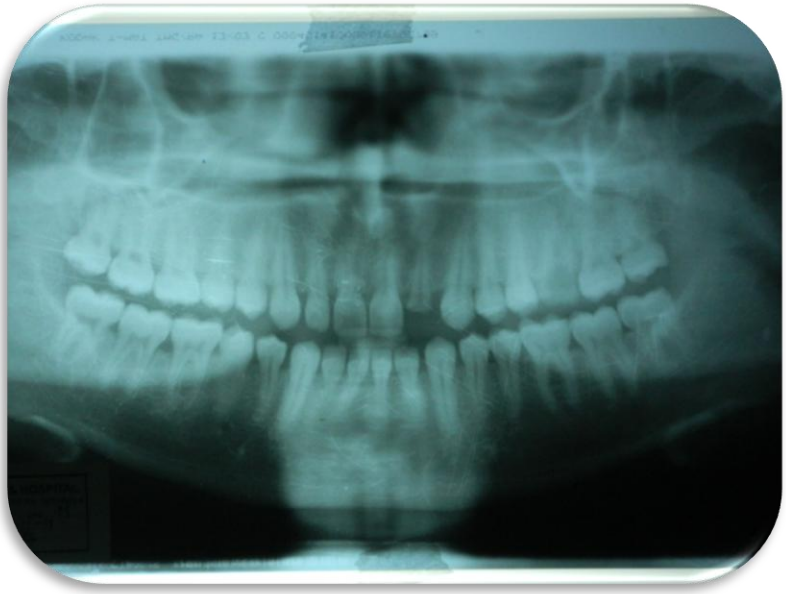
Implant Kit



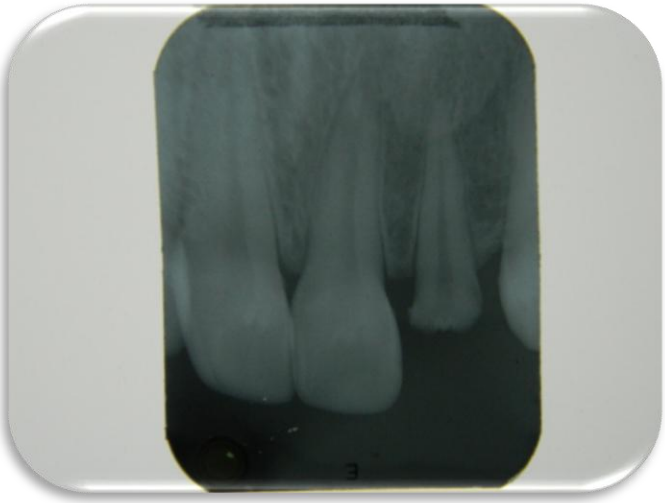
Bone Expanders

Extra oral view

Intraoral view

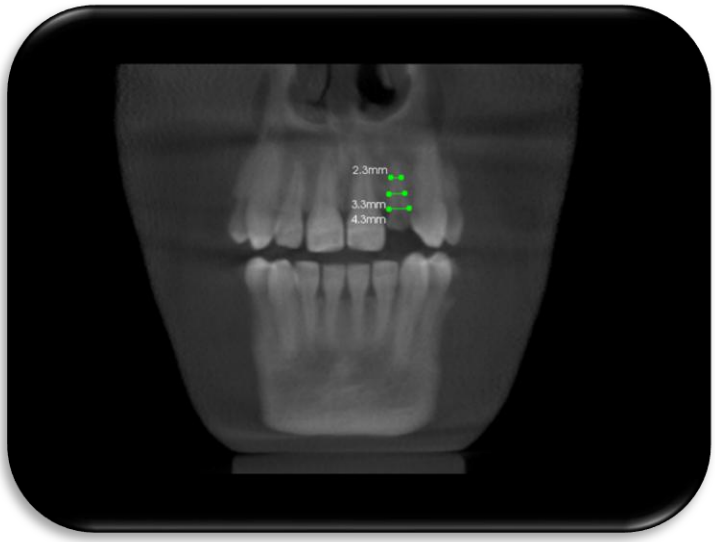


Preoperative OPG

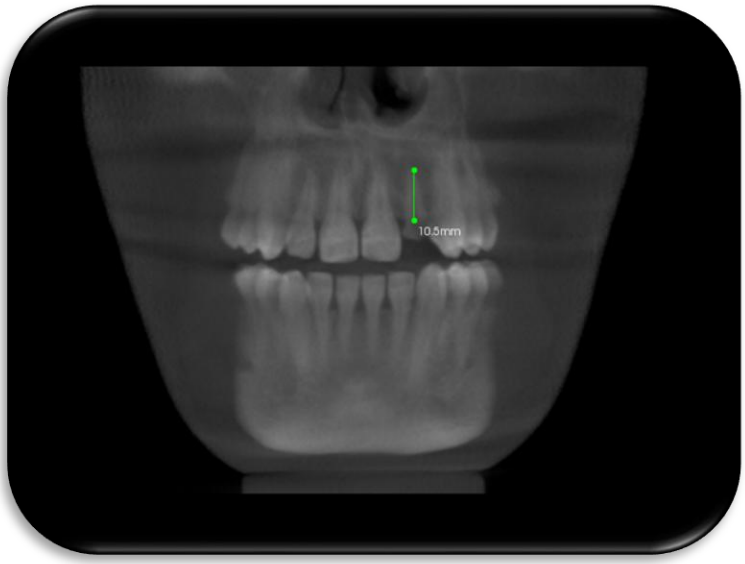


Preoperative IOPA

Pre operative Models

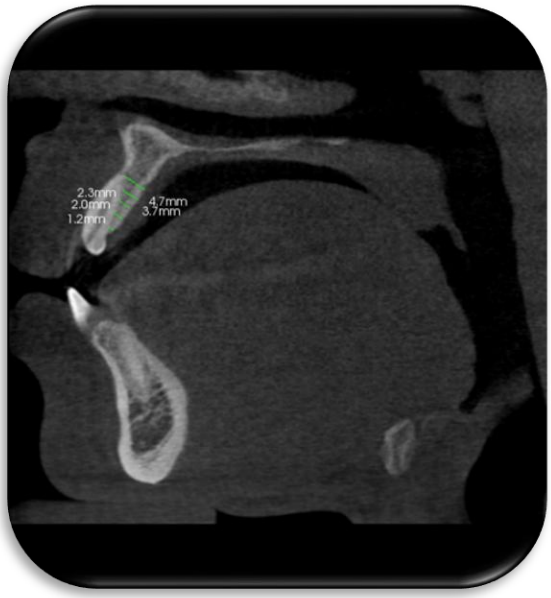


Measurement of width of 22 in CBCT



Measurement of Length of 22 in CBCT

Measurement of Labial bone thickness

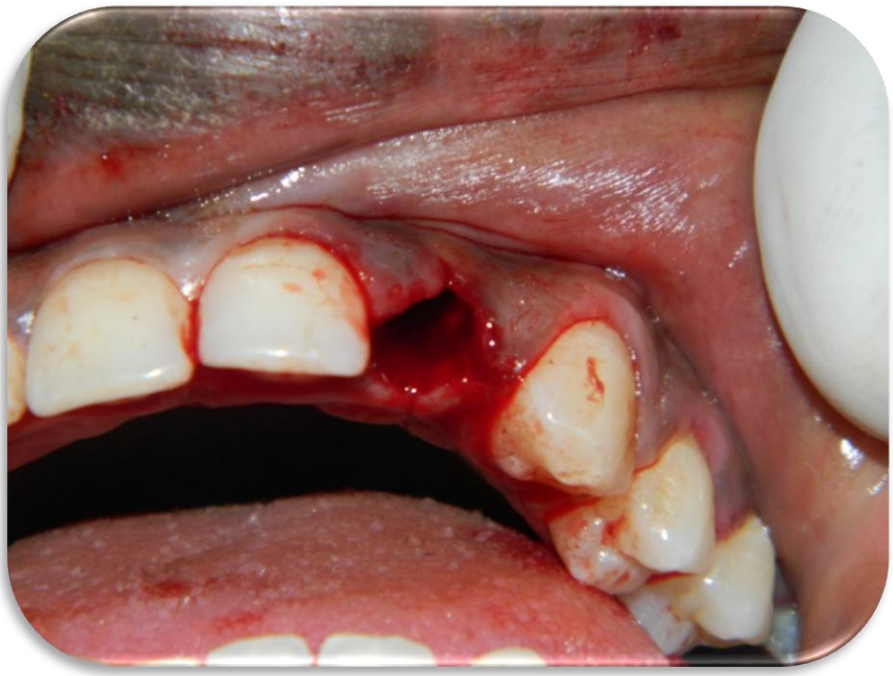


Measurement of Palatal bone thickness in CBCT

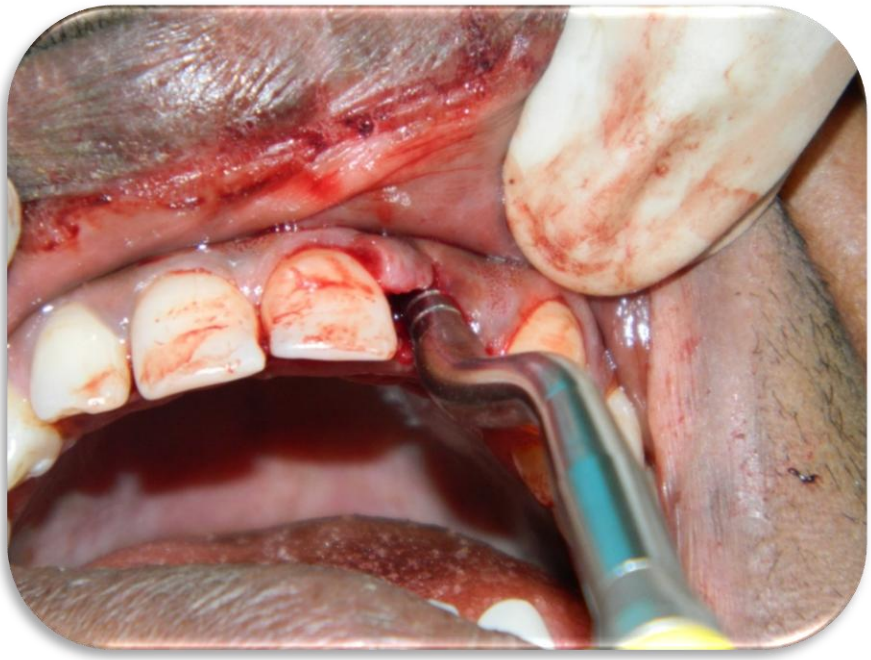
Atraumatic Extraction of 22 using Periotome

Extracted 22

Measurement of Clinical Tooth size



Extracted Socket with intact Buccal & Palatal Bone



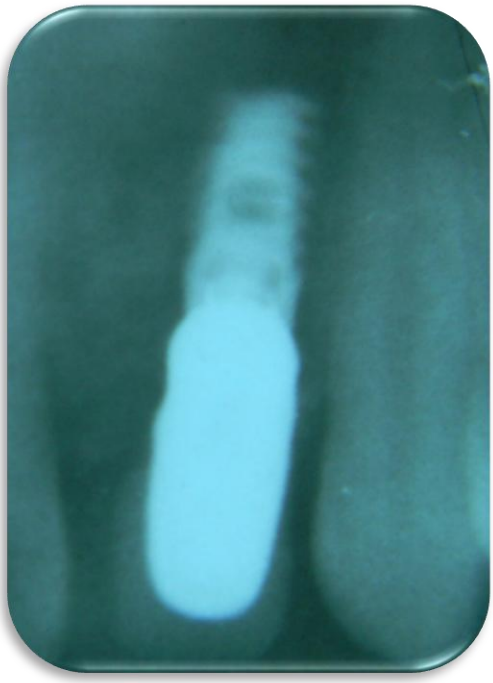
Expansion of socket to desired depth & width using bone expanders

Placement of 4.2/11.5 implant

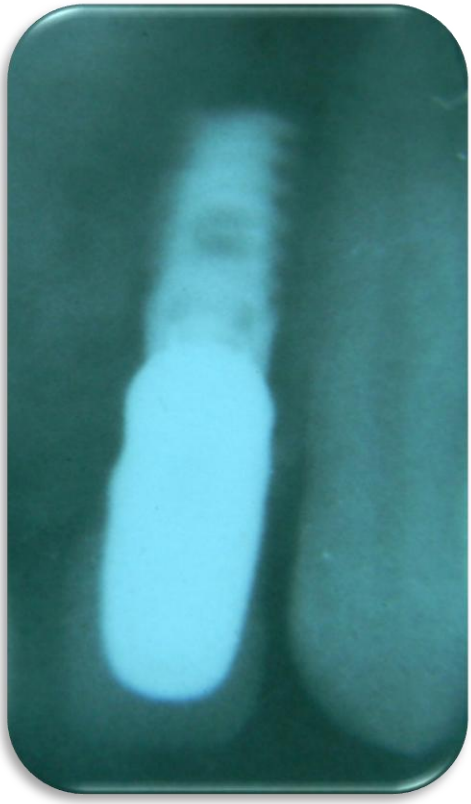
Stability of implant is checked

Healing cap is placed

Closure with 3-0 silk



3rd Month Post operative



6th Month Post operative

RESULTS

The study group was comprised of 11 implants in 10 patients. It consisted of 8 male and 2 female patients. The average age was 25 years old. The 11 implants were placed immediately after extraction by pre operative cone beam computed tomography (CBCT) measurements of the tooth and the socket in which ten implants were placed in the maxilla and one in the mandible. The reasons for extracting the teeth were vertical and horizontal fracture of the teeth, internal and external resorption of the teeth and failed endodontic procedures (table 3). The diameter of the implant ranged from 3.5 to 5 mm. The implant length ranged from 11.5 to 16 mm. The dimension of the implant was selected based on cone beam computed tomography (CBCT).

The accuracy of cone beam computed tomography (CBCT) is assessed by comparing it with the clinical bone and tooth dimensions. The mean (mm) width of the tooth in the cone beam computed tomography (CBCT) is 3.43 and clinically it is 3.5. p value of 0.34 is obtained by independent sample t test. The percentage of accuracy of cone beam computed tomography in assessing the width of the teeth is 98%. (Table 5). The mean (mm) length of the tooth in the cone beam computed tomography (CBCT) is 10.63 and clinically it is 10.73. p value of 0.99 is obtained by independent sample t test. The percentage of accuracy of cone beam computed tomography in assessing the length of the teeth is 99.06% (Table 5).

The mean (mm) labial bone thickness in relation to the teeth in cone beam computed tomography is 1.05 and clinically it is 1.18. The p value is 0.51 which is obtained by Mann Whitney test. The percentage of accuracy of cone beam computed tomography in labial bone thickness is 88.98% (table 6). The mean (mm) of palatal bone thickness in relation to the teeth in cone beam computed tomography is 2.38 and clinically it is 2.45. The p value is 0.79 which is obtained by Mann Whitney test. The percentage of accuracy of cone beam computed tomography in palatal bone thickness is 97.14% (Table 6).

The clinical outcome of immediately placed implants is evaluated by 1^{st}, 3^{rd}, 6^{th} month and 1year postoperatively. The clinical outcome is evaluated by Albrektsson success criteria. In the study no patient had clinical mobility of implants at 1^{st},3^{rd}, 6^{th} month and 1year postoperatively. However 1/11 implants (9.09%) exhibited more bone loss ranging from 1-2mm at 3 months when compared to other implants which exhibited only 0.3mm of marginal bone loss. 1/11 implants (9.09%) had peri- implant radiolucency at 6^{th} month postoperatively. 1/11 implants (9.09%) had peri- implant infection at 1^{st} month postoperatively which is treated by medications (antibiotics). 1/11 implants (9.09%) had pain at 1^{st} month postoperatively(table-4) No patients had dysesthesia. The mean marginal bone loss around implants is 0.5mm.

The postoperative healing was good in all the patients and one patient had implant exposure and dehiscence at 6^{th} month postoperatively. None of the implants exhibited fibrous healing or implant migration. All implants exhibited good osseointegration and were asymptomatic.

Table-1 TOOTH DIMENSIONS

Cone Beam CT			Clinically	
	Width (at middle third of the tooth)	Height (of the tooth)	Width (at middle third of the tooth)	Height (of the tooth)
1.	4.4 mm	12.1 mm	4 mm	12mm
2.	3.3 mm	10.5 mm	3 mm	11mm
3.	2.7 mm	7.8 mm	2 mm	7.5 mm
4.	3.9 mm	12.2 mm	3 mm	12 mm
5.	4.6 mm	14.3 mm	4 mm	13.5 mm
6.	3.2 mm	10 mm	3 mm	11 mm
7.	4.9 mm	13.3 mm	4.5 mm	13 mm
8.	5.2 mm	9.9 mm	5 mm	10 mm
9.	3.2 mm	8.1 mm	3 mm	8 mm
10.	5.2 mm	10.1 mm	5 mm	10 mm
11.	2.6 mm	9.7 mm	2 mm	10 mm

Table-2 BONE DIMENSIONS

Cone Beam CT			Clinically	
Labial bone		Palatal bone	Labial bone	Palatal bone
1.	1.9 mm	3.4 mm	2 mm	4 mm
2.	o.7 mm	2.3 mm	1 mm	3 mm
3.	1 mm	2.6 mm	1 mm	2.5 mm
4.	1.4 mm	2.4 mm	1 mm	2.5 mm
5.	1.2 mm	2.6 mm	1 mm	2.5 mm
6.	1 mm	2.5 mm	1 mm	2.5 mm
7.	0.8 mm	1.7 mm	1 mm	1.5 mm
8.	1.2 mm	3.5 mm	1.5 mm	3.5 mm
9.	1.3 mm	2.4 mm	1.5 mm	2.5 mm
10.	0.9 mm	1.6 mm	1 mm	1.5 mm
11.	0.9 mm	1.2 mm	1 mm	1 mm

Table-3 Patient Name and Reasons For Extraction

S.No:	Patient name	Tooth no.	Reasons for extraction
1.	Shenbagaraj	11	Endodontic failure
2.	Shenbagaraj	21	Endontic failure
3.	Kavipriya	12	fracture
4.	Harish	12	resorption
5.	S.Kanniappan	12	fracture
6.	K. Kanniappan	23	fracture
7.	Bhavani	233	fracture
8.	Gowtham	11	Endodontic failure
9.	Rajeswari	22	Endodontic failure
10.	Hari	22	fracture
11.	Krishnachandra	31	Endodontic failure

Table-4: Clinical Outcome

Symptoms	1st month	3rd month	6thmonth	1st year
Tooth mobility	-	-	-	-
Peri- implant radiolucency	-	-	10%	-
Peri- implant infection	10%	-	-	-
Pain	10%	-	-	-
Dysesthesia	-	-	-	-

Table 5: Comparison of the tooth dimensions measured clinically and using Cone beam CT scan.

Variable	Group	N	Mean (mm)	Std. Deviation	t value	p value*
Width	Cone Beam CT	11	3.93	0.98	0.97	0.34
	Clinical	11	3.50	1.07		
Height	Cone Beam CT	11	10.63	2.04	0.001	0.99
	Clinical	11	10.73	1.89		

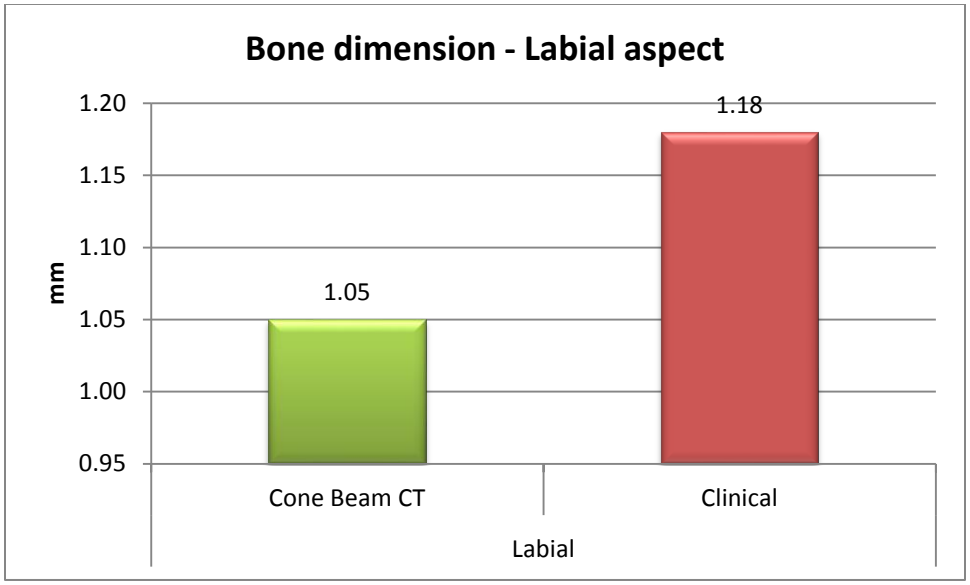
*Independent sample t test

Table 6: Comparison of bone dimension measured clinically and using Cone beam CT scan.

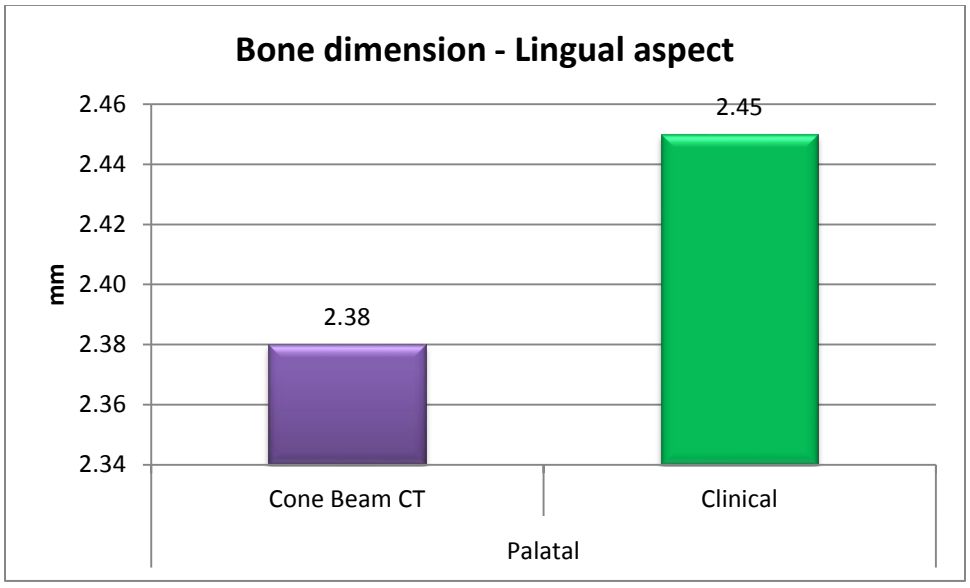
Region	Groups	N	Mean (mm)	Standard deviation	Mean Rank	z value	p value*
Labial	Cone Beam CT	11	1.05	0.46	10.55	-0.72	0.51
	Clinical	11	1.18	0.33	12.45		
Palatal	Cone Beam CT	11	2.38	0.69	11.09	-0.29	0.79
	Clinical	11	2.45	0.87	11.91		

*Mann Whitney test

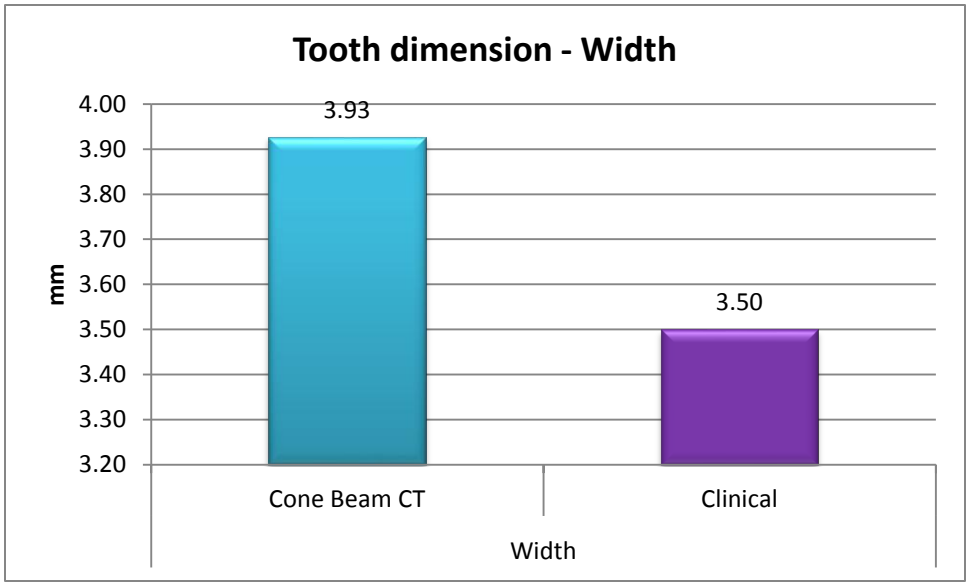
Graph 1: Comparison of bone dimension measured clinically and using Cone beam CT scan on the labial aspect



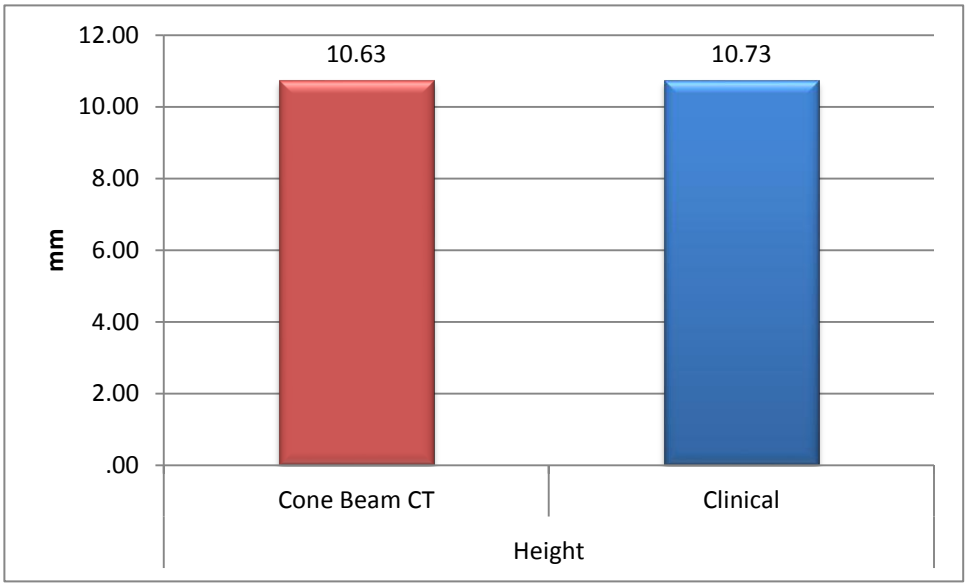
Graph 2: Comparison of bone dimension measured clinically and using Cone beam CT scan on the lingual aspect



Graph 3: Comparison of tooth dimension (Width) measured clinically and using Cone beam CT scan



Graph 4: Comparison of tooth dimension (Width) measured clinically and using Cone beam CT scan



DISCUSSION

The well established treatment option for replacing complete or partial tooth loss is the dental implants. As endoosseous dental implant therapy rapidly becomes the prosthetic standard of care for a vast array of clinical applications, we are faced with the challenge of developing dynamic treatment planning protocols. An obvious area of focus has been to decrease the amount of time necessary to complete implant therapy and to improve esthetics in the esthetic zone.

Three approaches to achieve this goal have dominated clinical research and practice:

1. Immediate placement of an endosseous implant after extraction of a natural tooth.
2. Improving implant surface technology (promotion of quicker healing and better osseointegration), and
3. Delayed/immediate implant loading,

In 1989, Lazzara first reported immediate implant placement at an extraction socket[58]. Immediate implants have become widely accepted despite controversial beginnings and the available literature consistently cites high levels of success ranging from 94- 100 percent on average[61]. Immediate implants provide clinically recognizable benefits which include reduction of morbidity, reduction of alveolar bone resorption, preservation of gingival tissue, preservation

of the papilla in the esthetic zone, and reduction in the number of procedures. To maximize the advantages of these benefits and to minimize implant failure, case selection must be based on sound clinical and research criteria.

In general, immediate dental implant selection criteria are contextually dependent on the unique circumstances that pertain to each individual patient and should reflect the following factors: achieving predictable osseointegration, anatomical considerations, maximizing esthetic results and soft tissue maintenance, restoring function and the surgical technique. Additionally, the criteria tend to reflect the fact that the vast majority of immediate implants are single tooth implant restorations (predominately incisors and premolars), which are site and defect specific. The cases selected in our study for immediate dental implants presented with one of the following conditions; endodontically unrestorable tooth, root fracture, root resorption. The teeth replaced with immediate implants were maxillary and mandibular anteriors.

The second thing to look out for is to achieve predictable osseointegration, Osseointegration is defined as "a direct structural and functional connection between ordered living bone and the surface of a load- carrying implant" and as "direct anchorage of an implant by the formation of bony tissue around the implant without the growth of fibrous tissue at the bone- implant interface". Histological analysis of successful immediate dental implant therapy demonstrates that osseointegration is predictably attainable and efficacious and

requires a minimum of 3-5 mm of intimate bone to implant contact[45.] Bone quality and quantity and surgical technique are predominant clinical determinants that affect primary stability. Initial implant stability is the most critical factor in implant osseointegration[36]. Literature repeatedly points to primary stability is the most important osseointegration determinant. In our study we were able to achieve primary stability in all the 11 cases (100%) which is similar to the study of Lang NP (2007)[37]. Primary stability is achieved when the micro- movement (biomechanical determinant) of the implant- bone interface is below the threshold at which fibrous encapsulation occurs.

Bone quality has been suggested as an important prognostic indicator of dental implant success and is of special importance when considering immediate implants[36.] Lekholm and Zarb's bone type classification is widely accepted and divides bone into four types in decreasing order of density. In our study the site selected for immediate implant placement was maxillary and mandibular anterior region where the bone is of type II or type III density hence a predictable result can be expected. Placement of an immediate implant has the desirable effect of preserving alveolar bone width and height. In our study we have successfully preserved the alveolar width as well as height over a follow up period of six months. When a tooth extracted, predictable bone resorption ensues for six months. A typical defect of such resorption is a loss of crestal bone with a labial concavity. Delayed implant placement may result in compromised esthetics and

function due to lingual placement of the implant. Hence, in such circumstances, immediate implants provide more ideal prosthetic placement and optimizes esthetics, all via the preservation of bone. The ideal extraction site for an immediate implant placement should have little or no periodontal bone loss[45] adequate remaining supporting alveolar bone, adequate sub- apical bone, and dense crestal bone i.e. types II and III bone or desirable and increase the likelihood of success. Chen et al concluded in a review that no significant differences in radiographic crestal bone level or in probing depth at implants placed immediately, delayed, or late relative to tooth extraction were found[16].

The number of remaining osseous walls is an important parameter in case selection criteria. Research consistently demonstrates that the presence of three to four remaining osseous walls is essential to immediate implant success and that implant failure rates significantly increase when this principle is violated[58]. According to Douglass and Merin, a bony defect with two or three missing walls is not suitable for an immediate dental implant. When an immediate implant is placed in a site with three to four remaining osseous walls, the peri - implant defects will eventually show bone fill and will demonstrate a close bone- implant interface[15]. A number of surgical techniques have been proposed to create sufficient bone volume at the implant site. In our study we have taken cone beam computed tomography pre-operatively and tooth dimensions- width and length, bone dimensions labial and palatal bone thickness are measured. Conebeam

computed tomography is being increasingly used for point of service head and neck and dentofacial imaging. This technique provides relatively high isotrophic spatial resolution of osseous structures with a reduced radiation dose compared with conventional CT scans[18]. The first CBCT system became commercially available for dentomaxillofacial imaging in 2001 (NewTom QR DVT 9000: Quantitative Radiology, Verona, Italy). Comparatively low dosing requirements and a relatively compact design have also led to intense interest in surgical planning and intraoperative CBCT applications, particularily head and neck region. The implant dimensions are selected 1 to 2mm larger than the tooth length and width.

In the buccal lingual dimension, an immediate implant site should possess a minimum bone measurement of 4 mm, and the individual plates should be thick enough to engage the implant without undue stress. The bony height of the socket (from the apex of the alveolus to the crest of bone) should demonstrate a minimum bone measurement of 7- 10mm[36,45]. All the cases selected in our study fulfilled the above mentioned criteria. Bone levels beyond the apex (sub- apical) are likewise important, especially if more bone is needed to achieve adequate implant purchase (to facilitate the previously mentioned requirement of 3-5 mm of intimate bone to implant contact). According to some clinicians, 4-5 mm or 3-5 mm of sound bone beyond the apex is necessary to achieve this goal.

Residual extraction site morphology is an important determinant of immediate implant success and can complicate implant positioning. The important aspects of residual extraction site morphology are axial inclinations, root curvature of the extracted tooth and location of the socket apex[45]. Studies have demonstrated that infra- bony defects were fully or partly resolved without intervention of augmentation treatments[41]. Total bone formation occurred in the sockets without the use of membranes or bone grafting[36]. Teeth those have considerable dilacerations, unfavorable axial contours, or mal- positioned apices often results in prosthetically compromised restorations in terms of function and esthetics. Mal positioned teeth are not considered for the study.

As with all implant protocols, one takes into consideration the proximity of structures such as the maxillary sinuses, the mental foramina, mandibular sublingual concavities, and the inferior alveolar neurovascular bundle. In our study the site selected was maxillary,mandibular anteriors and only the anatomic area of concern was nasal floor in the maxilla. It is desirable to have 3-5 mm of sound bone beyond the apex in order to facilitate better osseointegration[36]. Furthermore, this "cushion" of bone is an important guideline to prevent impingement of the aforementioned anatomical structures. Following tooth loss, the alveolar process undergoes a marked resorption and remodeling process. Clinically, a pronounced loss of volume of the alveolar ridge is observed during the first 6 and 12 months following tooth extraction[36,61,12]. Horizontal reductions

of up to 50% (5-7 mm) were observed during the first year following tooth extractions[36,12] Initial thickness of the buccal crestal bone may be a factor in determining the extent of crestal bone resorption during the healing phase. Bundle bone occupies the inner portion of the socket wall and a considerable portion of the marginal ridge segment of the alveolus, the resorption and replacement of this type of bone with new bone results in a pronounced vertical reduction of the bone crest. The vertical dimension of the bone crest is further reduced through resorptive processes at the outer surface of the ridge that is related to flap elevation and the separation of the periosteum from the surface of the mineralized bone. Thus, during the 8- week period of healing following tooth extraction the buccal bone wall suffered an apico- coronal reduction that amounted to anout 2.5 mm.[12] Sites with dehiscence type of defects exhibit significantly greater (up to three times) vertical resorption[16]. In our study we didn't give any incision or flap reflection around the teeth,so that we maintained the periosteal blood supply. According to Douglass and Merin, selected an immediate implant protocol allows for early maintenance of gingival form and greatly facilitates peri- implant gingival tissue esthetics due to maintanence of interdental papillae. Additionally Cavicchia and Bravi considered maintenance/ development of functional and esthetic soft tissue to be an important phase of immediate dental therapy. Using a reference line drawn between the points of emergence of adjacent teeth, Buser et al. described the position of implant shoulder as being in the "comfort" zone for

achieving optimum soft tissue esthetics when positioned 1 mm lingually, and in the "danger" zone when positioned within 1 mm or buccally to this line. In our study all the implants were placed in the comfort zone. At implants in extraction sockets, a larger safety margin should be adopted with the implant shoulder positioned at least 2 mm from the internal buccal socket wall[12]. The success of immediate implants in the esthetic zone can be enhanced further with the use of custom healing abutments and the placement of the implant without elevating a flap which serves to preserve crestal soft tissue and interdental papillae[45]. Lang NP et al in a series of cohort and case- tapered studies have suggested that high predictability of immediate implants with simultaneous bone augmentation can also be achieved with a one- step trans- mucosal healing approach[37].

Surgical technique plays an important role; atraumatic extraction technique is very important for the success of immediate implants and facilitates maintanence of the maximum amount of bone. The periotome helps in separating the periodontal ligament fibres from the tooth, thereby preventing the fracture of the alveolus.

Literature indicates some disagreement about employing immediate implants in infected sites. Opinions vary from removing all residual infection prior to implant placement to the position that moderate infection actually beneficial for immediate implant success. Casap et al suggest elimination of the soft and hard tissues by meticulous debridement and peripheral alveolar

ostectomy. This procedure, combined with pre- and postoperative antibiotics, should eradicate infection and establish a favorable basis for bone healing and osseointegration[47]. Casap's protocol of complete decontamination of extraction socket combined with pre- and postoperative antibiotics. Wagenberg and Ginsburg and Cavicchia and Bravi state that immediate dental implant sites should be free of residual infection[34]. However, Cavicchia and Bravi do concede some level of success if there is no suppuration and say that granulation tissue associated with chronic infection does not contraindicate immediate implant therapy. These authors also point out that more studies are needed to determine the efficacy of immediate implants placed in sites of active infection. Gelb states that residual infection is not a contraindication. He argues that sites with residual infection without active suppuration have increased vascularity and cellular elements supportive of osseointegration, regeneration and repair. Hence, the residual infection may provide a favorable environment. Because of these controversies, we didn't place implant in infected sites.

Screw type implants have superior stability and long- term osseointegration as compared to press-fit/machined surface implants. conical-shaped or tapered implants have shown promising results with failure rates consistent with those observed for standard implants in healed sites and fresh or recent extraction sockets[36]. One of the design objectives of tapered implants for immediate implant placement was a reduced need for additional bone

augmentation procedures also improved primary implant stability is achieved both by the tapered shape and a decreased pitch of the threads[16]. The literature also suggests the use of wide- diameter implants for immediate implants. Wide diameter implants have been used in healed bone and in extraction sockets with success. In our study we have used 5 mm diameter implants in wider sockets, others where we have used 4.2 diameter of implant. One concern of placing wide implants might be that presence of fragile bone walls or concavities in the alveolar bone may lead to dehiscence or fenestrations[36].

While implant placement in the extraction socket is desirable for a number of reasons previously described, there are number of challenges such as unfavorable extraction socket morphology, which is avoided in our study beause we have used pre-operative cone beam computed tomography where we measured the socket, inadequate soft tissue for implant coverage, and bone defects that may present unique challenge to the clinician in the quest for implant placement. Dental implants that are placed immediately into carefully selected extraction sockets have survival rates comparable to implants placed into the healed ridges. The key to implant success is to achieve primary stability. The immediate implant placement provides significant advantages, including fewer surgical procedures, shorter treatment time, and improved esthetics. The greatest advantage which seems to be often implied but rarely mentioned is the enormous psychological benefit this method of treatment offers to the patient. The loss of tooth can be

emotionally difficult for many, whether this stems from the actual loss, the anxiety of undergoing a surgical procedure, or the thought of functioning in the society with the missing tooth or poor replacement. In the case of immediate implants, the patient's loss is simultaneously replaced with little or no need for additional surgery and a long term functional and esthetic restoration can be completed in just a few months. Thus immediate implant placement in dentoalveolar sockets along with pre operative cone beam computed tomography measurements of tooth and alveolar socket seems to be a reliable treatment option offering several advantages to the clinician in terms of preserving hard and soft tissue morphology, and especially to the patients, in terms of functional, esthetic and psychological aspects.

SUMMARY AND CONCLUSION

Following conclusions withdrawn from this study:

1. The cone beam computed tomography measurements of the tooth and alveolar socket are more accurate in immediate implant treatment.
2. The implants placed into the sockets will heal predictably and therefore cause reductions in the number of surgical interventions and in the total span of treatment time.
3. The hard as well as soft tissue integrity is maintained giving higher esthetic results.
4. Clinical outcome of immediately placed implants is well recognized throughout the follow up period. The present studyindicate that undersized drilling technique resulted in good stability of immediately placed implants.

In the present study, we got 98% accuracy in width of the tooth, 99.06% in measuring the length of the tooth, 88.98% in measurement of labial bone thickness and 97.14% in palatal bone thickness in the cone beam computed tomography by comparing clinically.

Since the clinical outcome of immediately placed implants is successful and survival rate is high, hence this study, conebeam computed tomography assisted immediate implant placement can also be included in the modality of treatment of vertically or horizontal fractured or resorbed, or failed endodontic teeth in anterior maxilla and mandible.

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