"CLINICAL AND RADIOLOGICAL EVALUATION OF BASAL BI-CORTICAL SCREW IMPLANTS IN FRESHLY EXTRACTED TOOTH SOCKET"

A Dissertation submitted in
Partial fulfillment of the requirements
for the degree of

MASTER OF DENTAL SURGERY

BRANCH – III

ORAL AND MAXILLOFACIAL SURGERY

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI – 600 032

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PROFESSOR & H.O.D.,
Department of Oral & Maxillofacial Surgery.

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TNGDC&H

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Dept. of Oral and Maxillofacial Surgery,

HEAD OF THE DEPARTMENT
Prof. Dr. C. PRASAD, MDS.
Dept. of Oral and Maxillofacial Surgery,

Prof. Dr. G. VIMALA, MDS.,
Principal,
Tamilnadu Government Dental College & Hospital, Chennai - 600 003.

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I, **Dr. K. SENTHIL GANESH**, do hereby declare that the dissertation titled **"CLINICAL AND RADIOLOGICAL EVALUATION OF BASAL BICORTICAL SCREW IMPLANTS IN FRESHLY EXTRACTED TOOTH SOCKET"** was done in the Department of Oral and Maxillofacial Surgery, Tamil Nadu Government Dental College & Hospital, Chennai 600003. I have utilized the facilities provided in the Government dental college for the study in partial fulfillment of the requirements for the degree of Master of Dental Surgery in the specialty of Oral and Maxillofacial Surgery (BranchIII) during the course period 2017-2020 under the conceptualization and guidance of my dissertation guide, **Assoc.Prof. Dr. K. ARUN KUMAR, MDS.**

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Principal Investigator: Dr.SenthilGanesh.K

Review: New/Revised/Expedited

Date of review: 13.11.17

Date of previous review, if revised application: Not Applicable

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Last but not least I would like to seek the blessings of the almighty without whose grace this endeavor wouldn't be possible.

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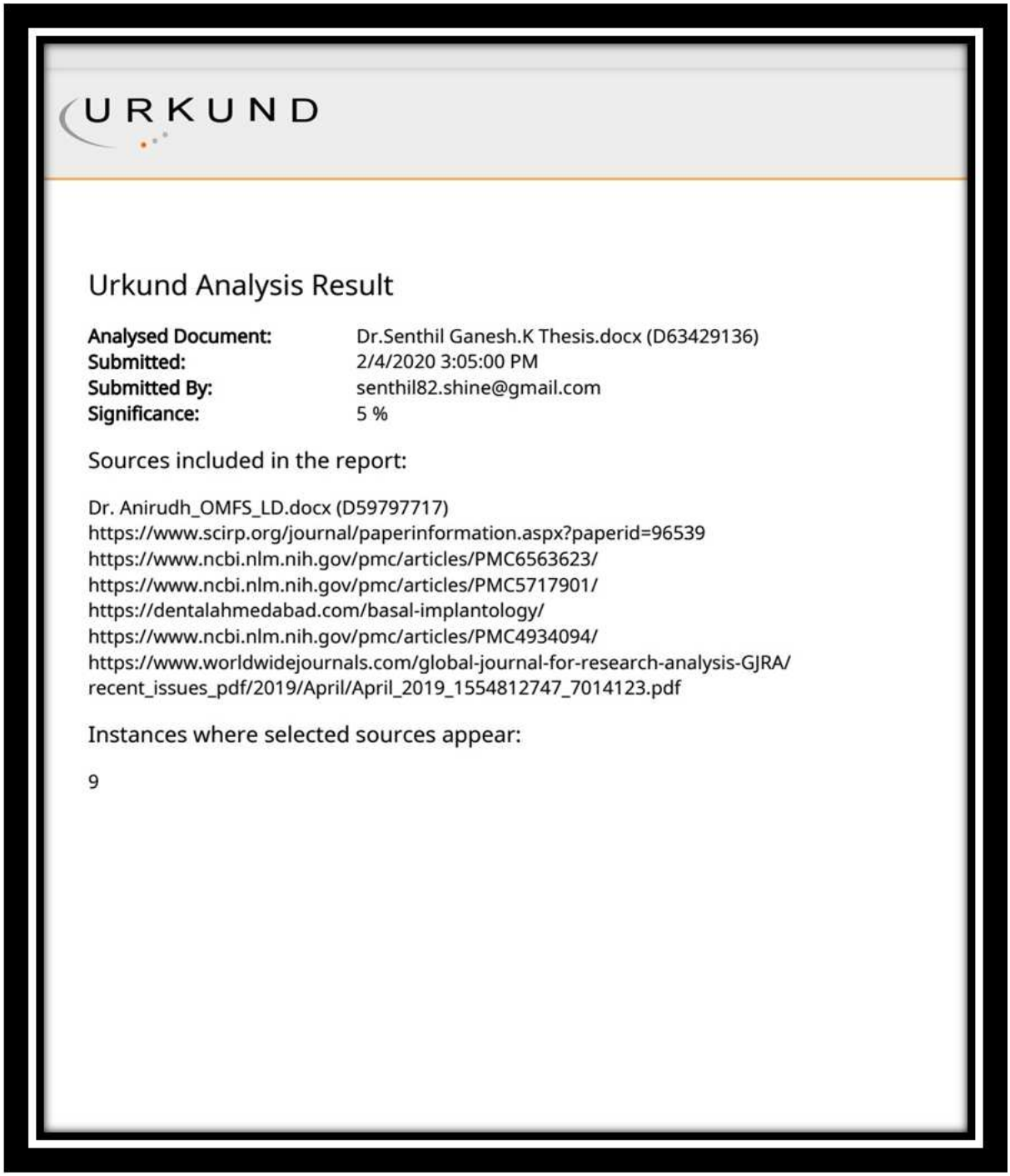

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LIST OF CONTENTS

ABSTRACT

Background: Basal implantology also known as bi cortical implantology or just cortical implantology is a modern implantology system which utilizes the basal cortical portion of the jaw bones for retention of the dental implants**.** The basal bone provides excellent quality cortical bone for retention of these unique and highly advanced implants. As basal implantology includes the application of the rules of orthopedic surgery, the basal implants are also called as "orthopedic implant". The traditional implants use the alveolar bone, this type of bone is lost after teeth are removed and decreases throughout life as function reduces. The basal bone is always present throughout life, it is very strong and forms the stress bearing part of our skeleton. Basal implants can be loaded immediately after immediate placement of the implant in a freshly extracted tooth socket. Basal bi cortical screw implants are flapless implants and are inserted through the gums without giving a single cut, inserted like a conventional implant.

Aims and Objectives:

To evaluate the clinical and radiological parameters of basal bi-cortical screw implants placed in freshly extracted tooth socket based on the following criteria's,

1] Primary stability of the implant at the time of implant placement.

2] Evaluation of pain during implant placement using VAS.

3] Evaluation of bone width and bone height using cone beam computed tomography.

4] Evaluation of bone loss in mesial and distal aspect of the implant using cone beam computed tomography.

Materials and Methods

The study populations are selected from the outpatient section of the Department of Oral and Maxillofacial surgery, Tamil nadu Govt. Dental College and hospital, Chennai. Study design is clinical trial and sampling method is simple random sampling and sample size is 10 implants. Average age of the patient selected 35 years [range 25- 55 years] followed 6, 9 and 12 months. Clinically healthy patient without any systemic disease which could contraindicate a surgical procedure & alter bone healing are selected. Pre-surgically evaluated patients with OPG, CBCT, IOPA.

Results

The study has been conducted in 4 patients with a mean age of 44.5±6.15 and male: female ratio of 70:30 with a total of 10 basal bi-cortical screw implants. The patients were followed for a period of six months and the clinical and radiological parameters were recorded. All the ten basal bi-cortical screw implants were placed in the freshly extracted tooth socket and no evidence of early failures or complications. The post-operative healing of implant surgery was uneventful. The patients showed good compliance and satisfaction as the extracted teeth were replaced at the same day of the surgery with a temporary crown and permanent crown within 72 hours of the surgery. All 10 implants had good primary stability with mean value of 55Ncm. All 10 implants had minimal marginal bone loss and minimal loss in bone width. The post-operative pain was minimal and all 4 patients were comfortable with the procedure.

Conclusion

In our present study of 10 BCS implants placed in 4 patients immediately into freshly extracted tooth sockets and loaded immediately within 72 hours had good primary stability with a mean value of 55Ncm and minimal marginal bone loss and less pain perception. This indicates good success rate of the BCS implants placed in the above patients. Basal bi-cortical screw implants had good success rate in patients with immediate extraction and immediate placement of implants with immediate loading of prosthesis. BCS implants can be placed in severely atrophied jaws without need of bone grafts with good stability where conventional implants could not be placed.

Though we had a good success rates of BCS implants in our present study, the sample size was small and the follow up period was short. Therefore, we require large randomized clinical trials to further evaluate the successful outcome of basal bi-cortical screw implants placed in freshly extracted tooth sockets.

LIST OF ABBREVIATION

BCS	Basal bi-cortical Screw implants
BOI	Basal Osseo -Integrated Implant
CBCT	Cone Beam Computed tomography
IOPA	Intra oral periapical
Ncm	Newton centimeter
OPG	Orthopantomogram
VAS	Visual analogue scale

KEY WORDS

Basal Bi-Cortical Screw Implants.

Primary Stability.

Immediate Implants.

Immediate Loading.

LIST OF TABLES

LIST OF FIGURES

LIST OF GRAPHS

INTRODUCTION

Dental implant is a biologic or alloplastic biomaterial surgically inserted into soft or hard tissue of the mouth for functional and aesthetic purposes[1].

An endosteal implant is an alloplastic material surgically inserted into a residual bony ridge, primarily to serve as a prosthetic foundation[2].

Crestal implants are implants that are placed in the alveolar crest of the jaw bones and their load transmitting direction is vertical but they can be placed in the jaws only when there is adequate vertical bone height and could not be placed in atrophied jaws and also, the time between implant placement and the prosthetic part insertion is too long and requires two surgical phases increasing the cost[3].

Basal bone is the osseous structure of the maxilla and mandible lying below the alveolar bone and the major advantage of basal bone is that the bone is always present throughout the life without resorption and acts as the stress bearing portion of the jaws[4,5].

Basal implants or bi-cortical implants are placed over the basal cortical bones of the jaws, which includes the application of the principles of orthopaedic implants and henceforth provides excellent stability and retention for the dental implants[3,6].

These implants can be immediately placed in a freshly extracted tooth socket and can be immediately loaded. The basal implants are single piece implants in which the implant part and the abutment part are fused as a single unit, in contrast to crestal implants which are two-piece implants[6].

The advantages of basal implants include, the implants can be placed in atrophied jaws, minimally invasive surgical procedure, less cost, and can be loaded immediately with in 72 hours of surgery[7].

Basal bi-cortical screw implants are designed in a manner, that the threads of the implant anchor the second cortical bone and the long polished vertical shaft create a non-infectable connection with the abutment and with the prosthetic part[8].

In this study we are evaluating the clinical and radiological outcomes of basal bi-cortical screw implants placed in a freshly extracted tooth socket with immediate loading.

AIMS AND OBJECTIVES

To evaluate the clinical and radiological parameters of basal bi-cortical screw implants placed in freshly extracted tooth socket based on the following criteria's,

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REVIEW OF LITERATURE

IMPLANTS

Implants are often used as a treatment option for partially or totally edentulous patients (***Pennington J***). The success is directly related to the osseointegration process, and the use of standard implants allows a larger contact area with the bone tissue, which supports the osseointegration process.

Branemark [1982][9] described for the first time the use of dental implants for the rehabilitation of edentulous patients, with prosthetic survival rates at 15 years of 81% for the maxilla and 100% for the mandible. Since then, implants are often used as a treatment option for total or partial edentulous patients being that their success is directly related to the osseointegration process.

The utilization of endosseous dental implants as one of the treatment modalities for tooth loss has increased recently, especially with the introduction of new, improved implant designs and surface topography that support and provide predictable results for both fixed and removable prostheses. For many years, the trend was to use longer and wider implants where possible for successful outcomes, on the basis that these implants provide greater surface area for bone contact which, in turn, increases implants' anchorage and enhances their long-term survival. In addition, longer implants were thought to distribute the occlusal loads more efficiently since they would provide a favourable implant to crown ratio (***Grossmann Y et al 2005***)[10].

Three types of forces may be imposed on dental implants within the oral environment: compression, tension, and shear. Bone is strongest when loaded in compression, 30% weaker when subjected to tensile forces, and 65% weaker when loaded in shear (***Reilly DT;1975***)[10]. An attempt should be made to limit shear forces on bone, because it is least

resistant to fracture under these loading conditions. This is most important in regions of decreased bone density, because the strength of bone is also directly related to its density (***Misch CE 1990***)[11,12].

An implant has a macroscopic body design and a microscopic component to implant design. Both design features (although independent) are relevant for the clinical behavior. The microscopic features are most important during initial implant healing and the initial loading period. The macroscopic implant body design is most important during early loading and mature loading periods.

The surface conditions of an implant may enhance bone-implant contact (BIC) and adhesion qualities to the bone implant interface at initial healing. However, the surface coatings on cylinders do not permit compressive forces to be effectively transmitted to the bone cells, because the micro features of the coating are too small for the cells to be loaded in compression (***Cook SD***). Therefore, the surface area-bone contact percentage is greater during initial healing, but the functional surface area over which loads are effectively dissipated during long term loading to the surrounding bone is most dependent on the macroscopic design of the implant body.

BICORTICAL IMPLANTS

Basal implantology

Yadav et al., (2015)[3], defined Basal implantology also known as bicortical implantology just cortical implantology is a modern implantology system which utilizes the basal cortical portion of the jaw bones for retention of the dental implants which are uniquely designed to be accommodated in the basal cortical bone areas. Basal implantology includes the application of the rules of orthopedic surgery, the basal implants are also called as “orthopaedic implant”

Two types of basal implants, Basal Osseo Integrated [BOI] and Basal Cortical Screw [BCS] designed to utilize cortical bone of the jaws which provides good primary stability. Diameter of 12mm thread diameter screwable implants been developed to place in the freshly extracted tooth socket, **Nair C, Bharathi S., (2013)[6].**

Scortecci et al., (2001)[13], reported that use of calvarial & iliac bone grafts in severely atrophied jaws for implant placement. Mental nerve displacement, and sinus lift procedures are mostly used to overcome the difficulties in anatomical and mechanical conditions which can be avoided in basal implantology.

According to **(Werner and Thomas, 2005)[14]** In anterior maxillary region, four basal implant were placed without open surgical procedure carried out in a single sitting and immediately loaded.

According to **(Narang et al., 2014)[15]**, basal implants provide excellent primary stability along the vertical surface of these implants with no need for corticalization. So, the basal implants are well suited not only for immediate loading but also for immediate placement.

A retrospective study conducted in 394 patients treated with 4570 immediately loaded single piece implants, with average observation of 18.93+8.41 months periods showed a high cumulative implant survival rate of 95.7%. In this study the single piece implants were used using second and third cortical anchorage in contrast to the crestal implants which uses single cortical anchorage. The success rate of the implant depends on the location of the second cortical anchorage it utilizes and the prosthetic construction to which it was connected. Bent implants had better survival rate than the non-bent implants, 98.5% vs 94.5%. The concept of Osseo-fixation anchoring basal implants in the second cortical bone has high success rate and allows functional loading in edentulous jaws compared to trying to achieve Osseo-integration in the first cortical

bone and the underlying spongy bone as in crestal implants. The survival rate of screw-able basal implants anchored to the second or the third cortical bone is independent on the presence of healed alveolar bone along the vertical shaft of the implant. The study gave better results both in the edentulous and partially edentulous jaws as well as in single tooth replacement, **Oleg D, Alexander L., (2019)[15].**

ADVANTAGES OF BASAL IMPLANTS

According to **ihde et al., (2015)[3,7].,** basal implants placement has the following advantages.,

- Immediate loading of prosthesis within 72 hours of implant placement.
- Single piece implants in which implant and abutment are fused, minimizing the failure between the implant and abutment interface.
- Implants takes the support from the basal cortical bone which is the stable bone resistant to resorption and the cortical bone has faster and stable repairing capacity.
- Most often flapless procedure involving minimum bone cutting associated with minimum post-operative edema and rapid healing potential.
- Avoidance of using bone augmentation procedures in severely atrophied jaws and grafting, sinus lift, trans-positioning of nerves etc.
- Better distribution of masticatory loads as the basal cortical bone is highly resistant to resorption.
- Peri-implantitis occurs in the conventional implants due to the rough surface of the implant surface and the interface problems between the multiple parts of the implant, which is eliminated in basal implants as they are single piece smooth surfaced implants.

- Basal implants can be used in medically compromised patients like well controlled diabetics, smokers, chronic destructive periodontitis.
- As elimination of second surgery and bone graft materials, the cost of the treatment is greatly reduced which is acceptable by the patient.

HEALING OF EXTRACTION SOCKET

Bone alterations following tooth extraction

Schropp L et al (2003)[16] in a study on human, reported dimensional changes results in a ridge width reduction of up to 50% during the first year following tooth loss, where two-thirds of the total changes take place within the first 3 months post extraction.

Chen & Buser (2009)[17] while evaluating the clinical and esthetic outcomes of implants placed in post-extraction sites observed that bone modelling in single- tooth extraction sites seems to be localized to the central, mid-facial aspect of the socket wall at 8 weeks post-extraction, while proximal areas are well supported by the periodontal ligament (PDL) of the neighbouring teeth and show no bone loss.

Ten Heggeler JM et al (2011)[18] in a systematic review observed an alveolar bone loss of 2.6–4.5 mm in width and 0.4–3.9 mm in height of healed sockets.

Chappuis et al (2013)[19] in a clinical cone beam computed tomography study of 39 patients, observed a progressive bone resorption pattern in sites with a facial bone wall thickness of 1 mm or less, leading to a median vertical bone loss of 7.5 mm or 62% of the former facial bone height after 8 weeks of healing. In contrast, patients with a thick wall phenotype, showing a facial bone wall thickness of more than 1 mm, displayed only a median vertical bone loss of 1.1 mm or 9%.

Araujo et al (2015)[20] observed that post-extraction dimensional alterations inevitably occur due to the resorption of the bundle bone as a tooth-dependent structure, and to related factors such as a lack of functional stimulus and a lack of vascular blood supply due to the missing periodontal ligament and genetic information.

Misawa M et al (2016)[21] in a study on humans observed that the extent of bone loss following extraction seems to depend on factors such as facial bone wall thickness, angulation of the tooth, and other differences in anatomy at the various tooth sites (66).

SOFT TISSUE ALTERATIONS FOLLOWING TOOTH EXTRACTION

Dimensional soft tissue changes post-extraction have been examined in single tooth extraction sites ***(Chappuis et al, 2015)***[22]**.** Overall, more than 50% of these changes occur very quickly, within 2 weeks of healing. The soft tissue thickness increases significantly depending on the underlying bone dimensions**.** In thick wall phenotypes, the alveolus provides a self-contained bony defect, which favours the ingrowth of progenitor cells from the bony socket walls and the surrounding bone marrow space. In such thick bone wall phenotypes, the soft tissue dimensions on the facial aspect remain unchanged during healing ***(Chappuis et al, 2015)***[22]**.**

This is in contrast to thin bone wall phenotypes, in which the soft tissue dimensions revealed a sevenfold spontaneous increase after healing which was termed spontaneous soft tissue thickening. It may be hypothesized that the rapidly resorbing thin facial bone wall favours facial soft tissue ingrowth due to its high proliferative rate. Subsequently, these soft tissue cells occupy the majority of the available space in the crestal area of an extraction socket defect. A highly vascularized granulation tissue is formed and fibroblasts migrate into the wound ***(Gurtner et al, 2008)***[23].

FLAPLESS TOOTH EXTRACTION:

Tooth extraction is an invasive procedure as it disrupts the vascular structures and damages the soft tissues and the periodontal ligament associated with the tooth **(Cardaropoli et al 2003)[24].**

A volumetric analysis done by **Fickle & Zuhr:(2008)[25],** in beagle dogs, the flapless tooth extraction done, greatly decreases the initial bone loss during the healing period of 4 to 8 weeks.

In cases of immediate implant placement in sockets with thick facial bone wall and planning early implant placement protocols (Type 2, 3) in order to avoid additional bone loss at the superficial bone wall, ***Buser et al (2008)[26] and Hammerle et al (2004)[27]*** recommended a flapless low-trauma tooth extraction approach.

Clinical studies conducted by ***Becker et al (2005)[28]*** and ***Rocci et al (2003)[29]*** recommends flapless surgical procedure prevents marginal bone loss.

An analysis conducted by **Lin et al (2014)[30],** compared the marginal bone loss between the flapless surgical procedures and with the flapped surgical procedures showed no statistically significant difference between the two procedures concluding that the flap design should be chosen for patient comfort, need for access and ridge augmentation, and experience level of the surgeon.

BASAL BONE

Basal bone forms the dental skeletal structure which contains muscle attachments, begins to form in the fetus during teeth development. Alveolar bone first appears when Hertwig's root sheath of the tooth bud evolves **Freeman E, Tencate., (1971)[31].**

Wolff J Berlin., (1892, 1986)[32], states that bone remodels in relationship to the forces applied **(Wolff's law 1892)[32]**. According to **Murray., (1936)[33],** whenever the function of bone is modified, a definite change occurs in the internal & external architecture. Bone needs stimulation to maintain its form and density. **Roberts et al., (1987)[34],** reports that a 4% strain to the skeletal system maintains bone and helps balance the resorption and formation of bone. According to **Carlsson G, Persson G., (1967)[35],** twenty five percent decrease in width of bone during the first year after tooth loss and overall 4mm decrease in height during the first year after extraction with a four-fold decrease in mandible.

A primary reason to consider dental implants to replace missing teeth is the maintenance of alveolar bone. Dental implant placed into the bone serves both as an anchor for the prosthetic device and as one of the better preventive maintenance procedures in dentistry. Stress and strain may be applied to the bone surrounding the implant increases the bone trabeculae and density when implant is inserted and functioning. The overall bone volume is maintained. An endosteal implant can maintain bone width and height as long as the implant remains healthy **Zarb G Schmitt A., (1996)[36].**

BONE DENSITY CLASSIFICATION

Bone density is directly related to the strength of bone before microfracture, **Carter DR., (1976)[37], Rice JC., (1988)[38], Misch CE., (1995)[39]. Misch et al** reported on the mechanical properties of trabecular bone in the mandible, using the Misch density classification.

Bone density classified by number of classifications. **Linkow., (1970)[40]** classified bone density into three categories:

Class I: Evenly spaced trabeculae with small cancellated spaces- ideal bone type.

Class II: Slightly larger cancellated spaces with less uniformity of the osseous pattern.

Class III: Large marrow-filled spaces exist between bone trabeculae.

According to **Linkow** class I bone, the most ideal for implant placement, class II bone is satisfactory for implant placement.

Most acceptable and widely followed bone type classification given by **Lekholm and Zarbs., (1985)**[41]with four bone types.

Lekholm and Zarbs classification

Type I: A homogeneous compact bone

Type II: A thick layer of compact bone surrounding a core of dense trabecular bone of good strength.

Type III: A thin layer of cortical bone surrounding a core of dense trabecular bone of good strength.

Type IV: A thin layer of cortical bone surrounding a core of low-density bone.

Misch., (1988)[42] proposed four density groups based on macroscopic cortical and trabecular bone characteristics independent of the regions of the jaws.

BONE DENSITY	DESCRIPTION	TACTILE ANALOG	TYPICAL ANATOMIC LOCATION
DI	Dense cortical	Oak or maple wood	Anterior mandible
D2	Porous cortical and coarse trabecular	White pine or spruce wood	Anterior mandible Posterior mandible Anterior maxilla
D3	Porous cortical[thin] and fine trabecular	Balsa wood	Anterior maxilla Posterior maxilla
D4	Fine trabecular	Styrofoam	Posterior maxilla

According to **Misch., (1988)[42],** D5 bone exists which is very soft bone with incomplete mineralization and large intertrabecular spaces, and often immature. The bone density may be determined by tactile sensation during the time of surgery, the location and radiographic evaluation.

According to **Friberg, van Steenberg he D, Lekholm U, Misch, (1990,1991,1998)[43-46]** bone density location in the regions of maxilla and mandible is given.

BONE	ANTERIOR MAXILLA	POSTERIOR MAXILLA	ANTERIOR MANDIBLE	POSTERIOR MANDIBLE
D1	0	0	6	3
D2	25	10	66	50
D3	65	50	25	46
D4	10	40	3	1

Bone density can be determined more precisely by computerized tomograms**, Cann CE., (1988)[47], Rothman SLG., (1998)[48]**. CT produces axial images of the patient's anatomy, perpendicular to the long axis of the body. The density is measured in Hounsfield unit. Higher the Hounsfield unit higher the density of bone.

CT DETERMINATION OF BONE DENSITY

D1: > 1250 Hounsfield units

D2: 850 to 1250 Hounsfield units

D3: 350 to 850 Hounsfield units

D4: <150 to 350 Hounsfield units

D5: <150 Hounsfield units

Bone density and Bone-implant contact percentage influences the implant success rate. **Misch., (1990)[45]** noted that Bone-implant contact [BIC] percentage is greater in cortical bone compared to trabecular bone. According to **Misch** D1bone has the highest BIC percentage of 85%, D2 of 65% to 75%, D3 of 40% to 50% after initial healing.

According to **Misch et al., (1995)[46],** bone density is directly related to bone strength before microfracture. From Misch bone to D4 bone. **Bidez and Misch., (1995)**[46]density classification it was found that there is a tenfold decrease in bone strength from D1**,** performed a three-dimensional finite stress analyses on bone volumes and clinical failure was mathematically predicted in D4 bone and some D3 bones under occlusal loads.

Elastic modulus represents the stiffness of a material is directly related to the density of bone, **Rice JC, Cowin SC., (1988)[49].** According to **Misch et al,** elastic modulus in the human jaw to be different for each bone density. He observed very small micro strain difference occurs between D1 bone and implant interface when occlusal stress is applied on the prosthesis compared to D4 which shows greater difference which results in implant failure.

Excess stress at the implant-bone interface results in crestal bone loss and early implant failure after loading. According to **Misch., (1990)[45],** stress contours are different for each bone density. Stress extending farther apically from crest results in implant failure. The stress transfer is less in D1 bone, than the D2, D3 and D4 bone densities.

CLASSIFICATION OF TIMING OF IMPLANT PLACEMENT

Wilson et al., (1993)[50] used the terms immediate, recent, delayed, and mature to describe the timing of implant placement in relation to soft tissue healing.

Mayfield et al., (1999)[51] proposed a classification based on timing of implant placement as,

Immediate – 0 weeks

Delayed – 6 to 10 weeks

Late – 6 months or more

Hammerle et al., (2004)[27] proposed a classification of implant placement into four types:

Type I – in fresh extraction sockets

Type II – after soft tissue coverage (after soft tissue healing) (4 to 8 weeks)

Type III – after soft tissue coverage (after partial bone healing) (12 -16 weeks)

Type IV – Healed socket (>16 weeks)

immediate implant placement (type 1);

early placement with soft-tissue healing (type 2);

early placement with partial bone healing (type 3); and

late placement (type 4)

Esposito et al (2007)[52] introduced terminologies like Immediate implant (In fresh extraction sockets), Immediate-delayed (< 8 weeks post extraction), and delayed (> 8 weeks post extraction) based on timing of implant placement.

IMMEDIATE IMPLANT PLACEMENT

The credit for the first evaluation of immediate implant placement goes to ***Professor Wilfried Schulte., (1978)***[53] from the University of Tubingen in Germany, who introduced the so-called Tubinger Immediate Implant in 1978, which was a ceramic implant made of Al_2O_3.

The advantages of immediate implant placement are:

1. Decrease in the number of surgeries and of the overall treatment time.

2. Ideal implant orientation.

3. Bone preservation in the extraction area**.**

4. Optimum esthetics of the soft tissues.

Systematic reviews by ***Esposito et al., (2010)***[54]and ***Lang et al (2012)***[55] have shown that the survival rate of type 1 implant placement is similar to those with a delayed approach.

Caneva et al (2010)[56] in an experimental study in dogs observed that although a minimum of 1 mm of vertical bone loss can be expected after immediate implant placement, the use of wider implants that have contact with the buccal bone wall increases the vertical bone loss two times.

Romanos et al (2002 & 2003)[57,58] in a histomorphometric analysis observed that Immediate implant loading may stimulate bone formation and thus may influence early stages of osseointegration.

Kan et al (2011)[59] suggested bone resorption following tooth extraction is not reduced by immediate implant placement per se but is influenced by the apicocoronal and buccopalatal position of the implant.

CLASSIFICATION OF IMMEDIATE IMPLANT SITE

Kan et al (2011)[59] Classification of the sagittal root position of the failing tooth in the alveolar bone done by Kan et al; [2011], via cone-beam computed tomography and can be categorized as four different classes.

Class I: The root is positioned against the labial cortical plate.

Class II: The root is centred in the middle of the alveolar housing without engaging either labial or palatal cortical plates at the apical third of the root.

Class III: The root is positioned against the palatal cortical plate.

Class IV: At least two-thirds of the root is engaging both labial and palatal cortical plates.

The authors suggested that it is important for clinicians to recognize cases that are favourable for immediate implant placement and provisionalisation (Class I sagittal root position), cases that are more technique-sensitive and entail additional attention (Class II and Class III sagittal root position) and cases that are contraindicated for immediate implant placement and provisionalisation, requiring augmentation of hard and/or soft tissue before implant placement (Class IV sagittal root position).

PRIMARY STABILITY

Dos Santos et al., (2011)[60], states that Primary stability is mainly influenced by the bone quality at the implantation site, the implant geometry, and the drilling sequence**.** Primary stability can be understood on two levels. First, under small displacements and rotations, (ie) when the bone-implant system is deformed elastically, stability is affected by the cracks generated during drilling and implantation in the surrounding bone. The appropriate mechanical variable is the stiffness of the bone-implant interface. Second, under large displacements and rotations, the bone-implant system is overloaded causing damage that propagates further, and the implant's motion becomes irreversible. Stability is, thus, also affected by the damage state of the bone of peripheral regions that were initially intact after implantation. Eventually, damage accumulates until failure of the bone-implant system. **Grunder et al., (1999)[61],** states that bone quality an important prognostic indicator in immediate implant placement.

Bone apparent density is the primary variable determining bone quality **(Seeman and Delmas, 2006)[62]** and the main determinant of bone strength **(Carter and Hayes, 1976)[37]** and primary stability **(Pommer et al., 2014)[63].** Bone quality depends on the

bone type in which the implants is placed. Most acceptable and widely followed bone type classification given by **Lekholm and Zarbs,** with four bone types.

LEKHOLM AND ZARBS CLASSIFICATION

Type I: A homogeneous compact bone

Type II: A thick layer of compact bone surrounding a core of dense trabecular bone of good strength.

Type III: A thin layer of cortical bone surrounding a core of dense trabecular bone of good strength.

Type IV: A thin layer of cortical bone surrounding a core of low-density bone.

Implantation torque may finally be used to evaluate primary stability, but resonance frequency analysis (RFA) conducted with an ad hoc device such as the Osstell ISQ (Integration Diagnostics AB, **Göteborg, Sweden**) can be used for measuring post-implantation stability (**Ahn et al., 2012; Bayarchimeg et al., 2013; Farré-Pagès et al., 2011; Pommer et al., 2014; Turkyilmaz et al., 2009)**[63-65]**.**

Two limitations can be identified; the clinician does not have an objective assessment of bone quality and 4 RFA only assesses the stiffness of the bone-implant interface (**Sennerby and Meredith, 2008)**[66] without accounting for what occurs under larger deformations.

IMMEDIATE IMPLANTS WITH IMMEDIATE LOADING

Barzilay et al., (1991), Lazzara et al., (1989), Fugazzote et al., (1999)[67-69], conducted experimental studies on animals and concluded osseointegration occurred in implants

placed in freshly extracted tooth sockets. **Garber and Besler., (1995)[26],** demonstrates that minimum 3 to 5mm of intimate bone to implant contact for predictable osseointegration to be achieved.

According to **Barzilay I, Schropp L, Polizzi G (1996,2000,2008)[67,16]**,

Reduced number of surgical appointments,

Reduction of time of edentulism,

Prevention of bone loss and

Preservation of soft tissue architecture are the major advantages of immediate implants.

Cavicchia and Bravi., (1999)[70], Garber and Belser., (1995)[26], states that atraumatic extraction is very important in immediate implant placement success rate and it facilitates maintenance, maximum amount of bone. According to **Cavicchia and Bravi., (1999)[70],** immediate implants should not be loaded immediately, as immediate loading carries a great risk for fibrous encapsulation as the bony defect, lack of osseointegration, apical epithelial migration on to the implant surface and lack of primary bone contact. But **Cooper et al., (2001)[71],** reports 100% success rate at 6 to 18 months after placements of 54 immediate implants with immediate loading protocol.

Mayer et al., (2002)[72], states delayed implant placement results in compromised esthetics and function due to lingual placement of implant as resorption occurs in first six months of extraction creating a labial concavity. According to **Saadown and Landsberg., (1997)[73],** immediate implant success rate is greater in mandible than maxilla as the bone quality and quantity are superior in mandible. **Cornelini et al.,**

(2005)[74], cites that mandibular implant placement success rate is 95% than maxilla which is 92%.

Chang TL., (2006)[75] states that basal implants placed in the dense cortical bone attains high primary stability and can be immediately loaded though the crestal bone loss is more.

Kopp S., (2008)[76] states that placement of dental implants over the fresh extraction sockets are more successful as the cortical walls around the extraction socket are stable at the time of extraction.

Dental implants placed immediately into the extraction socket takes advantages of the healing potential of the bone. **Pedro et al., (2010)[77]**, reported 93.5% survival rate of immediately placed implants for 5year period.

According to **Ihde A., (2013)[3,8]**, basal bicortical screw implants are smooth surface implants with aggressive threads and can be placed in already infected sockets, can achieve excellent primary stability along the vertical surfaces with no need of corticalization with 100% success rate.

Yadav RS., (2015)[3] states dental implants placed in the basal bone can be immediately loaded, as the basal bone never gets resorbed and is the stress bearing portion of our skeleton.

SURGICAL ANATOMY

MAXILLA:

The maxilla or the upper jaw is a hollowed, cuboidal shaped paired bone with its pyramidal base facing medially and separated by the nasal fossa with its septum in the centre, bordered inferiorly and bilaterally by the oral cavity. These borders which forms the outer limits of the maxilla[78].

The maxilla has a three layered mucoperiosteal lining, the Schneiderian membrane or sinus membrane with a thickness varies between 0.3mm to 0.8mm. This mucoperiosteal membrane is in intimate contact with the periosteum, colour varies from red to purple and is elastic in consistency. The clinical importance of this membrane is that the unrepairable membrane perforation limits the maxillary antroplasty procedures for bone grafting and implant placements[78].

The maxillary nerve, the second division of the trigeminal nerve, innervates the maxillary sinus membrane through its branches, superior alveolar branches of the infraorbital nerve, the greater palatine nerve, and the posterolateral nasal nerve. These nerves controls the discharge of the mucous glands of the Schneiderian membrane. The blood supply to the maxilla is through the maxillary and the facial arteries. Venous drainage occurs either anteriorly or anterosuperiorly by the anterior facial vein into the jugular vein or posteriorly by vessels of the maxillary vein. The volume of maxillary sinus varies from 9.5cc to 20cc with average capacity of 14.75cc[79,80].

The maxillary sinus is in close relationship with the maxillary alveolar ridge, associated with second premolars and the first molar teeth. The maxillary 1st and 2nd molar roots are often found in the maxillary sinus. When teeth are lost, the sinus tends to expand into the remaining alveolar bone because of lack of functional stimulation by the teeth

and negative pressure during inspiration. Over time, pneumatization may cause the residual alveolar bone to resorb as a result of continuous expansion of the maxillary sinus along with horizontal and vertical forces[79,80].

In edentulous severely resorbed maxilla's, the floor of the sinus is often found at the level of the crest of the residual alveolar ridge and the bone level approximate the level of the floor of the nasal cavity. The inferior turbinate is located 5mm to 9mm above the nasal floor. An accessory ostium, occurs in 30% to 40% of all sinuses, mostly found between the lower and the middle turbinates[80].

In the anterior maxillary region of resorbed maxilla's, care must be taken with respect to the incisive foramen, found close to the remaining alveolar crest when placing an implant. The incisive canal is found adjacent to the nasal septum, 8mm to 18mm behind the anterior aspect of the floor of the nasal fossa. The septum marks the upper end of the incisive canal, which contains the terminal branches of the nasopalatine nerve, the greater palatine artery, and the Stenson's canal[81]. The incisive canal measures about 8mm to 26mm in length from the oral cavity in adults. The axis of the canal forms an angle between 57degrees to 89.5degrees with a plane through the eye and ear[82].

The oxygen concentration with in the maxillary antrum is approximately 19%, and as low to 9% when the true ostium is closed[82,83]. The mean temperature inside the maxillary sinus is 31degrees Celsius during inspiration and 37degrees Celsius during expiration[81,84]. If the true ostium is open, the air with in the maxillary sinus is completely exchanged after 15 breaths in one minute.

PTERYGOIDS:

The maxillary tuberosity contacts with the anterior pterygoid process and forms the pterygomaxillary fossa. Superior to the pterygomaxillary fossa, pterygomaxillary fissure occurs and opens into the pterygopalatine fossa in which the maxillary artery is present. The maxillary artery divides into posterosuperior alveolar artery, descending palatine artery, sphenopalatine artery and the infraorbital artery. The pterygoid process has two plates, one is laterally placed called lateral pterygoid plate and another is the medial placed called the medial pterygoid plate. Both the plates point downwards and perpendicular to the body and the greater wing of sphenoid. Both the plates form a V-shaped concavity called the pterygoid fossa to which the medial pterygoid muscle gets attached in the inner surface. The inferior belly of the lateral pterygoid muscle attaches to the lateral surface of the lateral pterygoid plate. The implant is placed in this pterygoid region through the maxillary tuberosity, pterygoid process into the pterygoid portion of the maxillary bone, passing the lateral pterygoid plate medially, the pterygoid process posteriorly to avoid the pterygoid fossa.

Care should be taken when placing an implant in the dangerous zone, which can cause severe haemorrhage from the pterygoid muscles and the pterygoid plexus. There is an increased bone density and volume in the pterygomaxillary buttress which transmits the posterior masticatory forces to the skull base from the maxillary tuberosity.

MANDIBLE:

The anterior dentate mandible consists of attached gingiva and alveolar mucosa buccally surrounding the teeth. The inferior portion extends up to the mandibular symphysis, passing through a depression called the incisive fossa to which the levator labii inferiors muscle gets attached[85].

Lingually the anterior mandible is concave with two superior genial tubercles from which the genioglossus muscle gets originates and two inferior tubercles from which the geniohyoid muscle gets originates. Sublingual fossa is found bilaterally which is an oval depression lodging the sublingual salivary glands. Immediately beneath the sublingual fossa, mylohyoid muscle gets attached to the internal oblique line that runs posteriorly, up to the second molars bilaterally.

The mental nerve before exiting from the mental foramen form an anterior loop that runs inferior- medial- lateral or inferior to mental foramen, may extend for 1mm to 7mm anteriorly depending on the size of the mandible[86-89]. The mental nerve exits the foramen, gives 3 branches, anterior, middle and posterior, the mental foramen is usually located slightly inferior towards the border of the mandible. Most commonly the foramen is located around the apex of the second premolar, but can also be found at the apex of the first premolar.

The inferior alveolar nerve, the sensory branch of the mandibular nerve[V3], begins its course as it enters the mandibular canal located approximately at the centre of the ramus at its internal surface. The inferior alveolar nerve runs inferiorly and anteriorly, passing medially and then laterally below the apex and buccally to the roots of molars and premolars until it reaches the mental foramen. At this point there may be considerable variation present on the anterior loop. If the anterior loop shows variation, the inferior

alveolar nerve runs inferiorly to the mental foramen coursing at this point anteriorly and laterally. The course of the inferior alveolar nerve may extend up to 8mm forward, and then the anterior loop runs superiorly, posteriorly and medially to the medial aspect of the mental foramen. The inferior alveolar nerve divides into the incisive nerve and as mental nerve. The mental nerve runs into the mental canal laterally and gives three branches, anterior, middle and posterior upon exiting the foramen.

According to Ritter's studies on radiography the lowest point along the course of the mandibular canal is 5.9mm + 2.2mm[90], when measured from the inferior border of mandible, which is important when performing lateralization of the inferior alveolar nerve during osteotomy of the mandible.

The retromolar area of the mandible is an anatomically important site for dental implants. An implant can be placed in the retromolar area about 5mm distal to the mandibular 3rd molar. The implant gets engaged in the cortical bone, between the mandibular retromolar area and the ascending mandibular ramus, coming from medial to lateral and from superior to inferior with the head of the implant coming out buccally to the buccal tooth crown surface. Care should be taken with the angle of the implant during its placement to avoid directing the bur to the mandibular canal.

MATERIALS AND METHODS

STUDY POPULATION:

- The study populations are selected from the outpatient section of the Department of Oral and Maxillofacial surgery, Tamil nadu Govt. Dental College and hospital, Chennai.

STUDY DESIGN: Clinical trial

SAMPLING METHOD: Simple Random sampling

SAMPLE SIZE: 10 Implants

- Average age of the patient selected 35 years [range 25- 55 years] followed 6, 9 and 12 months.
- Clinically healthy patient without any systemic disease which could contraindicate a surgical procedure & alter bone healing are selected.
- Pre-surgically evaluated patients with OPG, CBCT, IOPA.

DATA COLLECTION: INFORMATION COLLECTED

1. IDENTITY NUMBER:
2. AGE/SEX:
3. OCCUPATION:
4. INCOME:
5. NATIVITY:
6. CHIEF COMPLAINTS AND DURATION:
7. HISTORY OF PRESENTING ILLNESS:
8. PAST MEDICAL HISTORY:
9. DRUGS BEING TAKEN:
10. PAST DENTAL HISTORY:
11. FAMILY HISTORY:
12. CLINICAL EXAMINATION:
13. EXTRA ORAL EXAMINATION:
14. INTRA ORAL EXAMINATION:
15. RADIOGRAPHIC ASSESSMENT:

SELECTION CRITERIA:

INCLUSION CRITERIA:

1. All kinds of situation where two or more teeth have to be extracted and replaced immediately.

2. Conditions where conventional implants cannot be placed immediately after extraction.

EXCLUSION CRITERIA:

1. Cases where bilateral equal mastication cannot be arranged.

2. Medical conditions like recent myocardial infarction, cerebrovascular accident, immune suppression, uncontrolled diabetes.

3. Patient on drugs of concern those used in the treatment of cancers, used in inhibiting blood clotting, bisphosphonates in the treatment of osteoporosis.

EXCLUSION CRITERIA FOR IMMEDIATE LOADING:

1. Bruxism

2. Uncontrolled Diabetes

3. Metabolic diseases

STUDY DESIGN:

1. Obtaining medical history and informed consent.

2. Complete Maxillofacial examination.

3. Extra oral and intra oral examination.

4. Radiographic evaluation:

   Pre- operative: CBCT, OPG, IOPA

   Post- operative: OPG, CBCT

5. Clinical photographs.

6. Pre- surgical preparation.

7. Surgical procedure.

8. Post-operative review

Clinical re-evaluation on the 1st postoperative day, after one week and 1st, 3rd, 6th and 12th months.

PARAMETERS:

Pain: Assessed post-operatively by VAS [Visual Analog Score]

0 - None

1-3- Mild

4-7- Moderate

8-10- Severe

PRIMARY STABILITY:

- Implant stability evaluated by Torque wrench immediately after implant placement.

BONE WIDTH AND BONE HEIGHT:

- Evaluation of bone width and bone height in the surgical area after 6 months using CBCT in millimeters. Bone height measured in all 4 surfaces labial, palatal/lingual, mesial and distal. Measured from crestal to prominent portion of the basal bone.

MESIAL AND DISTAL BONE LOSS:

- Evaluation of bone loss in the mesial and distal aspect of the implant using CBCT in millimeters.
- Bone loss calculated in 6^{th} month after implant placement.

ARMAMENTARIUM:

- Mouth mirror
- William's periodontal probe
- Dental tweezers
- Surgical gloves
- Disposable mouth mask and head cap
- Local anesthetic solution

- Periotome
- Extraction forceps
- Bard parker blade No. 15 and handle – straight no:3
- Periosteal elevator
- Straight and curved scissors
- Physio dispenser
- Basal bicortical screw Implant surgical kit
- Surgical handpiece
- Saline and irrigation syringe
- Metal suction tip
- Basal bicortical screw implant of specified size
- Needle holder
- Adson's tissue forceps
- Metal scale
- Sterile cotton and spirit
- Tourniquet
- 5ml &10 ml syringes
- 3-0 vicryl

BASAL BICORTICAL SCREW IMPLANT KIT:

- Pilot drill
- Calibrated twist drills of size 2mm
- Calibrated twist drills of size 2.5mm
- Insertion tools
- Rachet
- Torque wrench

BCS IMPLANT DESIGNS

FIG: 1

BCS SEQUENCE DRILLS

PATH FINDER DRILLS **TWIST DRILLS**

FIG:2

FIG:3

ARMAMENTARIUM I

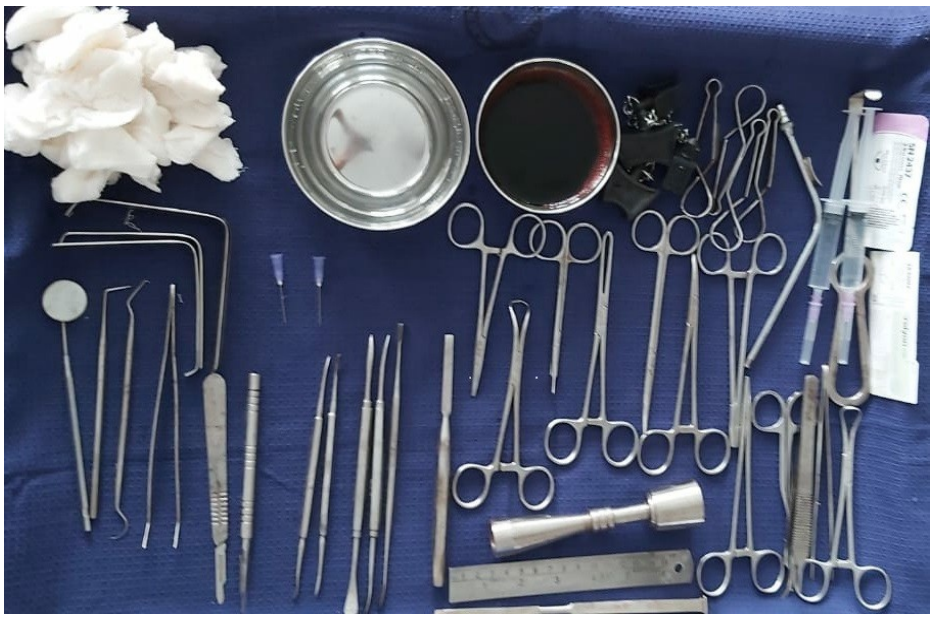


FIG:4

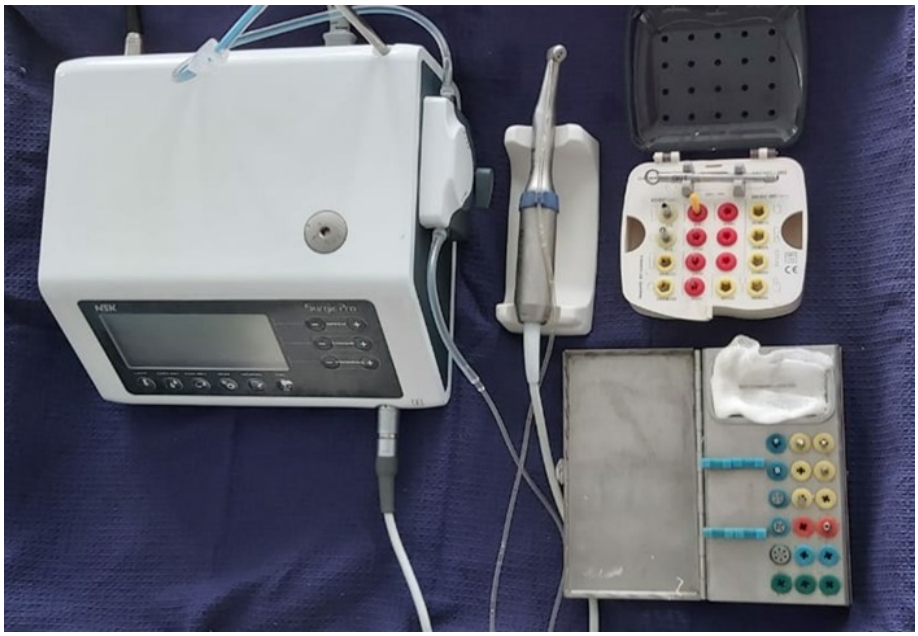


FIG:5

SURGICAL TECHNIQUE

The surgical procedure is performed under strict aseptic condition and with lignocaine local anaesthetic injection after giving a test dose. The tooth or teeth to be replaced should be extracted under minimal trauma to both the soft tissue and bone with periotome and extraction forceps. The socket should be evaluated and prepared for implant placement. Osteotomy procedure done initially with pilot drill [depth or path finder drill] followed by sequential order of calibrated twist drills of size 2mm and 2.5mm to place the implant in the basal bone. BCS implant of appropriate size and length is placed in to the socket with insertion tool manually and with rachet until it is seated firmly in the second cortical region. The implant should rigidly fix to the basal bone. The initial primary stability is measured using a torque wrench. Implant abutment head is bent along the neck of the implant for achieving parallelism and adequate space between implants and tooth for prosthetic replacement. Irrigation is done with betadine and saline. A 3-0 vicryl suture is used to suture the flaps if necessary. Post-operative instructions given to the patient. After the surgical procedure impressions are taken with silicon impression material and the Implants are loaded with fixed prosthesis within 72 hours.

POST-OPERATIVE PROCEDURES:

In the first post-operative day, metal try-in was made.

During second post-operative day, inter-maxillary relationship made and adjusted.

During the third post-operative day, final permanent metal ceramic bridge fixed using fuji plus cement.

Regular follow-up done.

Post insertion instructions to follow symmetrical chewing habits and to have soft diet.

Mild occlusal adjustments done, for phonetic issues.

All the patients were followed up at 1 week, 1,3,6 and 12 months.

CASE-1

Name: Mr. Joseph **Age:** 52 yrs. **Sex:** Male. **OP No.: 519297.**

Occupation: Labour.

Address: Chennai. **Phone Number: 8754420077.**

CHIEF COMPLAINTS AND DURATION: C/O pain in left lower back tooth region for past 1 week and shaking of lower front teeth region for past 1 month.

PAST MEDICAL HISTORY: No relevant history.

PAST DENTAL HISTORY: H/O Extraction.

FAMILY HISTORY: No relevant history.

PERSONAL HISTORY: No relevant history.

a) Oral Hygiene Practices: poor.

b) Habits: Nil.

Extra-Oral Examination: Mouth opening adequate, B/L condylar movements palpable.

Intra-Oral Examination: Edematous red gingiva, generalized plaque & calculus, Grade II mobility 31,32,41,42,36.

PROVISIONAL DIAGNOSIS: Chronic periodontitis 31,41,32,42,36.

FINAL DIAGNOSIS: Chronic periodontitis 31,32,36,41,42.

TREATMENT PLAN: ↓LA 31,32,41,42 Teeth extraction &

BASAL IMPLANT-BCS type implant placement.

TREATMENT DONE: ↓LA 31,32,41,42 Teeth extraction done.

BASAL IMPLANT-BCS type implant placement done in 32,42. extraction sockets. Impression taken with condensation silicon. Metal try in done the next day. Metal ceramic prosthesis placed within 72 hours.

CASE-2

Name: Mrs. Geetha **Age:** 45 yrs. **Sex:** Female **OP No.: 570176.**

Occupation: Executive in Private concern.

Address: Chennai. **Phone Number: 8939302271.**

CHIEF COMPLAINTS AND DURATION: C/O shaking upper left and lower front teeth region for past 3 months.

PAST MEDICAL HISTORY: No relevant history.

PAST DENTAL HISTORY: No relevant history.

FAMILY HISTORY: No relevant history.

PERSONAL HISTORY: No relevant history.

a) Oral Hygiene Practices: Good.

b) Habits: Nil.

Extra-Oral Examination: Mouth opening adequate, B/L condylar movements palpable.

Intra-Oral Examination: Grade II mobility 23,31,41, 42.

PROVISIONAL DIAGNOSIS: Chronic periodontitis 23,31,41, 42.

FINAL DIAGNOSIS: Chronic periodontitis 23,31,41, 42.

TREATMENT PLAN: ↓LA 23,31,41, 42 teeth extraction &

BASAL IMPLANT-BCS type implant placement.

TREATMENT DONE: ↓LA 23,31,41, 42 teeth extraction done.

BASAL IMPLANT-BCS type implant placement done in 23,31,42. extraction sockets. Impression taken with condensation silicon. Metal try in done the next day. Metal ceramic prosthesis placed within 72 hours.

CASE-3

Name: Mr. Hema Nathan **Age:** 38 yrs. **Sex:** Male **OP No.: 590776.**

Occupation: Police officer.

Address: Chennai. **Phone Number: 9498197799.**

CHIEF COMPLAINTS AND DURATION: C/O shaking of lower front teeth region for past 3 months.

PAST MEDICAL HISTORY: No relevant history.

PAST DENTAL HISTORY: No relevant history.

FAMILY HISTORY: No relevant history.

PERSONAL HISTORY: No relevant history.

a) Oral Hygiene Practices: Good.

b) Habits: Nil.

Extra-Oral Examination: Mouth opening adequate, B/L condylar movements palpable.

Intra-Oral Examination: Grade II mobility 31,32,41,43, missing 42.

PROVISIONAL DIAGNOSIS: Chronic periodontitis 31,32,41,43.

FINAL DIAGNOSIS: Chronic periodontitis 31,32,41,43.

TREATMENT PLAN: ↓LA 31,32,41,43 teeth extraction &

BASAL IMPLANT-BCS type implant placement.

TREATMENT DONE: ↓LA 31,32,41,43 teeth extraction done.

BASAL IMPLANT-BCS type implant placement done in 32,43 extraction sockets. Impression taken with condensation silicon. Metal try in done the next day. Metal ceramic prosthesis placed within 72 hours.

CASE-4

Name: Mr. Kadar Moiden **Age:** 46 yrs. **Sex:** Male **OP No.: 583290.**

Occupation: Auto driver.

Address: Chennai. **Phone Number: 8667209096.**

CHIEF COMPLAINTS AND DURATION: C/O shaking of lower front teeth region for past 3 months.

PAST MEDICAL HISTORY: No relevant history.

PAST DENTAL HISTORY: No relevant history.

FAMILY HISTORY: No relevant history.

PERSONAL HISTORY: No relevant history.

a) Oral Hygiene Practices: poor.

b) Habits: Heavy coffee drinker.

Extra-Oral Examination: Mouth opening adequate, B/L condylar movements palpable.

Intra-Oral Examination: Generalized plaque & calculus, generalized stains present. Grade II mobility 31,32,41,42,43,44.

PROVISIONAL DIAGNOSIS: Chronic periodontitis 31,32,41,42,43,44

FINAL DIAGNOSIS: Chronic periodontitis 31,32,41,42.43,44.

TREATMENT PLAN: ↓LA 31,32,41,42,43,44 teeth extraction &

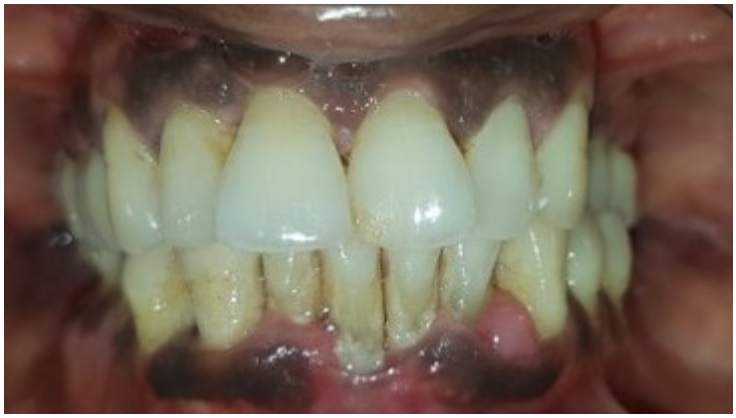
BASAL IMPLANT-BCS type implant placement.

TREATMENT DONE: ↓LA 31,32,41,42,43,44 teeth extraction done.

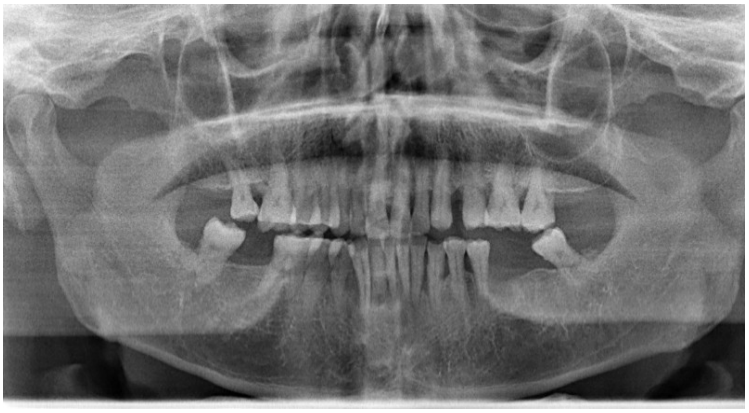
BASAL IMPLANT-BCS type implant placement done in 32,41,44 extraction sockets. Impression taken with condensation silicon. Metal try in done the next day. Metal ceramic prosthesis placed within 72 hours.

CASE-1

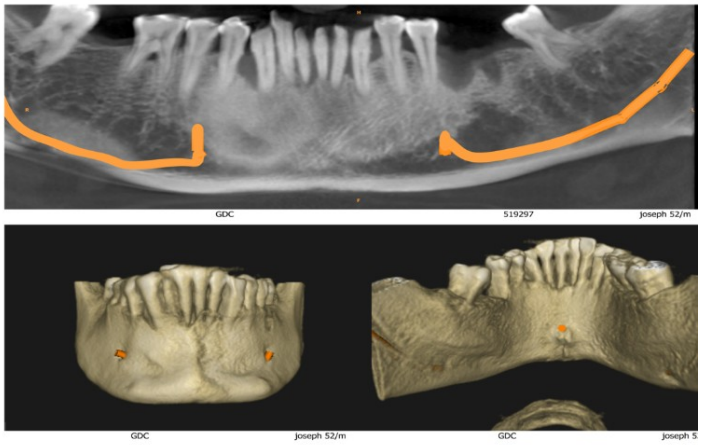
Picture 1: Clinical photo Pre-operative



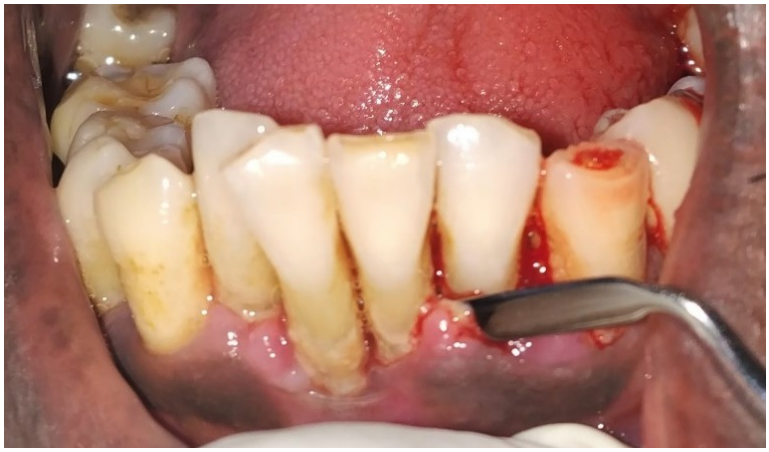
Picture 2: Pre-operative OPG



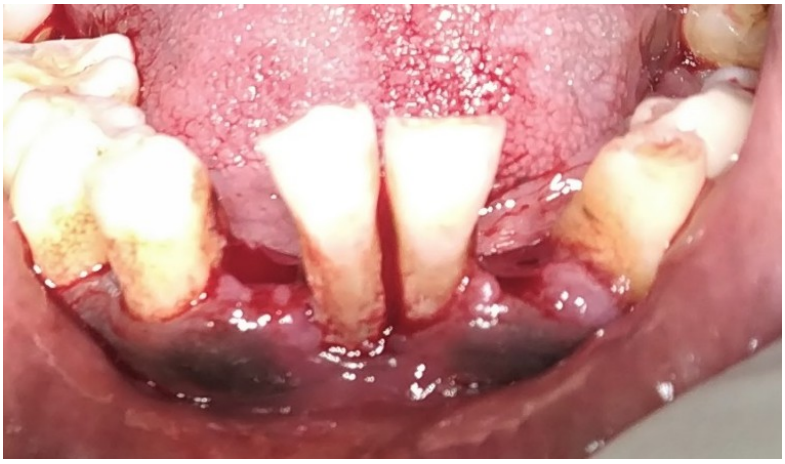
Picture 3: Pre-operative CBCT



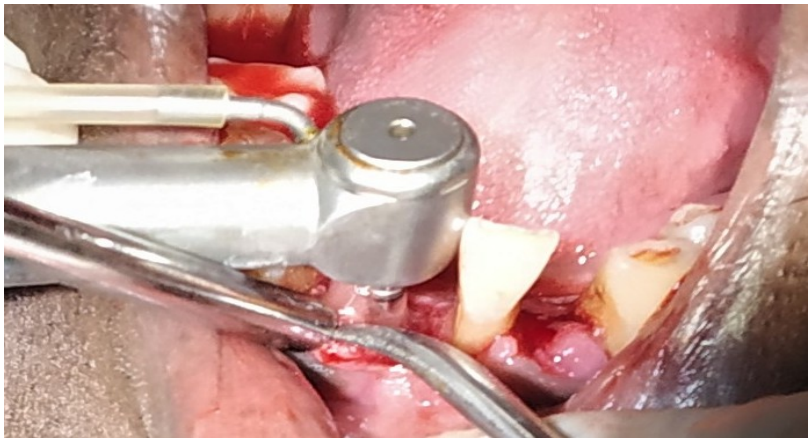
Picture 4: Intra-operative



Picture 5: Intra-operative

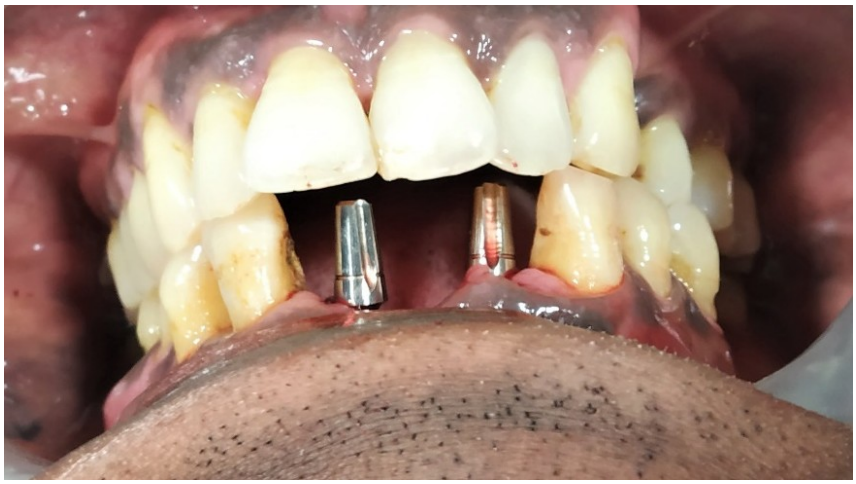


Picture 6: Intra-operative

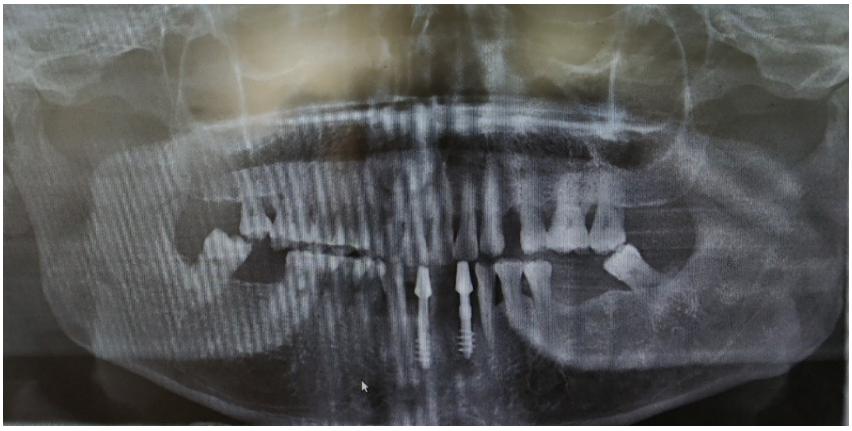


Picture 7: Intra-operative

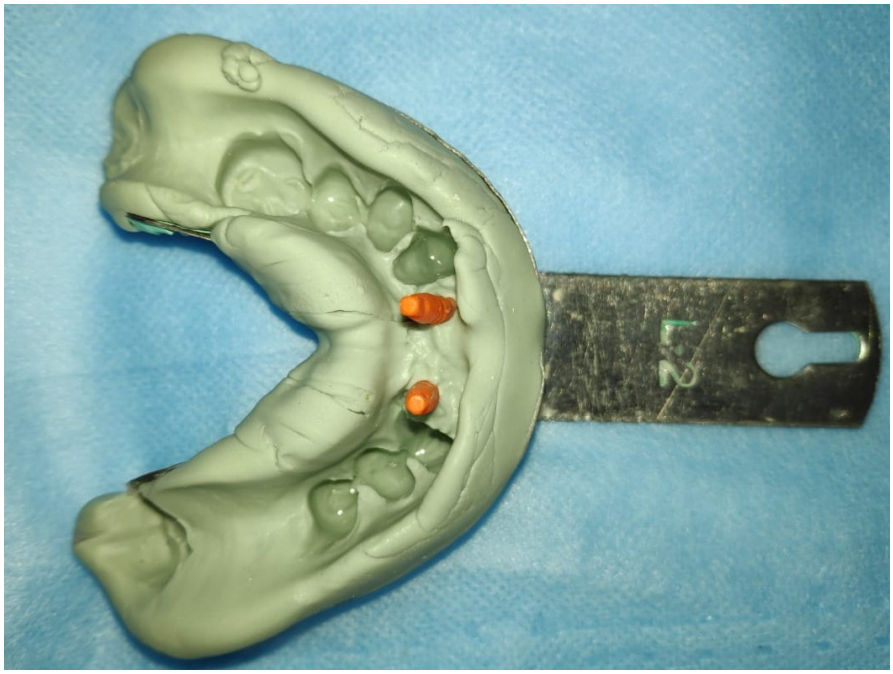
Picture 8: After implant placement



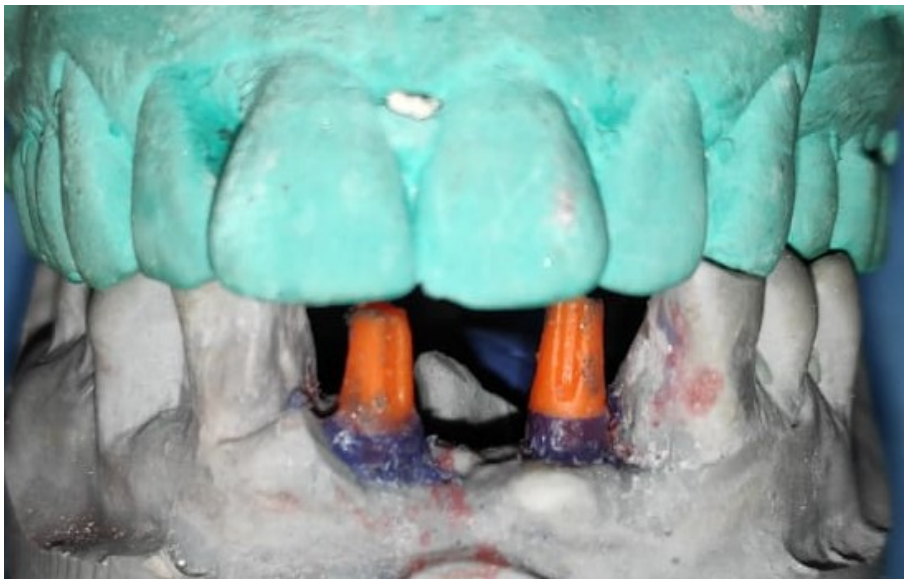
Picture 9: post- operative OPG



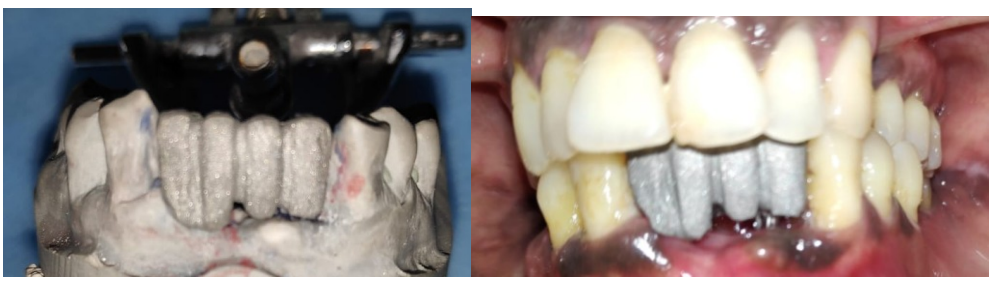
Picture 10: Impression with implant analogue



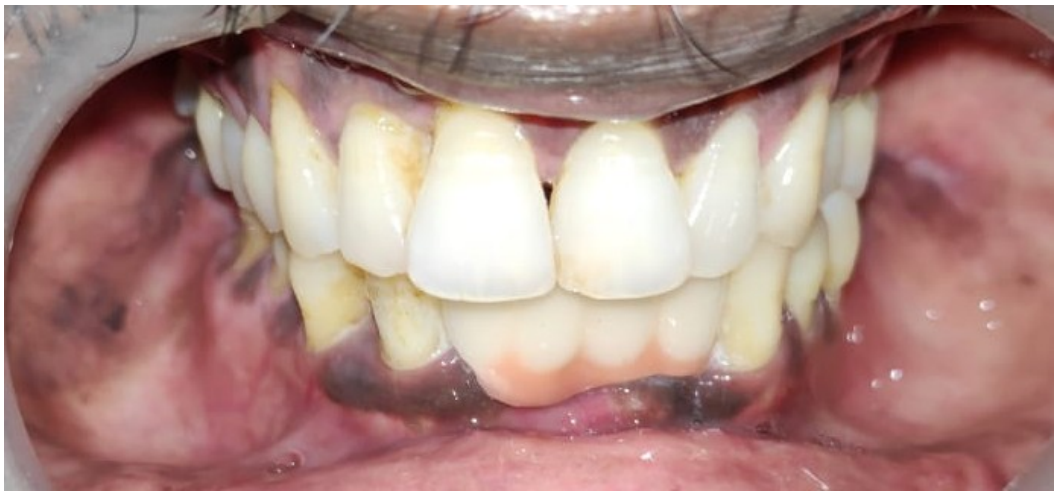
Picture 11: Model with implant analogue



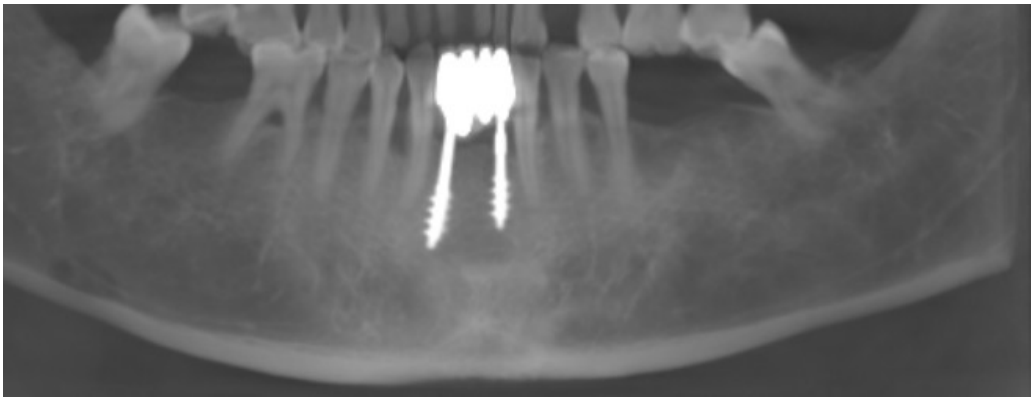
Picture 12: Metal try in



Picture 13: After Prosthesis placement

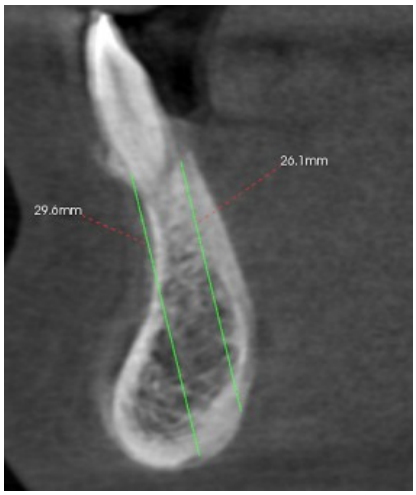


Picture 14: OPG – 6 months post-operative

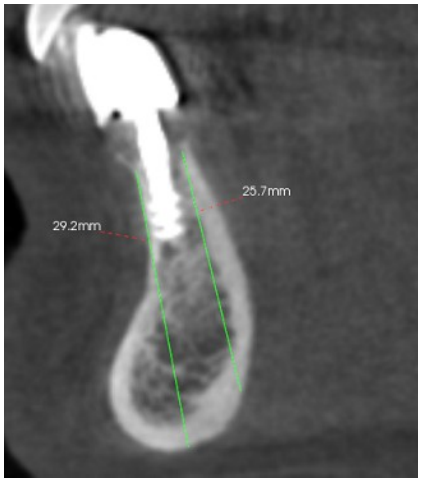


CBCT measurements: Pre-operative and 6months Post-operative (Bone height)

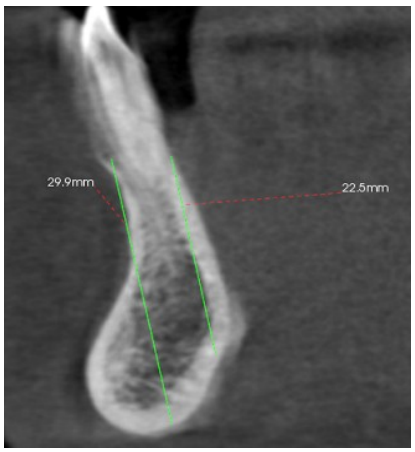
Pre-operative 32



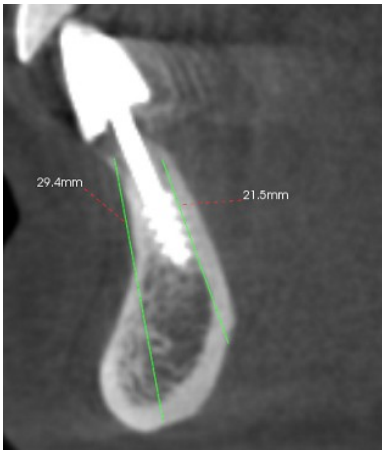
Post-operative 32 (6months)



Pre-operative 42

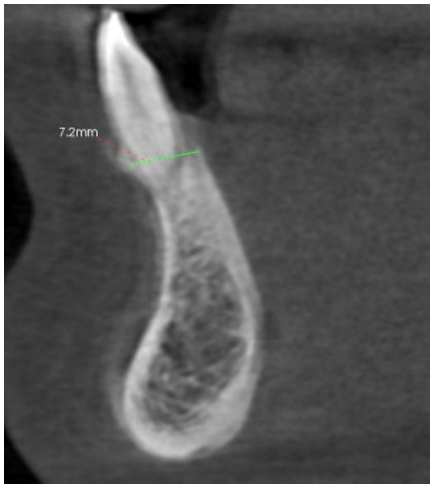


Post-operative 42(6months)

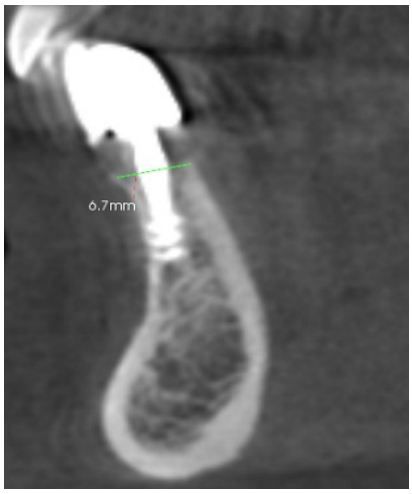


CBCT measurements: Pre-operative and 6months Post-operative (Bone Width)

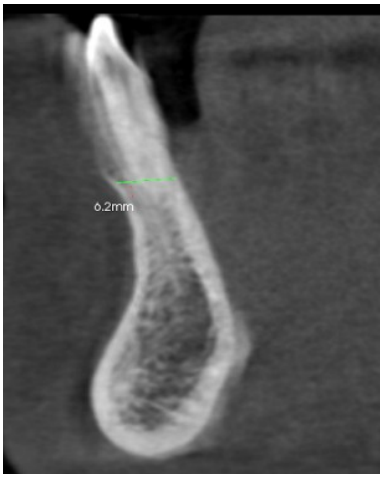
Pre-operative 32



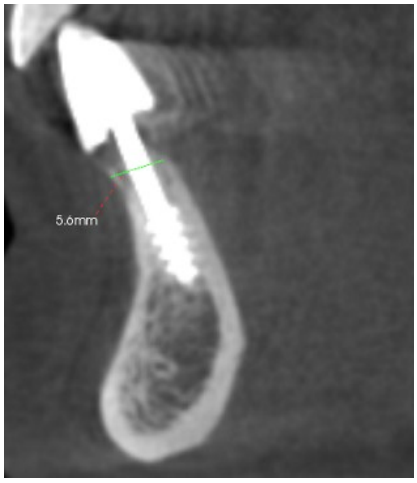
Post-operative 32 (6months)



Pre-operative 42

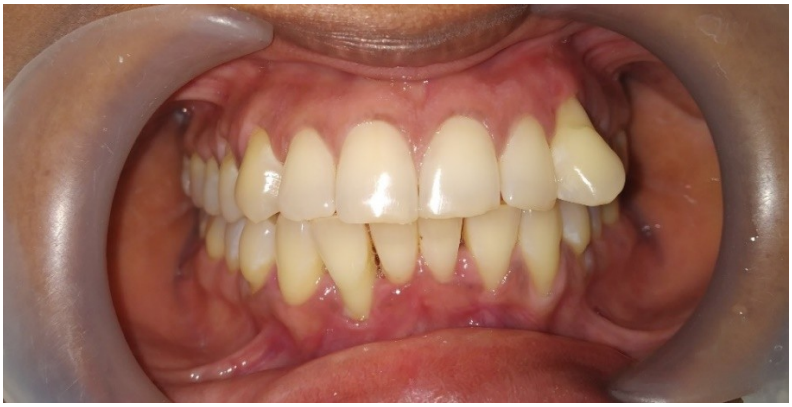


Post-operative 42(6months)

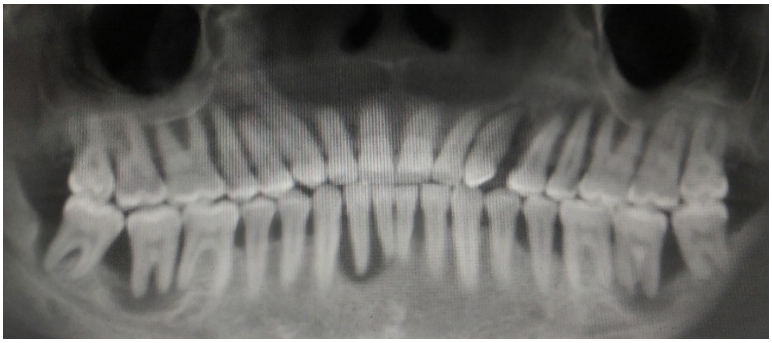


CASE-2

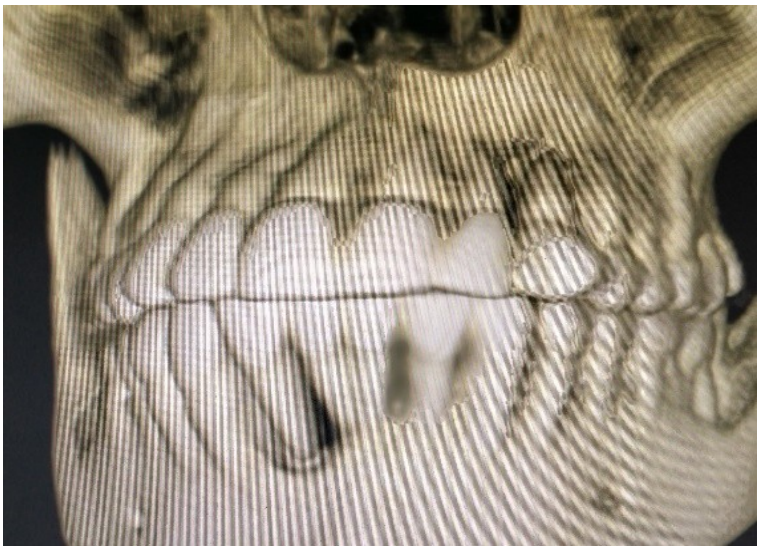
Picture1: Clinical photo Pre-operative



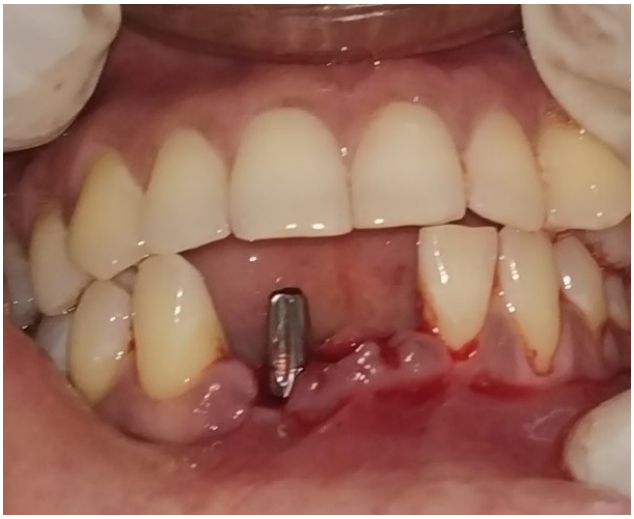
Picture 2: Pre-operative OPG



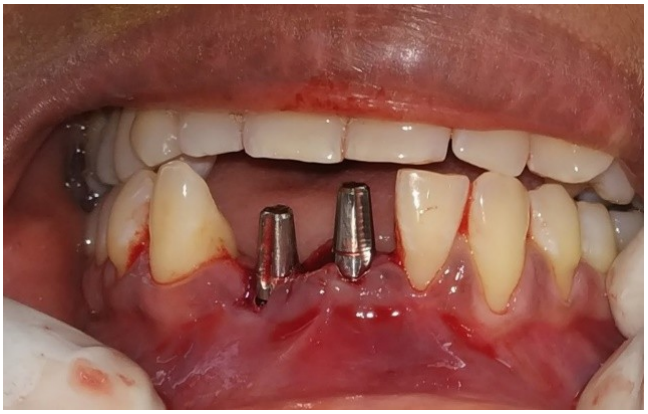
Picture 3: Pre-operative CBCT



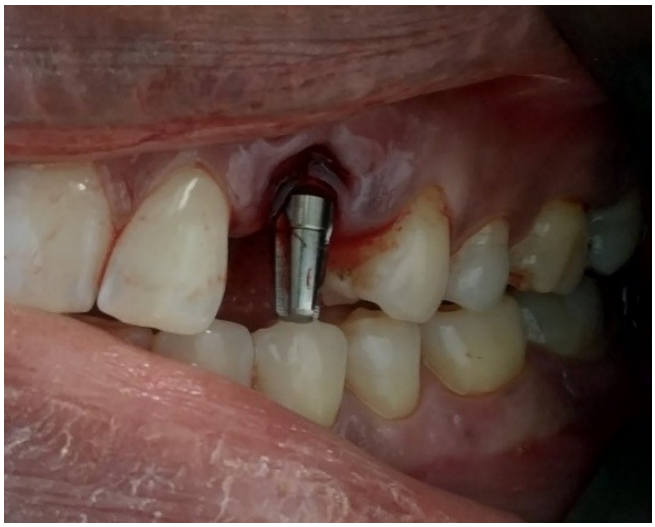
Picture 4: Intra-operative



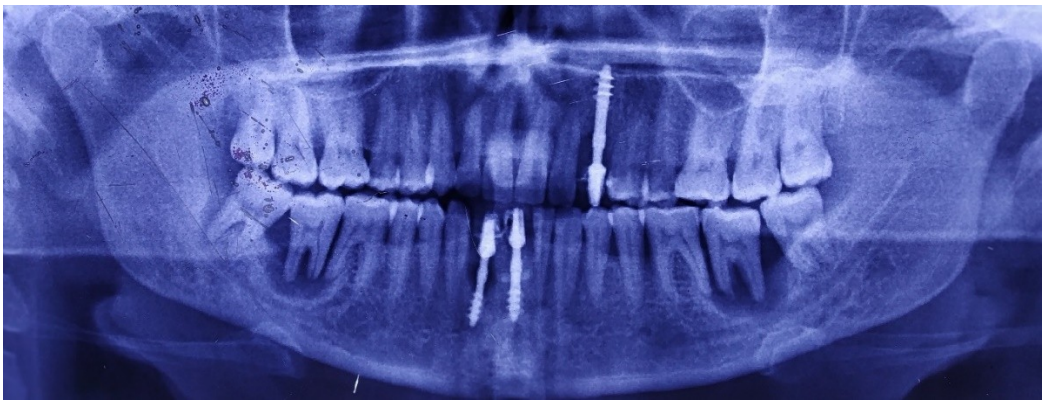
Picture 5: Intra-operative



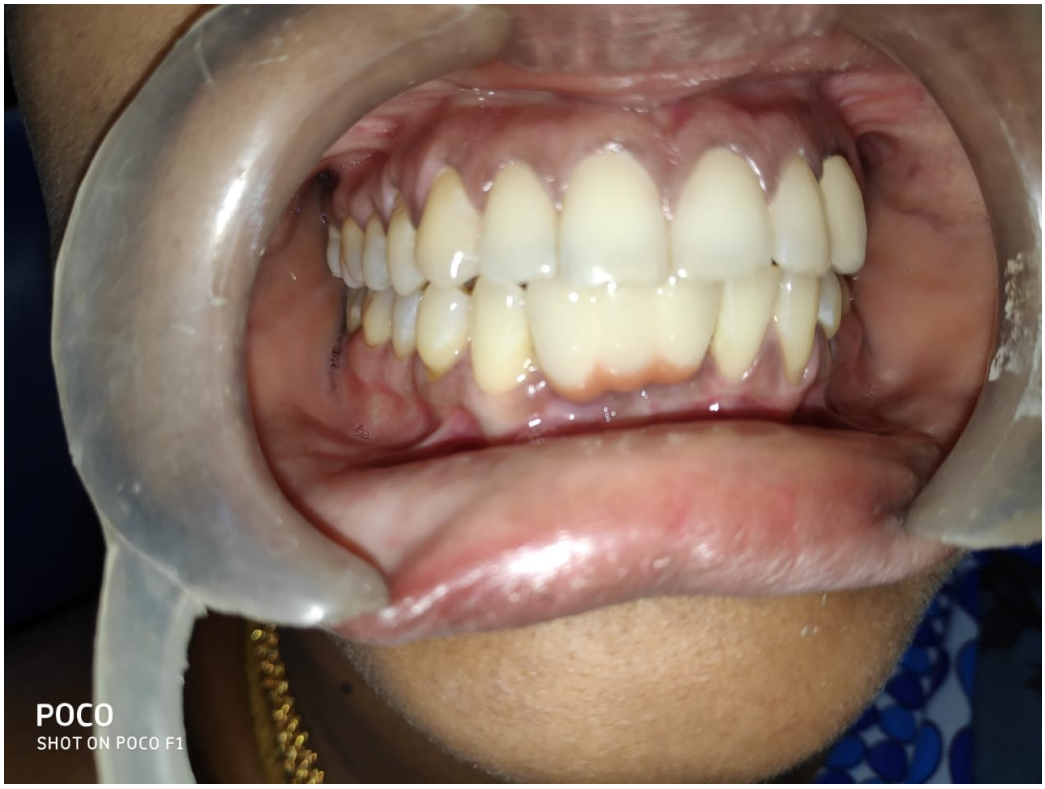
Picture 6: Intra-operative



Picture 7:Post- operative OPG:

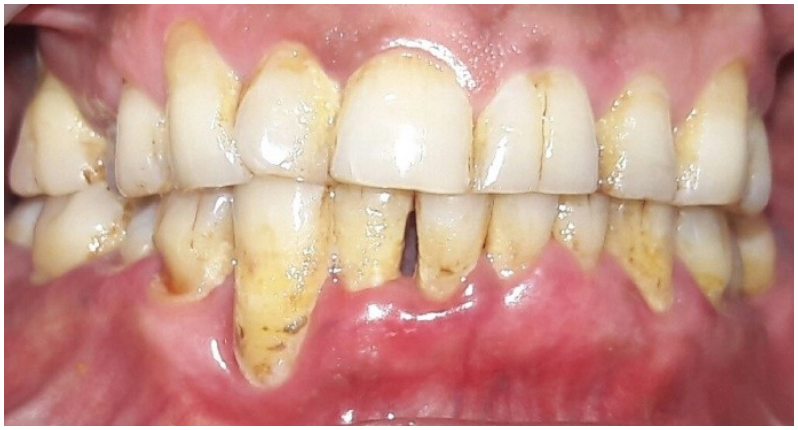


Picture 8: After Prosthesis placement

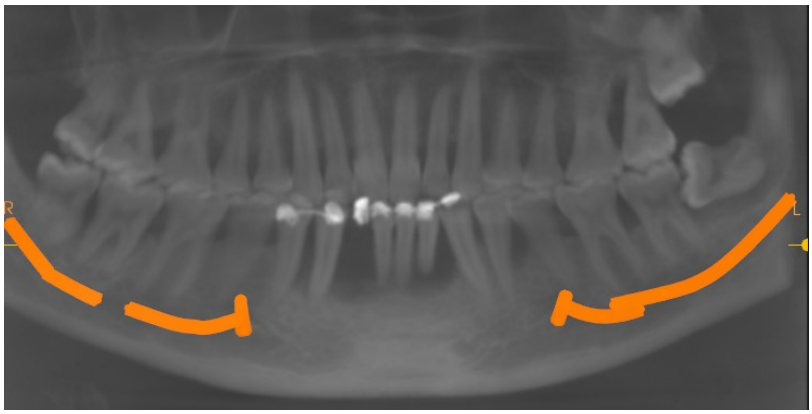


CASE-3

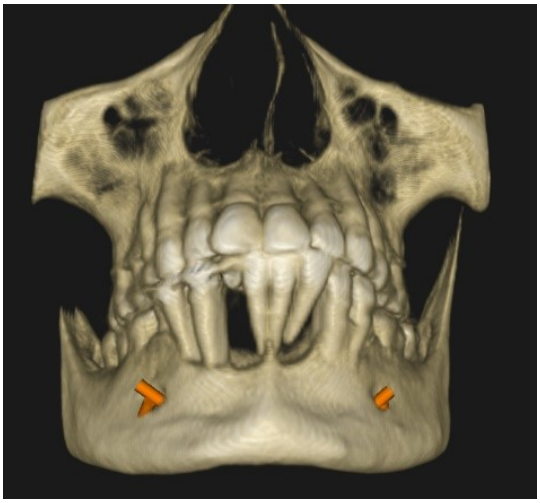
Picture 1: Clinical photo Pre-operative



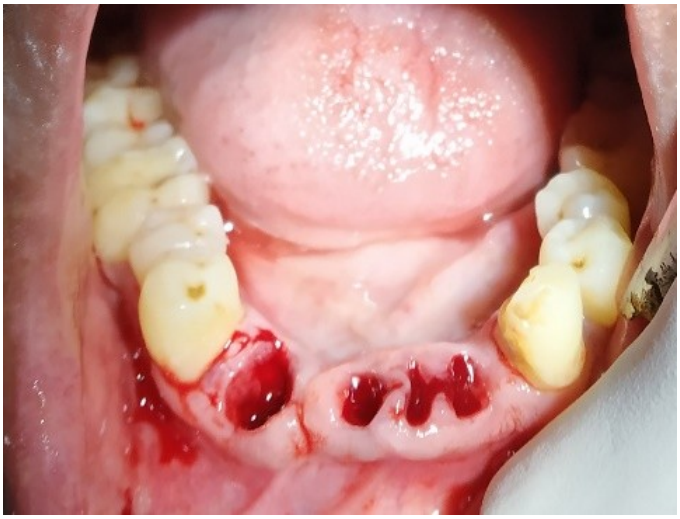
Picture 2: Pre-operative OPG



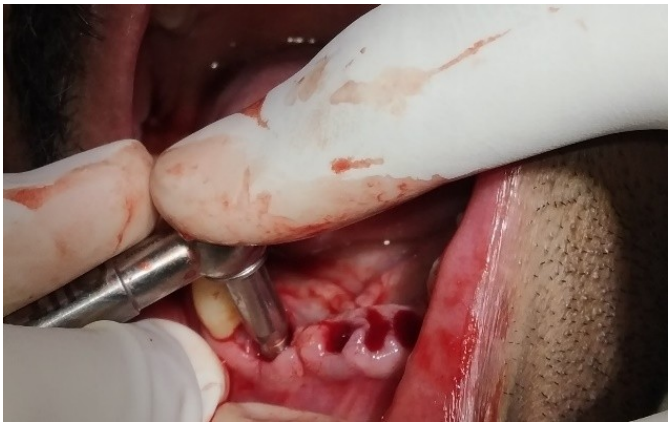
Picture 3: Pre-operative CBCT



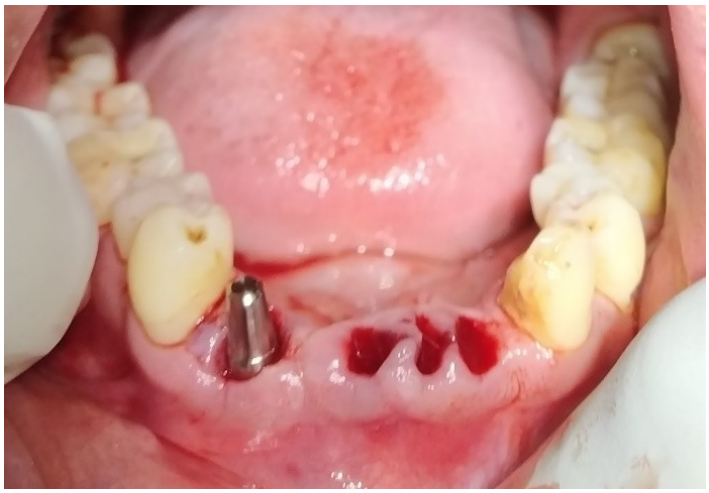
Picture 4: Intra-operative



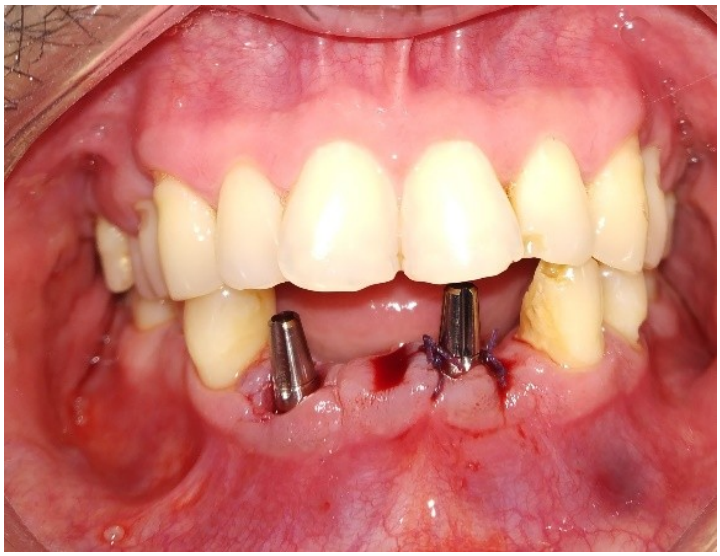
Picture 5: Intra-operative



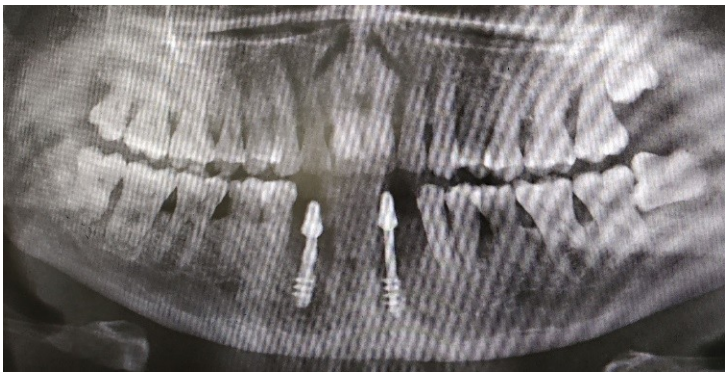
Picture 6: Intra-operative



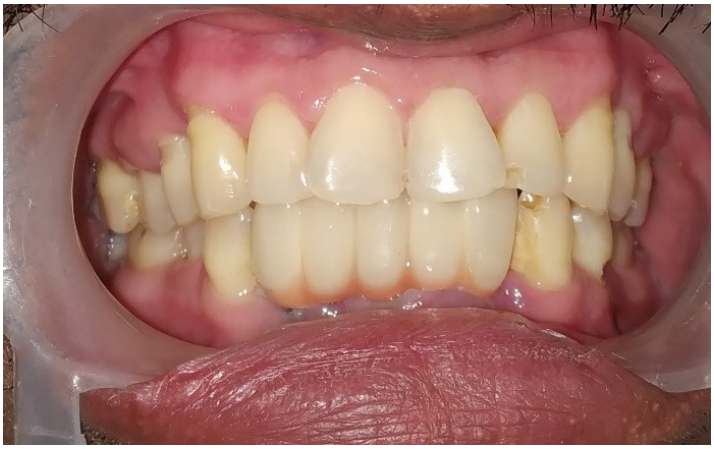
Picture 7: Intra-operative



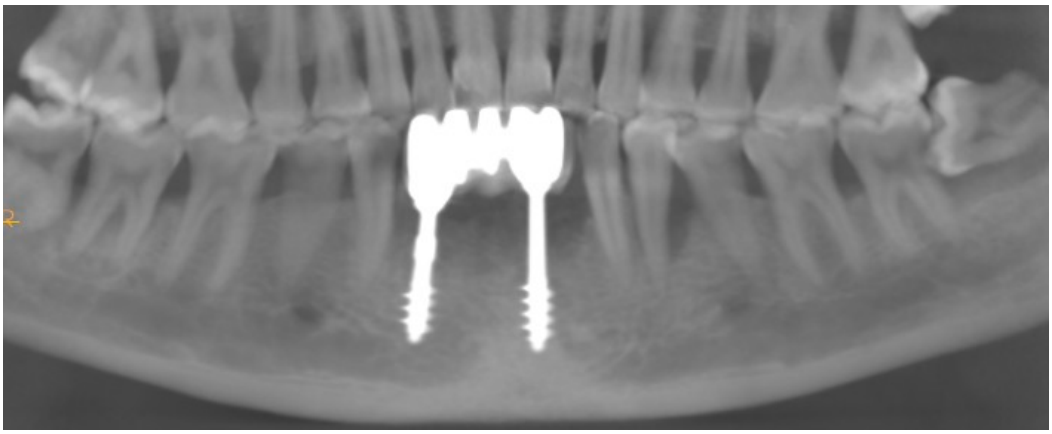
Picture 8: Post- operative OPG:



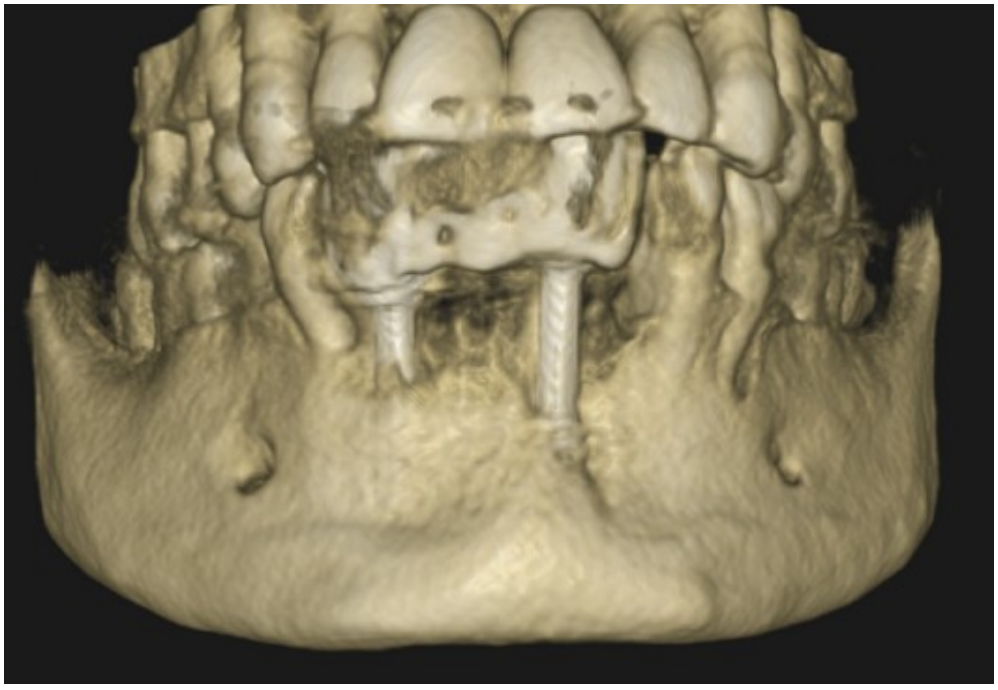
Picture 9: After Prosthesis placement



Picture 10: OPG – 6 months post-operative

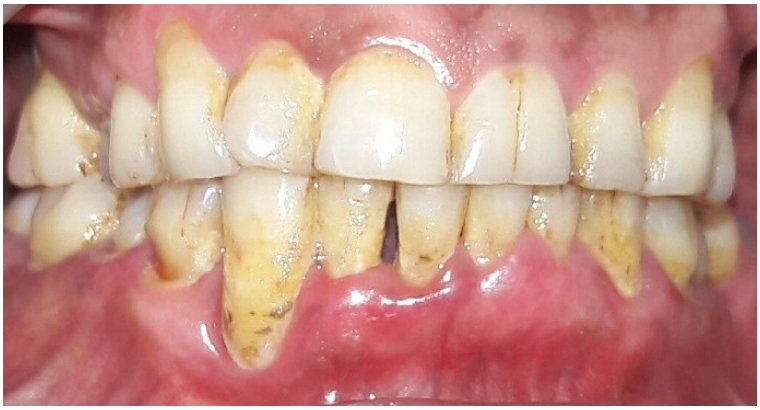


Picture 11: 3D 6 months post-operative

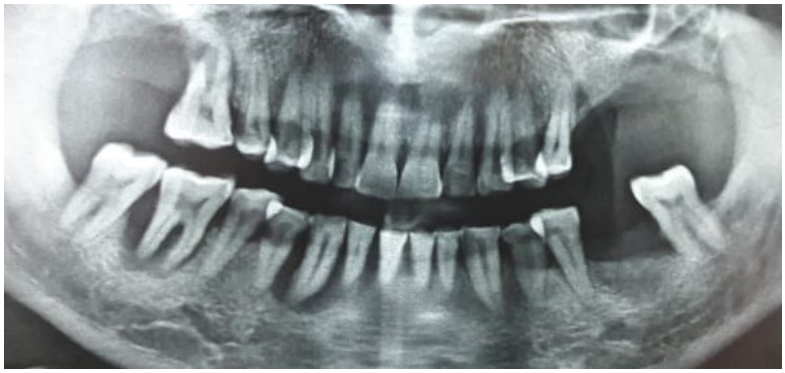


CASE-4

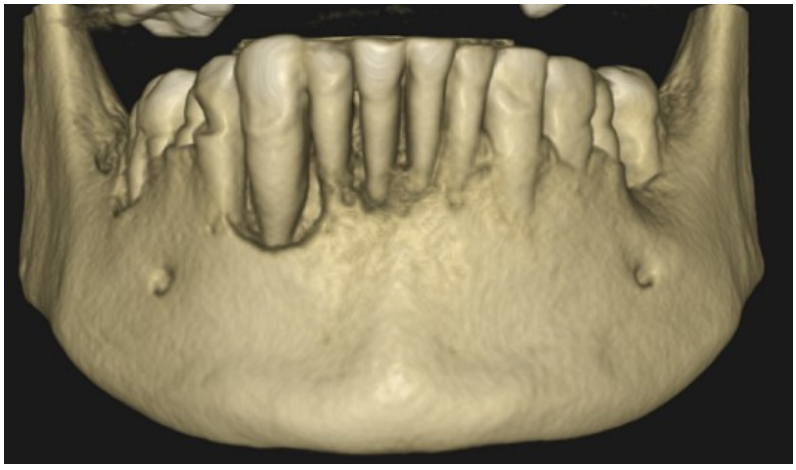
Picture 1: Clinical photo Pre-operative



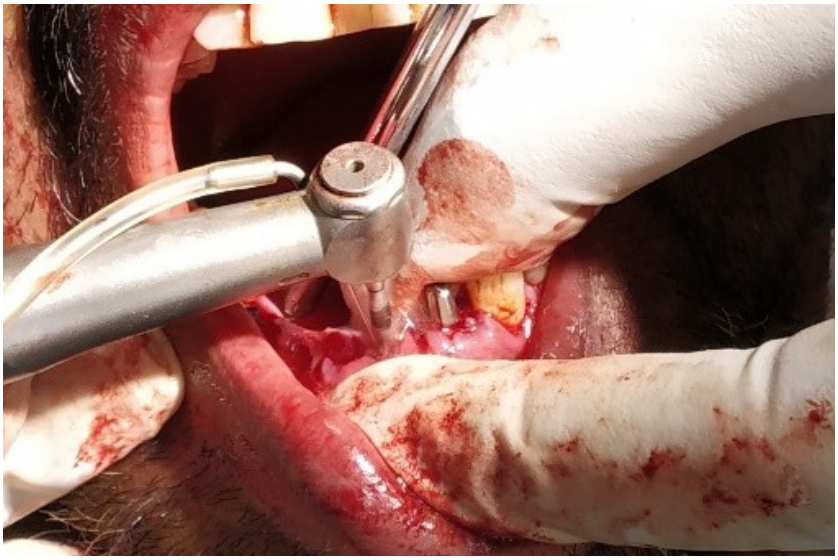
Picture 2: **Pre-operative OPG**



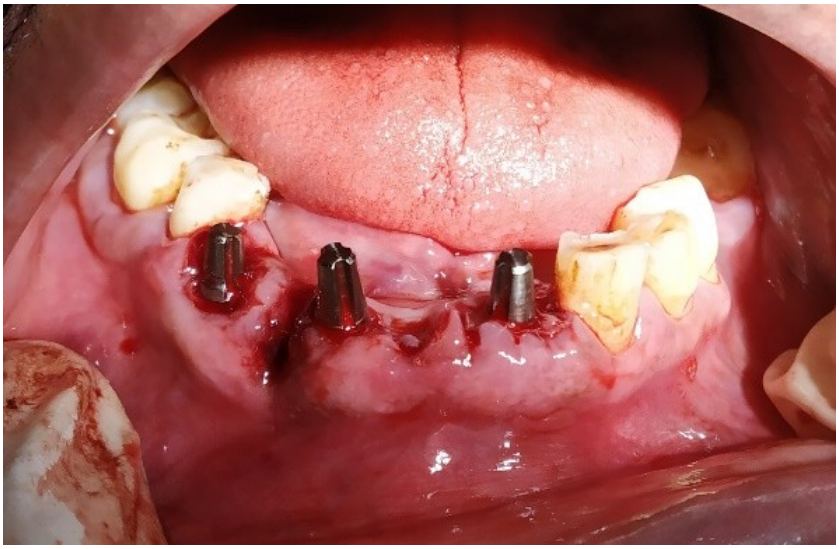
Picture 3 Pre-operative CBCT:



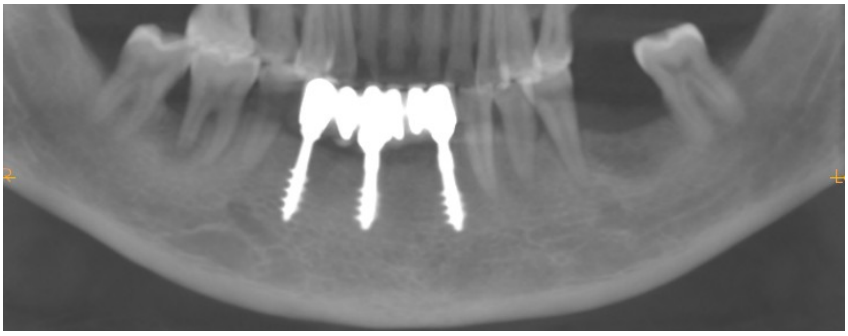
Picture 4: Intra-operative



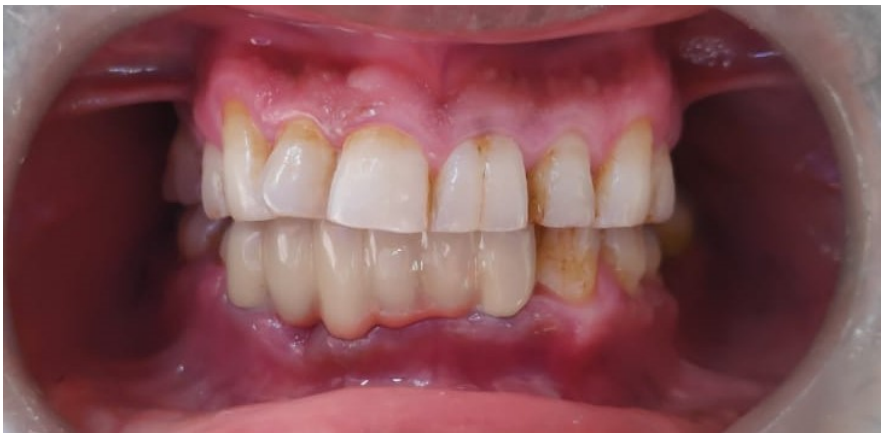
Picture 5: Intra-operative



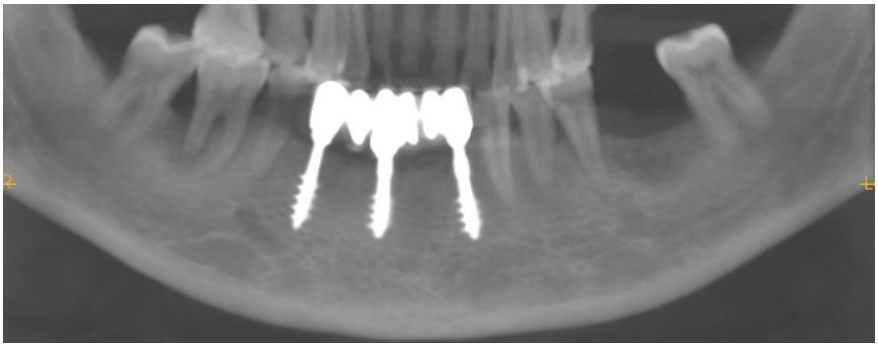
Picture 6: Post- operative OPG:



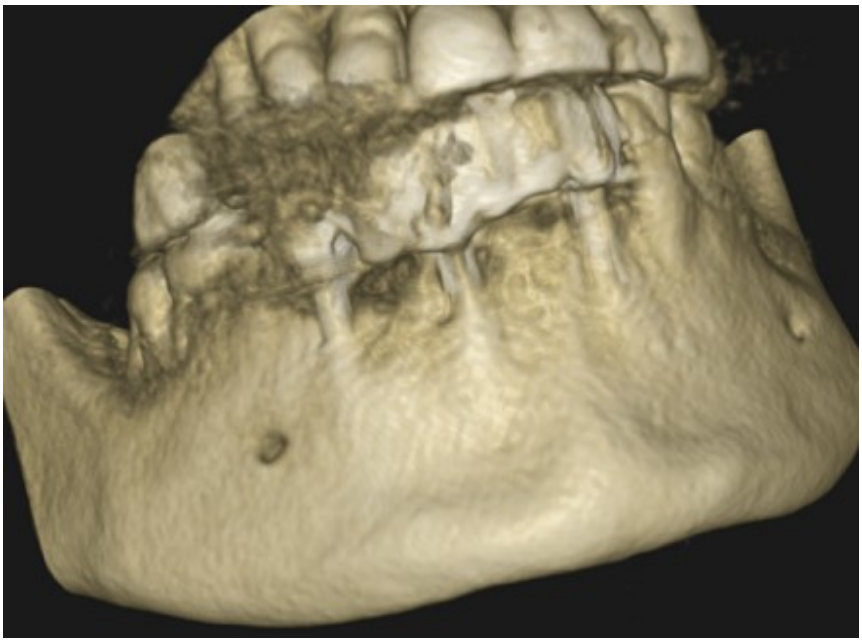
Picture 7: After Prosthesis placemen



Picture 8: OPG – 6 months post-operative



Picture 9: 3D 6 months post-operative



OBSERVATIONS AND RESULTS

TABLE:1: DEMOGRAPHIC DATA

S. NO	AGE	SEX	IMPLANT POSITION	REASON FOR EXTRACTION	IMPLANT DIAMETER [mm]	IMPLANT LENGTH [mm]	INSERTION TORQUE[Ncm]	ADJACENT AREA		ABUTMENT TYPE
								MESIAL	DISTAL	
1.	52	M	32	Chronic periodontitis	3.6	17	54	A	P	Straight
2.	52	M	42	Chronic periodontitis	3.6	20	56	A	P	Straight
3.	45	F	31	Chronic periodontitis	3.6	20	52	A	P	Straight
4.	45	F	42	Chronic periodontitis	3.6	20	56	A	P	Straight
5.	45	F	23	Chronic periodontitis	3.6	23	52	P	P	Straight
6.	38	M	32	Chronic periodontitis	3.6	17	54	A	P	Straight
7.	38	M	43	Chronic periodontitis	3.6	20	56	A	P	Straight
8.	46	M	32	Chronic periodontitis	3.6	20	58	A	P	Straight
9.	46	M	41	Chronic periodontitis	3.6	17	56	A	A	Straight
10.	46	M	44	Chronic periodontitis	3.6	20	58	A	P	Straight

TABLE 2: CHANGES IN MARGINAL BONE LEVELS

IMPLANT	PRE-OPERATIVE				POST-OPERATIVE (AT 6 MONTHS)			
	HEIGHT OF LABIAL BONE	HEIGHT OF PALATAL/ LINGUAL BONE	HEIGHT OF MESIAL BONE	HEIGHT OF DISTAL BONE	HEIGHT OF LABIAL BONE	HEIGHT OF PALATAL/LINGUAL BONE	HEIGHT OF MESIAL BONE	HEIGHT OF DISTAL BONE
1.	29.6	26.1	28.3	27.6	29.2	25.7	27.7	27.2
2.	29.9	22.5	24.6	23.5	29.4	21.5	23.9	22.9
3.	20.6	24.2	22.1	21.9	20.1	23.5	21.3	20.6
4.	17.4	17.8	17.2	17.6	16.9	17.1	16.6	16.8
5.	19.5	18.7	18.2	17.9	18.8	18.1	17.5	17.2
6.	16.1	22.9	21.7	21.3	14.9	21.5	20.3	20.1
7.	18	20.9	21.2	20.7	17.5	20.1	20.4	20.1
8.	21.4	23.1	21.1	20.7	20.7	22.5	20.3	20
9.	23.5	22.1	21.8	21.4	22.6	21.4	21	19.8
10.	24.5	22.7	21.2	23.4	23.4	21.8	20	22.6

TABLE 3: PRIMARY STABILITY

S.NO	IMPLANT POSITION	TORQUE [Ncm]
1.	32	54
2.	42	56
3.	31	52
4.	42	56
5.	23	52
6.	32	54
7.	43	56
8.	32	58
9.	41	56
10.	44	58

TABLE 4: MEASUREMENT OF BONE WIDTH [AT CRESTAL LEVEL]

S.NO	IMPLANT POSITION	PRE-OPERATIVE	POST-OPERATIVE AFTER 6 MONTHS
1.	32	7.2	6.7
2.	42	6.2	5.6
3.	31	7.3	6.7
4.	42	7.1	6.5
5.	23	6.3	6.1
6.	32	9.5	8.9
7.	43	6.5	6.1
8.	32	7.1	6.5
9.	41	6.8	6.2
10.	44	6.7	6.4

TABLE 5: MESIAL AND DISTAL MARGINAL BONE LOSS

S.NO	IMPLANT POSITION	PRE-OPERATIVE [mm]		POST-OPERATIVE [mm]		BONE LOSS [mm]	
		MESIAL	DISTAL	MESIAL	DISTAL	MESIAL	DISTAL
1.	32	28.3	27.6	27.7	27.2	0.6	0.4
2.	42	24.6	23.5	23.9	22.9	0.7	0.6
3.	31	22.1	21.9	21.3	20.6	0.8	1.3
4.	42	17.2	17.6	16.6	16.8	0.6	0.8
5.	23	18.2	17.9	17.5	17.2	0.7	0.7
6.	32	21.7	21.3	20.3	20.1	1.4	1.2
7.	43	21.2	20.7	20.4	20.1	0.8	0.6
8.	32	21.1	20.7	20.3	20	0.8	0.7
9.	41	21.8	21.4	21	19.8	0.8	1.6
10.	44	21.2	23.4	20	22.6	1.2	0.8

TABLE 6: VISUAL ANALOG SCALE FOR PAIN PERCEPTION

S.NO	AGE	SEX	IMPLANT POSITION	VAS SCORE PAIN SCALE
1.	52	M	32	2
2.	52	M	42	2
3.	45	F	31	3
4.	45	F	42	3
5.	45	F	23	3
6.	34	M	32	2
7.	34	M	43	2
8.	46	M	32	2
9.	46	M	41	2
10.	46	M	44	2

DEMOGRAPHIC DATA

Demographic data	Observation
Age	44.5±6.15
Males	70%
Females	30%

DESCRIPTIVE STATISTICS

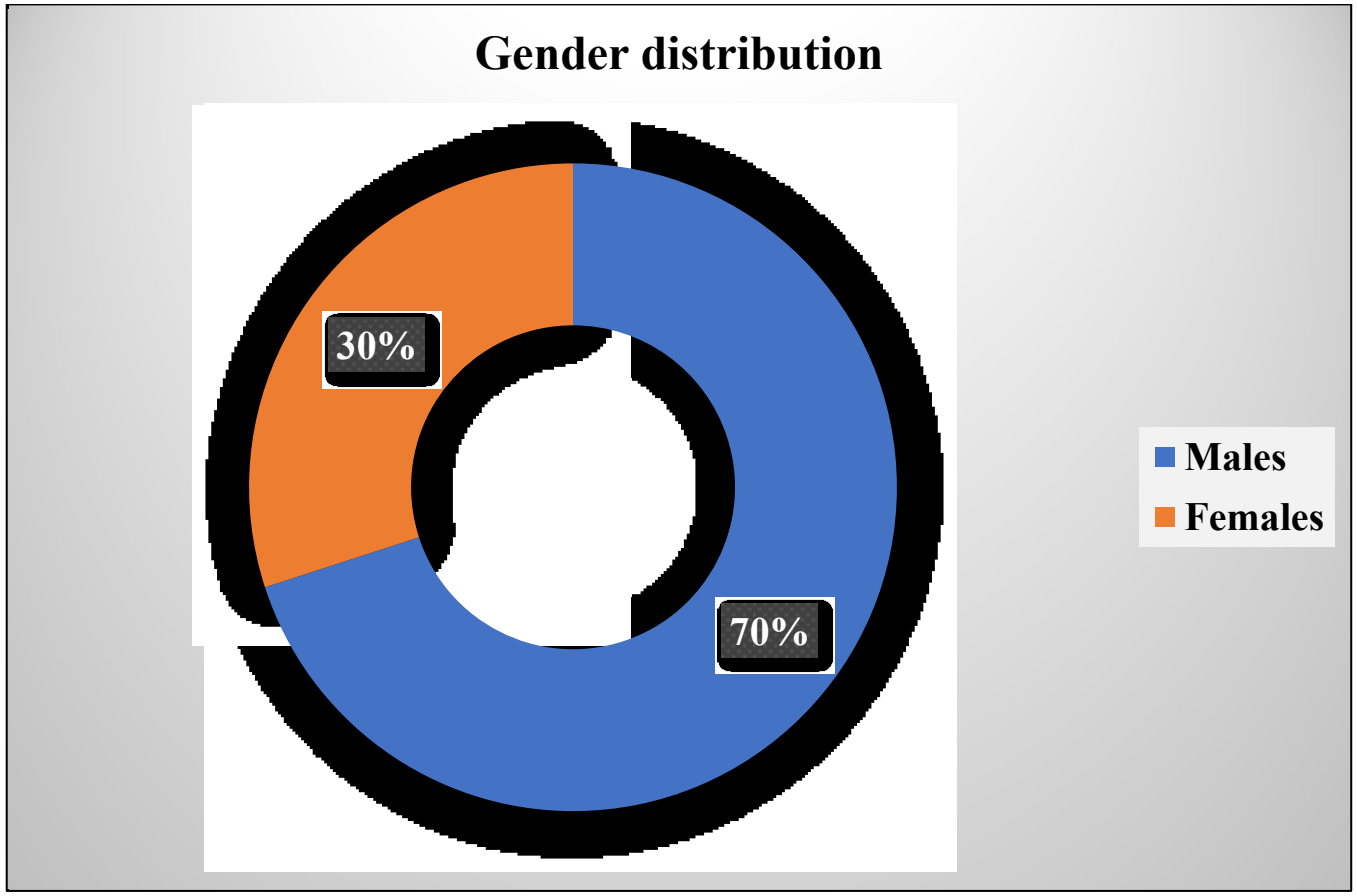
Variable	Mean	SD
Torque	55.200	2.149
Labial bone height	22.050	4.821
Palatal bone height	22.100	2.450
Mesial bone height	21.740	3.081
Distal bone height	21.600	2.874
Labial bone height post	21.350	4.909
Palatal bone height post	21.320	2.478
Mesial bone height post	20.900	3.113
Distal bone height post	20.730	2.984
Bone Width at crest - pre	7.0700	.9345
Bone Width at crest - post	6.5700	.8832
Mesial marginal bone loss	.8400	.2590
Distal marginal bone loss	.8700	.3743

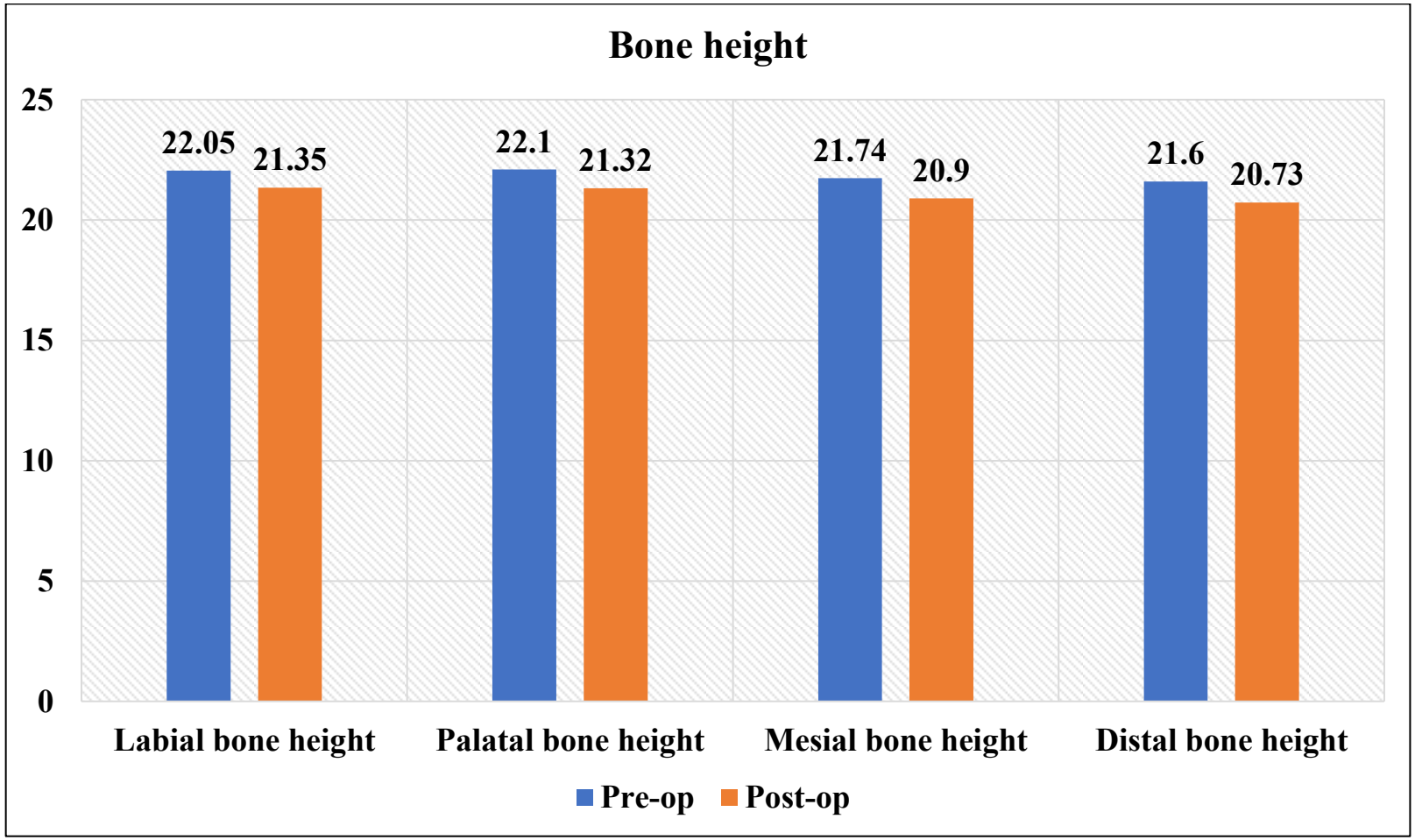
Paired samples t test for comparison of pre and post values of bone height and width

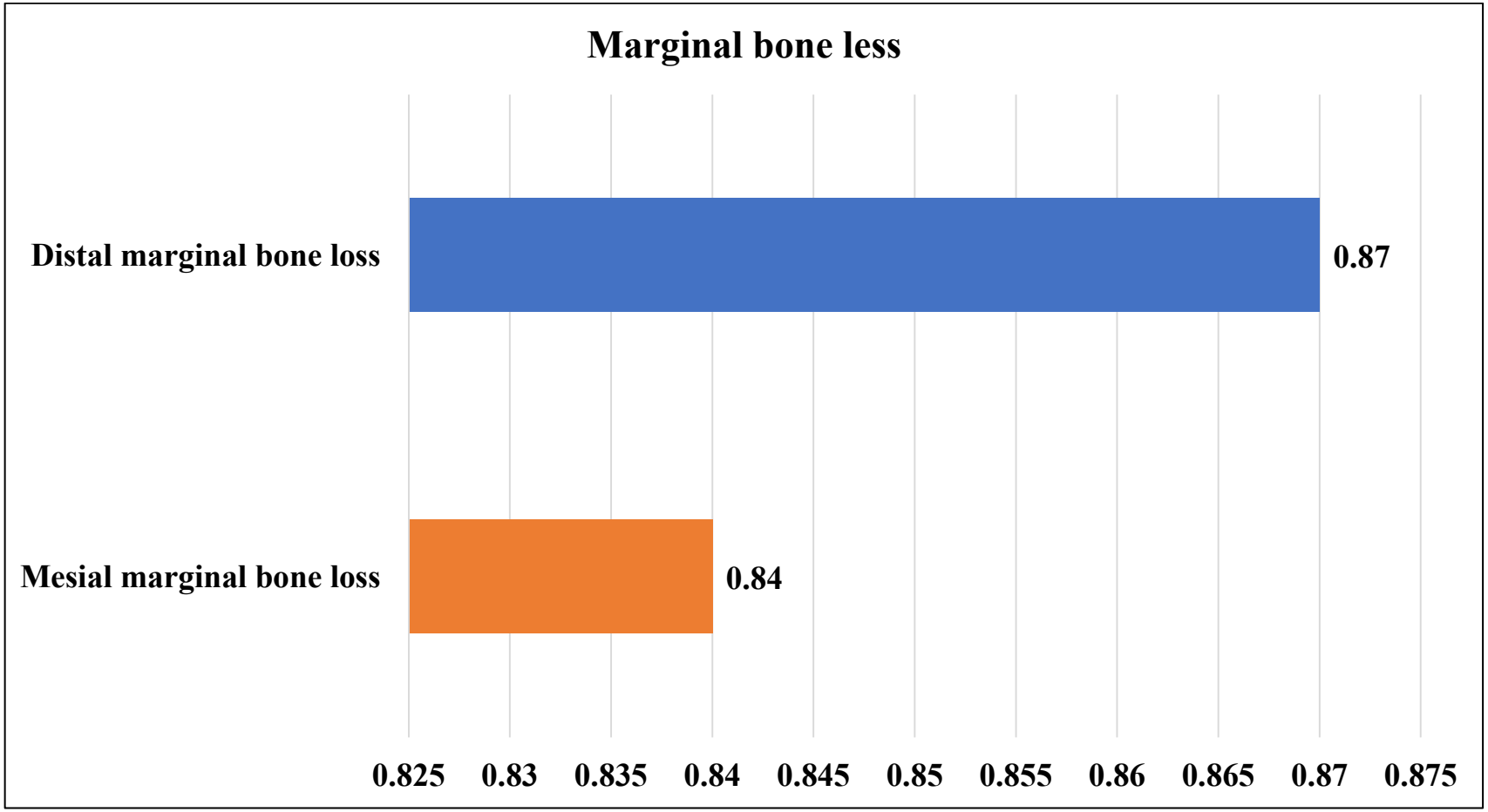
		Mean	SD	95% CI of the Difference		P value
				Lower	Upper	
Pair 1	Labial bone height Pre-Post	.700	.278	.500	.899	0.21
Pair 2	Palatal bone height Pre-Post	.780	.274	.583	.976	0.10
Pair 3	Mesial bone height Pre-Post	.840	.259	.654	1.02	0.09
Pair 4	Distal bone height Pre-Post	.870	.374	.602	1.13	0.06
Pair 5	Bone width Pre-Post	.500	.149	.393	.606	0.12
Pair 6	Mesial marginal bone loss Pre-post	.840	.259	.654	1.025	0.13
Pair 7	Distal marginal bone loss Pre-post	.870	.374	.602	1.137	0.08

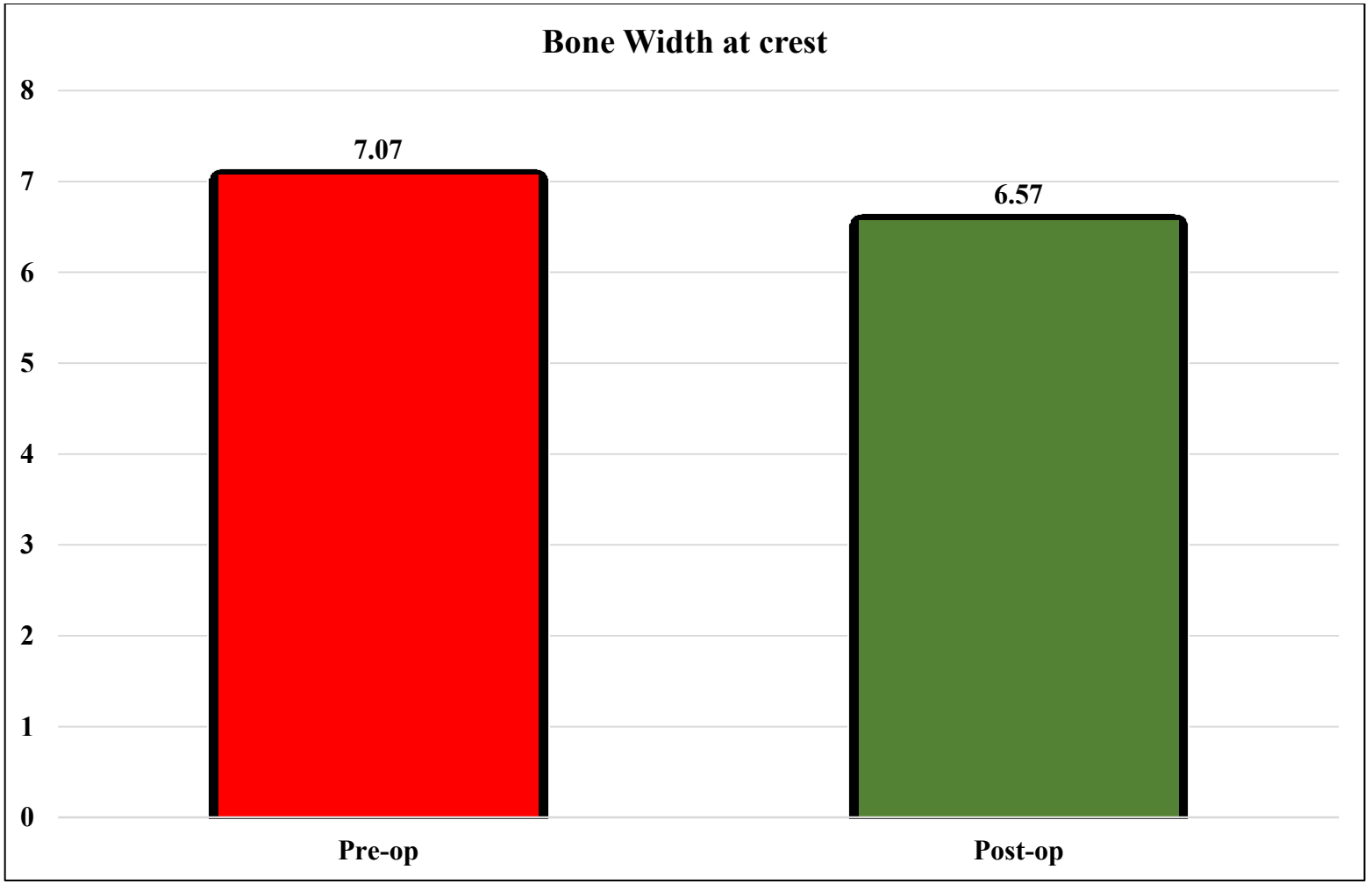
Test: Paired t test

Inference: The test shows that there is no significant difference in post measurements (6 months) from the pre-operative (baseline) measurements, in any of the parameters (bone height, width and marginal bone loss)


Gender distribution
30%
70%
Males
Females


Bone height
25
20
15
10
5
0
22.05
21.35
22.1
21.32
21.74
20.9
21.6
20.73
Labial bone height
Palatal bone height
Mesial bone height
Distal bone height
Pre-op
Post-op


Marginal bone less
Distal marginal bone loss
0.87
Mesial marginal bone loss
0.84
0.825
0.83
0.835
0.84
0.845
0.85
0.855
0.86
0.865
0.87
0.875


Bone Width at crest
8
7
6
5
4
3
2
1
0
7.07
6.57
Pre-op
Post-op

RESULTS

The study has been conducted in 4 patients with a mean age of 44.5±6.15 and male: female ratio of 70:30 with a total of 10 basal bi-cortical screw implants. The patients were followed for a period of six months and the clinical and radiological parameters were recorded. All the ten basal bi-cortical screw implants were placed in the freshly extracted tooth socket and no evidence of early failures or complications. The post-operative healing of implant surgery was uneventful. The patients showed good compliance and satisfaction as the extracted teeth were replaced at the same day of the surgery with a temporary crown and permanent crown with in 72 hours of the surgery. The observation and results of various parameters are categorized in tables and figures.

PRIMARY STABILITY OF THE BCS IMPLANT:

The primary stability of the basal bi-cortical screw implants was measured immediately after placement of the implants with a torque wrench. The primary stability measured with a range of 52Ncm to 58Ncm with a mean insertion torque of 55.2±2.14Ncm. This mean insertion torque value of 55.2±2.14Ncm shows a good primary stability of the BCS implants at the time of implant placement.

EVALUATION OF PAIN USING VAS SCORE:

The pain perception of the patient was measured using the Visual Analog Scale, the immediate post-operative day and recorded for the 4 patients. The VAS score ranged from 2 and 3 with the most of the patients had a score of 2 and one patient had a score of 3. This observation shows that the placement of bi-cortical screw implants in patients had a mild discomfort in regarding pain perception.

EVALUATION OF BONE HEIGHT USING CBCT:

The bone height of labial, lingual/palatal, mesial and distal surfaces were measured before and six months after BCS implant placement with CBCT in mm.

LABIAL BONE HEIGHT:

The mean difference in labial bone height at 6 months when compared with baseline was 0.70±0.27mm. The 'P' value of 0.21 which is insignificant shows there is minimal labial bone loss.

PALATAL BONE HEIGHT:

The mean difference in palatal bone height at 6 months when compared with baseline was 0.78±0.27mm. The 'P' value of 0.10 which is insignificant shows there is minimal palatal bone loss.

MESIAL BONE HEIGHT:

The mean difference in mesial bone height at 6 months when compared with baseline was 0.84±0.25mm. The 'P' value of 0.09 which is insignificant shows there is minimal mesial bone loss.

DISTAL BONE HEIGHT:

The mean difference in distal bone height at 6 months when compared with baseline was 0.87±0.37mm. The 'P' value of 0.06 which is insignificant shows there is minimal distal bone loss.

EVALUATION OF BONE WIDTH USING CBCT:

The bone width was measured before and 6 months after the placement of BCS implant with CBCT in mm. The mean difference in bone width at 6 months when compared with baseline were 0.50±0.14mm. The 'P' value of 0.12 which is insignificant shows there is minimal loss in bone width.

EVALUATION OF MESIAL AND DISTAL MARGINAL BONE LOSS USING CBCT:

The mesial and distal bone height were measured before and 6 months after BCS implant placement with CBCT in mm and the mesial and distal marginal bone loss were measured.

MESIAL MARGINAL BONE LOSS:

The mean difference in mesial marginal bone height, before and after implant placement were measured and the mean difference was 0.84±0.25mm. The 'P' value of 0.13, which is insignificant shows minimal mesial marginal bone loss.

DISTAL MARGINAL BONE LOSS:

The mean difference in distal marginal bone height, before and after implant placement were measured and the mean difference was 0.87±0.37mm. The 'P' value of 0.08, which is insignificant shows minimal distal marginal bone loss.

DISCUSSION

Implants are often used as a treatment option for partial or complete edentulous patients. In **1982, Branemark**[9] for the first time described the use of dental implants for the prosthetic rehabilitation of edentulous patients with survival rate of 81% for the maxillary arches and 100% for mandibular arches. The success of implants were directly related to the osseointegration process.

The utilization of endosseous dental implants for tooth loss has increased recently with the improved implant design and surface topography of the implants that provide predictable success rate for dental prostheses.

Dr. Jean- Marc Julliet in (1972)[6]developed 1st single piece implant, which was then improved by **Dr. Gerard Scortecci.** In **(2005)**[3] **Dr. Stefan Ihde** modified the lateral basal implants to basal screwable bi-cortical implants**. Yadav (2015)**[3] defined basal implantology also known as bi-cortical implantology which is a mod ern implantology system, that utilizes the basal cortical bone of the jaws for retention of the implants which are uniquely designed to be accommodated in the basal cortical bone areas. It utilizes the rules of orthopedic surgery, and hence also called as "orthopaedic implants''.

Nair C Bharathi S, (2013)[6] states that two types of basal implants, basal osseointegrated [BOI] and Basal Cortical Screw [BCS] designed to utilize cortical bone of the jaws, provides good primary stability. A special type of 12mm thread diameter screwable implants has been developed to place into the freshly extracted tooth socket.

A primary reason for replacing the missing tooth with dental implants is to maintain the alveolar bone. An endosteal implant can maintain the bone width and height as long as the implant remains healthy**, Zarb G Schmitt A, (1996)[36]**.

Basal bone forms the dental skeletal structure which contains muscle attachments, resistant to resorption and also acts as the stress bearing portion of the jaws. Basal bi-cortical screw implants are designed in a manner, that the threads of the implants anchor the 2nd cortical bone.

Dos Santos, (2011)[60] states that the primary stability of the implant is mainly influenced by the bone quality at the implant site, the implant geometry and the drilling sequence. According to **Seeman and Delmas (2006)[62]** the bone density is the primary variable determining the bone quality and the main determinant of bone strength and the primary stability.

Narang et al, (2016)[15] states that the basal implants provides excellent primary stability along the vertical surface of the implants with no need for corticalization. A retrospective study conducted in 394 patients treated with 4570 immediately loaded single piece implants, with an average observation of 18.93±8.41 months periods showed a high cumulative implant survival rate of 95.7%.The concept of Osseo fixation anchoring basal implants in the 2nd cortical bone has high success rate and allows functional loading in edentulous jaws compared to trying to achieve Osseo-integration in the 1st cortical bone as with crestal implants.

The present study consists of 4 patients with 10 basal bi-cortical screw implants [BCS] placed in freshly extracted tooth socket. Primary stability was measured immediately after placement of the implant with a torque wrench. Primary stability in the range of 52Ncm to 58Ncm with mean insertion torque of 55.2±2.24Ncm which indicates a good

primary stability of the Basal bi-cortical screw implants at the time of implant placement.

After extraction of a tooth, the bone and the soft tissues undergoes various changes like crestal bone resorption and soft tissue levels. A study conducted by

Schropp L et al., (2003)[16] reported that following tooth extraction there is 50% reduction in ridge width during the 1st year, in which 2/3rd of the total changes takes place in the first three months after extraction of the tooth.

Evaluation of the clinical and esthetic outcomes of implants placed in post-extraction sites by **Chen and Buser., (2009)[17]** observed that bone remodelling in single tooth extraction sites are localized to the central, midfacial aspect of the socket wall at eight weeks post-extraction, while proximal areas are well supported by the periodontal ligament of the neighbouring teeth and showed no bone loss.

According to **Arangio et al., (2015)[20]**, the post-extraction dimensional alterations occur due to resorption of the bundle bone due to lack of functional stimulus and lack of vascular blood supply.

In cases of immediate implant placement in freshly extracted tooth sockets with thick facial bone wall and planning for early implant placement protocols in order to avoid additional bone loss at the superficial bone wall, **Buser et al (2008)[26] and Hammerle et al (2004)[27]** recommended a flapless low trauma tooth extraction approach. Clinical studies conducted by **Becker et al (2005)[28] and Rocci et al (2003)[29]** recommends flapless surgical procedure which prevents marginal bone loss.

Lin et al (2014)[30] conducted an analysis of flapless tooth extraction and flapped tooth extraction and compared the marginal bone loss and showed no statistically significant

difference between these two procedures. According to **Brazilay I and Schroop L** the immediate implants with immediate loading, reduced multiple surgical appointment, reduction in time of edentulism, prevention of marginal bone loss and the preservation of soft tissue architecture.

According to **Casicchra and Brasi., (1999)**[22], atraumatic extraction is very important in immediate placement success rate as it facilitates in maintaining maximum amount of bone. **Chang TL, (2006)**[3] states that basal implants placed in the dense cortical bone attains high primary stability and can be immediately loaded though the crestal bone loss is more.

In our present study, the basal bi-cortical screw implants were placed in freshly extracted tooth socket done under flapless procedure. The implants were placed immediately and they were loaded immediately within 72 hours of the implant placement. The pre-operative and the 6 months post-operative bone height and width were measured using CBCT. The bone height was measured in labial, lingual/palatal, mesial and distal surfaces. The buccolingual bone width were measured.

The labial bone height was measured and the mean difference in labial bone height at 6 months when compared with baseline was 0.7±0.27mm less, with 'P' value of 0.21 which is statistically insignificant and shows there is minimal labial bone loss which is not significant.

The mean difference in lingual/palatal bone height at 6 months when compared with baseline was 0.78±0.27mm less, with 'P' value of 0.10 which is statistically insignificant and shows there is minimal lingual/palatal bone loss which is not significant.

The mean difference in mesial bone height at 6 months when compared with baseline was 0.84±0.25mm less, with 'P' value of 0.09 which is insignificant and shows there is minimal mesial bone loss which is not significant.

The mean difference in distal bone height at 6 months when compared with baseline was 0.87±0.37mm less, with 'P' value of 0.06 which is insignificant and shows there is minimal distal bone loss which is not significant.

The pre-operative and the 6 months post-operative labiolingual bone width was measured using CBCT in mm. The mean difference in bone width at 6 months when compared with baseline were 0.50±0.14mm less, with a 'P' value of 0.12 which is insignificant and shows there is a minimal bone loss which is not significant.

In our present study of placement of 10 BCS implants immediately in freshly extracted teeth socket and with immediate loading within 72 hours of implant placement shows clinically significant amount of crestal bone loss which occurs in every case of tooth extraction and implant placement whatever the implants placed. The bone loss ranges from 0.4mm to 1.4mm. The bone loss is minimal and statistically not significant in our present study. There is also minimal loss of bone width in the 6 months before and after implant placement ranging from 0.3mm to 0.6mm. These observations show that there was minimal loss in bone width whatever the type of implants placed.

In our present study, assessment of pain perception of the patient was done the immediate post-operative day with the placement of BCS implant. The pain perception is assessed using VAS score with a scale measuring from 0 to 10, with ranges from no pain to worst pain possible. A score of '0'indicates no pain, '1-3' mild pain, '4-6' moderate to severe, '7-9'very severe and '10'indicates the worst pain possible. The patients in our present study showed responses ranging from 2 and 3. Three male

patients showed response of 2 and one female patient showed response of 3. This shows that the overall pain perception in our study is mild which indicates that the patients were comfortable with BCS implant placement.

SUMMARY AND CONCLUSION

Immediate implant placement and immediate loading of basal bi-cortical screw implants are one of the greatest opportunities in our modern dentistry. Most of the patients expects the immediate replacement of tooth after extraction which is mostly possible in basal implantology. The basal implants takes its support from the basal bone, which is the most stable bone of our jaws. Dental implants placed in the basal bone of jaws which forms the stress bearing portion of the human skeleton, can be immediately loaded with prostheses.

The cortical bone around the extraction tooth socket are stable at the time of extraction which is advantageous in placement of implants immediately than placing implants few months later. The BCS implants placed immediately in the freshly extracted tooth socket minimizes the crestal bone loss to some extent compared to the conventional implants placed after few months. As the basal implants are placed into the basal bone, the primary stability is good which makes the implant successful and bone grafts are not needed for implant stability.

In our present study of 10 BCS implants placed in 4 patients immediately into freshly extracted tooth sockets and loaded immediately within 72 hours had good primary stability with a mean value of 55Ncm and minimal marginal bone loss and less pain perception. This indicates good success rate of the BCS implants placed in the above patients. Basal bi-cortical screw implants have good success rate in patients with immediate extraction and immediate placement of implants with immediate loading of prosthesis. BCS implants can be placed in severely atrophied jaws without need of bone grafts with good stability where conventional implants could not be placed.

Though we had a good success rates of BCS implants in our present study, the sample size was small and the follow up period was short. Therefore we require large randomized clinical trials to further evaluate the successful outcome of basal bi-cortical screw implants placed in freshly extracted tooth sockets.

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TAMILNADU GOVT. DENTAL COLLEGE AND HOSPITAL CHENNAI -3
DEPARTMENT OF ORAL AND MAXILLOFACIAL SURGERY

Investigator: Dr. K. Senthil Ganesh Guide: Dr. K. Arun Kumar., MDS

INFORMED CONSENT FORM

STUDY TITLE: "CLINICAL & RADIOLOGICAL EVALUATION OF BASAL BI-CORTICAL SCREW IMPLANTS IN FRESHLY EXTRACTED TOOTH SOCKET"

Name: Mr/Ms _____

Address: _____ SEX: Male /Female

_____ AGE: Years

_____

I, _____, exercising my free power of choice, hereby give my consent to be included as my son or daughter participant in the study. I agree to the following: 1. I have been informed to my satisfaction about the purpose of the study and study procedures. I agree to co-operate fully for complete examination. 2. I hereby give permission to use my medical records for research purpose. 3. I am told that the investigating doctor and the institution will keep my identity confidential. 4. I understand that I have rights to withdraw from the study and that the investigator has the right to exclude me from the research at any point of time.

Name of Participants:
Investigator:
Date: Signature/ Thumb impression of Parent/Guardian

PARTICIPANT INFORMATION SHEET

Title of the study: 'CLNICAL & RADIOLOGICAL EVALUATION OF BASAL BI-CORTICAL SCREW IMPLANTS IN FRESHLY EXTRACTED TOOTH SOCKET'

Investigator: Dr. SENTHIL GANESH. K

Guide: Assoc. Prof. Dr. K. Arun Kumar. M.D.S

Purpose of the study: To assess the clinical & radiological parameters of Basal Bi-cortical Screw implant in freshly extracted tooth socket.

Procedure of the study that involves your participation is as follows:

Done under LA. The tooth or teeth to be replaced should be extracted under minimal trauma to both the soft tissue and bone. The socket should be evaluated and prepared for implant placement with bi cortical screw implant kit. Basal bi cortical screw drills of appropriate length and size is evaluated and used to make crestal, apical and basal bone osteotomy procedure to place the implant in the basal bone. BCS implant of appropriate size and length is placed in to the socket with torque of 35-45 N cm. Implants are loaded with acrylic fixed partial denture within 72 hours.

Vulnerable Population: Vulnerable population are never included in study group.

Risks: Patients are selected only by proper inclusion and exclusion criteria so risk of participation is negligible or at least manageable.

Benefits: It is a single surgical procedure to replace tooth or teeth that have poor prognosis. Provides good stability by bicortical bones. ➢Immediate loading protocol substantially decreases the treatment time and increases the treatment acceptance by the patient.

Confidentiality: The identity of the patients participating in the research will be kept confidential throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Informed consent: Taking part in the study is voluntary. Patients are free to decide whether to participate in the study or to withdraw at any time; patient's decision will not result in any loss of benefits to which you are otherwise entitled. The results of the

special study may be intimated to patient at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Expected Outcome: Achievement of proper physiological function, esthetics, and anatomy.

Compensation: NIL

Contact details:

Contacts details of The Principal investigator:

Dr. K. Senthil Ganesh
I Year Post Graduate,
Department of Oral & Maxillofacial Surgery,
Tamil Nadu Govt Dental College & Hospital,
Phone number: 9994149477

Contact details regarding rights of the participant:

Dr. G. Vimala, M.D.S., Ph.D.,
The Chairperson,
Institutional Ethics Committee,
Tamil Nadu Govt Dental College & Hospital, Chennai- 600 003

PROFORMA FOR TREATMENT GROUP

Date: OP No.: S.No.:

Name: Age: Sex:

Occupation: Income:

Address: Phone Number:

CHIEF COMPLAINTS AND DURATION:

HISTORY OF PRESENT ILLNESS:

PAST MEDICAL HISTORY:

PAST DENTAL HISTORY:

FAMILY HISTORY:

PERSONAL HISTORY:

a) Oral Hygiene Practices:

b) Habits:

GENERAL EXAMINATION

a) Extra-Oral Examination

b) Examination of Lymph nodes

INTRA-ORAL EXAMINATION WITH CLINICAL FINDINGS:

Investigations:

1. Haematological Investigation:

2. Others:

Blood Pressure:

Pulse:

Respiratory Rate:

RADIOGRAPHIC EVALUATION

Orthopantomogram (OPG),

Computed tomography (CBCT)

PROVISIONAL DIAGNOSIS

PROGNOSIS

TREATMENT PLAN

FITNESS FOR TREATMENT

TREATMENT DONE

DATE: PROCEDURE: SIGNATURE:

SIGNATURE OF THE PROFESSOR

இணைப்பு –III

வரிசைஎண் :

தமிழ்நாடு அரசு பல் மருத்துவக் கல்லூரி மற்றும் மருத்துவமனை-சென்னை 3
ஆராய்ச்சி ஒப்புதல் படிவம்

ஆராய்ச்சியாளர்: மரு.க.செந்தில் கணேஷ் வழிகாட்டி: மரு.டி.துரைராஜ்

ஆராய்ச்சி தலைப்பு:

புதிதாக பிரித்தெடுத்த பல் சாக்கெட்டில் பைசல் பைகோர்ட்டிகள் திருகு உள்வைப்பின் மருத்துவ மற்றும் கதிரியக்க மதிப்பீடு.

பெயர் திரு/திருமதி..... புற நோயாளியின் எண் .....

முகவரி: ..... பாலினம்:ஆண்/ பெண்

..... வயது:

.....

நான் ..... என்னுடைய சுயநினைவுடனும் மற்றும் முழு சுதந்திரத்துடனும் என்னை இம்மருத்துவ ஆராய்ச்சியில் சேர்த்துக் கொள்ள ஒப்புதல் அளிக்கிறேன்.

1. இந்த ஆராய்ச்சியின் நோக்கம் மருத்துவமுறைகள் மற்றும் பரிசோதனைமுறைகள் குறித்த விளக்கங்கள் அனைத்தும் எனக்கு திருப்திதரும் வகையில் அளிக்கப்பட்டன.
2. இந்த ஆராய்ச்சிக்காக எனது வாய் முழு பரிசோதனை செய்யப்படும் என்பதை அறிகிறேன்.
3. இந்த ஆராய்ச்சிக்கு தேவையான முழுமையான பரிசோதனைக்கு ஒத்துழைக்க சம்மதிக்கிறேன்.
4. நான் ஏற்கனவே உட்கொண்ட மற்றும் உட்கொள்கிற மருந்துகளைப் பற்றிய விவரங்களைஆராய்ச்சியாளரிடம் தெரிவித்துள்ளேன்.
5. மருத்துவரின் ஆராய்ச்சிற்கு தேவைப்படும்பொழுது மீண்டும் மருத்துவ ஆய்விற்கு கண்டிப்பாக ஆராய்ச்சியாளரிடம் வர சம்மதிக்கிறேன்.
6. எந்த ஒரு நிலையிலும் நான் இந்த ஆராய்ச்சியிலிருந்து விலகுவதற்கும் அல்லது மருத்துவ ஆராய்ச்சியாளருக்கு என்னை விலக்குவதற்கும் முழு உரிமை இருப்பதாகவும் அறிகிறேன்
7. என் மருத்துவக் குறிப்பேடுகளை இந்த ஆராய்ச்சியில் பயன்படுத்திக்கொள்ள சம்மதிக்கிறேன். இந்த ஆராய்ச்சி மையமும் ஆராய்ச்சியாளரும் என்னுடைய விவரங்கள் அனைத்தையும் இரகசியமாகவைப்பதாக அறிகிறேன்.
8. எனக்கு படிக்கதெரியாததால், மேலே உள்ளஅனைத்தையும் கூறக்கேட்டேன்.

பெயர் கையொப்பம்/ கைரேகை

ஆராய்ச்சியாளர் தேதி

இணைப்பு –IV

வரிசைஎண் :

தமிழ்நாடு அரசு பல் மருத்துவக் கல்லூரி மற்றும் மருத்துவமனை- சென்னை 3

ஆராய்ச்சியாளர் : மரு.க.செந்தில் கணேஷ் **வழிகாட்டி:** மரு.டி.துரைராஜ்

தகவல் தாள்

மரு.க.செந்தில் கணேஷ் ஆகிய நான், தமிழ்நாடு அரசு பல் மருத்துவக்கல்லூரி மற்றும் மருத்துவமனையில்,, முதல் வருட முதுகலைப் படிப்பு பயில்கிறேன். ஆய்வறிக்கையானது எனது பட்டப்படிப்பு பாடத்திட்டத்தின் ஒரு அங்கமாகும். எனவே ''புதிதாக பிரித்தெடுத்த பல் சாக்கெட்டில் பைசல் பைகோர்ட்டிகள் திருகு உள்வைப்பின் மருத்துவ மற்றும் கதிரியக்க மதிப்பீடு'' என்கிற ஆய்வினை நான் செய்ய விரும்புகிறேன். இந்த வேலை அனைத்தும் எனது பேராசிரியர் மற்றும் துறைத்தலைவருமான மரு.டி.துரைராஜ், *M.D.S.* அவர்களின் வழிகாட்டுதலின் கீழ் மேற்கொள்ளப்படும் .

ஆய்வின் தலைப்பு:

புதிதாக பிரித்தெடுத்த பல் சாக்கெட்டில் பைசல் பைகோர்ட்டிகள் திருகு உள்வைப்பின் மருத்துவ மற்றும் கதிரியக்க மதிப்பீடு

ஆய்வின் தன்மை:

தற்போதைய ஆய்வின் நோக்கம் புதிதாக பிரித்தெடுத்த பல் சாக்கெட்டில் பைசல் பைகோர்ட்டிகள் திருகு உள்வைப்பின் மருத்துவ மற்றும் கதிரியக்க மதிப்பீடுதல்

பங்கேற்பாளர்களின் செயல்முறை மற்றும் காலம்:

மறப்பு ஊசி செலுத்திய பின்,பிரித்தெடுக்க வேண்டிய பற்களை பிரித்தெடுத்து, பின் பைசல் பைகோர்ட்டிகள் திருகு கருவி மூலம் துளை இட்டு, பின் பைசல் பைகோர்ட்டிகள் திருகு உட்பொருத்தி தையல் போடப்படும். அக்ரிலிக் பல் செட் உடனடியாக இம்பிளான்ட்ஸ் உட்பொருத்திகளில் ஏற்றப்படும் அறுவை சிகிச்சைக்கு ஒன்று முதல் இரண்டு மணி நேரம் ஆகும்

அபாயங்கள்:

இந்த ஆய்வில் பங்கேற்க பங்கேற்பாளர்களுக்கு நடைமுறை ஆபத்துகள் எதுவும் இல்லை

நன்மைகள்:

தரித்திரமான முன்கணிப்பு இருக்கக்கூடிய பற்களுக்கு செய்யக்கூடிய ஒரே ஒரு அறுவை சிகிச்சை முறை. பைகோர்ட்டிகள் எலும்புகள் நல்ல ஸ்திரத்தன்மை வழங்குகிறது. உடனடி ஏற்றுதல் நெறிமுறை சிகிச்சையின் நேரத்தை கணிசமாகக் குறைத்து நோயாளிக்கு சிகிச்சை அளிப்பதை அதிகரிக்கிறது.

இரகசியத்தன்மை:

பங்கேற்பாளர்களிடமிருந்து சேகரிக்கப்பட்ட தரவு ஆராய்ச்சியாளரால் இரகசியமாக பராமரிக்கப்படுகிறது.

தன்னார்வ பங்களிப்பு:

ஆய்வில் பங்களிப்பது தன்னார்வம் கொண்டதாகும். ஆய்வில் பங்கேற்க வேண்டுமா அல்லது எப்போது வேண்டுமானாலும் திரும்பப் பெறலாமா என நீங்களே முடிவு செய்யலாம்; உங்கள் முடிவை நீங்கள் வேறு எந்த உரிமையினாலும் இழக்க நேரிடாது.

தொடர்பு விவரங்கள்

தலைமை ஆராய்ச்சியாளரின் தொடர்பு விவரங்கள்

மரு. க.செந்தில் கணேஷ்
முதல் வருட முதுகலைப் படிப்பு
தமிழ்நாடு அரசு பல் மருத்துவக் கல்லூரி மருத்துவமனை ,
பிரேசர் பாலச் சாலை,
பூங்கா நகர்,
சென்னை - 600 003

பங்கேற்பவர்கள் உரிமை குறித்த தொடர்பு விவரங்கள்

மரு. ம.சரவணன் M.D.S., Ph.D.,
தலைவர்,
நிறுவன நெறிமுறைகள் குழு ,
தமிழ்நாடு அரசு பல் மருத்துவக் கல்லூரி மருத்துவமனை ,
பிரேசர் பாலச் சாலை,
பூங்கா நகர்,
சென்னை - 600 003

பங்கேற்பவரின் பெயர்
ஆராய்ச்சியாளர் : மரு. க.செந்தில் கணேஷ்
தேதி :
இடம் :

பங்கேற்பவரின் கையொப்பம்