

## Evaluate The Bone Mineral Density In Maxilla Of Edentulous Patients And Comparison Trabecular Bone Between Men And Women Subjects.

### Abstract

The purpose of this study was to evaluate bone mineral density in maxilla of edentulous patients at prospective intraoral implant sites, and comparison of trabecular bone between men and women subjects. A study group of twelve edentulous patients comprising of 6 male and 6 female edentulous subjects between the age group of 45-50 years seeking implant supported prosthesis were selected. A radiographic stent using auto polymerizing resins incorporating the small round ball at the implant site were prepared for the computed tomography scan. The bone mineral density values were recorded in the various sites (trabecular) of maxilla in Hounsfield units. The data thus obtained was tabulated and statistically analyzed using Mann Whitney U test and kruskal wallis test.

### Key Words

Density, Tomography, Edentulous Maxilla

### Introduction:

Rehabilitation of complete edentulism using osseointegrated implants can generally be regarded as the method of choice if there are no local and systemic contraindications. Osseointegrated endosseous implants are used in prosthodontics with high rate of success. Patient selection, treatment planning, implant design, suitable implant materials, good surgical technique and restorative treatment are critical for the success of the procedure. Bone quality and quantity varies from site to site and from patient to patient. Improved success rates for implants are in patients having good bone quality and quantity. Computed tomography is a noninvasive preoperative method and has the major advantage of enabling trabecular and cortical bone density to evaluate separately<sup>(1)</sup>. Optimum implant orientation can be aided by the 3-D radiographic data base provided by a computed tomography scan. The reformatted sectional images, when related to each other, facilitate a thorough visualization of the bone topography, sinus and nerve location and bone density. The study was designed to evaluate and compare the trabecular bone mineral density in males and females in edentulous maxilla for assessment of prospective implant sites.

### Objectives:

- To evaluate bone mineral density in edentulous maxillary prospective implant sites.
- To compare trabecular and cortical bone mineral density of male and female edentulous patients at prospective implant sites of maxilla.

### Methodology

An in vivo study was designed to evaluate the bone mineral density using computed tomography in maxilla of male and female edentulous subjects seeking implant therapy was conducted in the Dept of Prosthodontics and Dept of Radiology, St.Joseph dental college, Andhra Pradesh for assessment of prospective implant sites.

The materials and methods used for the study are described under the following headings:

- 1) Armamentarium used
- 2) Method employed

### Armamentarium Used:

1. Irreversible Hydrocolloid (Zhermack)
2. Dental stone (Kalabhai Kalastone)
3. Plaster of Paris
4. Rubber bowl

1. Plaster mixing spatula
2. Cold mould seal separating

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Submission : 26<sup>th</sup> December 2012

Accepted : 27<sup>th</sup> January 2015

Quick Response Code



medium(DPI Mumbai)

3. Petroleum jelly
4. Graphite pencil (0.5mm)
5. Gutta percha points (Dentsply)
6. Cyanoacrylate adhesive.
7. Autopolymerizing acrylic resin (DPI Mumbai)
8. Kodak T-Mat g/RA Panoramic dental film (Size 15x 30 cm).
9. Panoramic & linear tomographic radiograph machine (PLANMECA PM 2002 CC PROLINE).
10. CT films (Kodak Ektascan).
11. CT machine with Dental scan software (SIEMENS Somatrom ESPRIT PLUS).
12. Radiograph Viewer.

### Method

A group of 24 edentulous subjects comprising of 12 males and 12 females between the age group of 45-50 years seeking implant supported prosthesis were selected for the purpose of this study. All the subjects were informed about the study and their written consent to participate in the study was taken.

### Criteria For Selection:

The subjects were selected on the basis of the following criteria:

Subjects should be completely edentulous with no intra alveolar tooth

remnants and seeking rehabilitation with implant supported prosthesis. The subjects were categorized into two groups of 12 males and 12 females. The patients had good general health and were deemed fit for implant therapy.

A diagnostic impression was made of the completely edentulous maxillary and mandibular arches and cast were poured (Fig-1). Using a graphite pencil prospective implant sites namely at the region of central incisor, lateral incisor, canine on either side of the arch were marked on the maxillary and mandibular cast. Guttapercha cones of diameter 1mm, height 1mm were fixed at the corresponding sites on the cast (Fig-2). A radiographic stent using autopolymerizing resins incorporating the guttapercha cones were prepared on the cast. Occlusal rims were prepared on these radiographic stent and adjusted for proper vertical and horizontal intermaxillary relation and were sealed in order to prevent movement of jaws during computed tomography procedure. Computed tomography was done using a SIEMENS Somatom ESPRIT PLUS fitted with a Kodak Ektascan 160 laser image was used. The patient was stabilized in a standardized position within the gantry (Fig-3). The densities of bone in the various sites (trabecular and cortical) were obtained by locating a cursor at various positions on the image and using Dental scan software program to determine the density which was expressed in the Hounsfield scale (Fig-4). The bone mineral density values were recorded on both sides of the maxillary jaw in the trabecular and cortical region and mean of these was obtained.

The data thus obtained was tabulated and statistically analyzed using Mann Whitney U test and kruskal wallis test.

**Results:**

Comparison of bone mineral density in incisor, canine, premolar and molar areas in the trabecular region of maxilla in males in Hounsfield units (H.U).

**Table I** - Shows the comparison of bone mineral density in incisor, canine, premolar and molar areas in the trabecular region of maxilla in males in Hounsfield units (H.U). The bone mineral density in the trabecular region of maxilla in the incisor areas was (591.0), canine areas was (534.3),

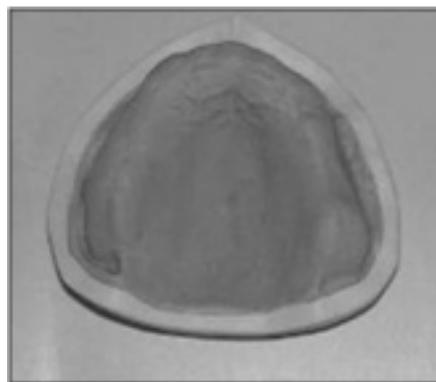


Fig 1 : Diagnostic Maxillary Cast

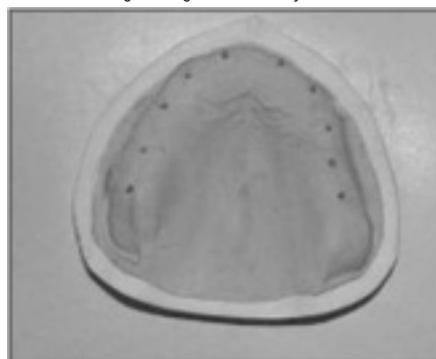


Fig 2 : Gurrapercha Markers on Maxillary Cast



Fig 3 : Computed Tomography

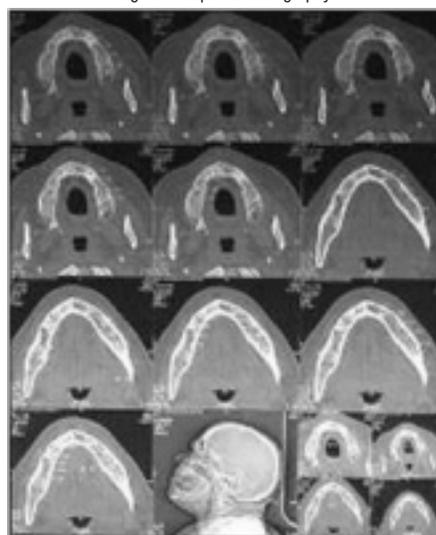


Fig 4 : Computed Tomography of the Subject

premolar areas was (385.1) and molar areas was (341.1). in which density is more in the incisor and canine areas

Table 1

	N	Mean	Std Deviation	H	p
Incisor	6	591.0000	113.85429		
Canine	6	534.3333	78.12213		
Premolar	6	385.1667	51.93618		
Molar	6	341.1667	81.78855	16.513	.001

Table 2

	N	Mean	Std Deviation	H	P
Incisor	6	460.5000	83.67019		
Canine	6	329.5000	56.38706		
Premolar	6	271.1667	25.63136		
Molar	6	250.1667	43.02751	16.387	.001

Table 3

		N	Mean	Std. Deviation	Z	P
Incisor	Male	6	591.0000	113.85429	-1.761	.078
	Female	6	460.5000	83.67019		
Canine	Male	6	534.3333	78.12213	-2.882	.004
	Female	6	329.5000	56.38706		
Premolar	Male	6	385.1667	51.93618	-2.722	.006
	Female	6	271.1667	25.63136		
Molar	Male	6	341.1667	81.78855	-2.082	.037
	Female	6	250.1667	43.02751		

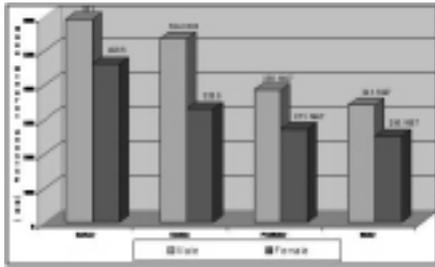
compared to the premolar and molar areas. Variation in the bone mineral density was found to be statistically highly significant (p=.001 sig).

Comparison of bone mineral density in incisor, canine, premolar and molar areas in the trabecular region of maxilla in females in Hounsfield units (H.U).

**Table II** - Shows the comparison of bone mineral density in incisor, canine, premolar and molar areas in the trabecular region of maxilla in females in Hounsfield units (H.U). The bone mineral density in the trabecular region of maxilla incisor areas was (460.5), canine areas was (329.5), premolar areas was (271.1) and molar areas was (250.1) in which density is more in the incisor and canine areas compared to the premolar and molar areas. Variation in the bone mineral density was found to be statistically highly significant (p=.001 sig).

Comparison of bone mineral density in incisor, canine, premolar and molar areas in the trabecular region of maxilla in males and females in Hounsfield units (H.U).

**Table III** - Shows the comparison of bone mineral density in incisor, canine, premolar and molar areas in the



Graph 1

trabecular region of maxilla in the males and females in Hounsfield units (H.U)

The bone mineral density in the trabecular region of maxilla in the incisor region of males is (591.0) and females is (460.5) Variation in the bone mineral density was found to be statistically not significant ( $p=0.078$ .ns).

In the canine region of males is (534.3) and females is (329.5) Variation in the bone mineral density was found to be statistically highly significant ( $p=0.004$ hs).

In the premolar region of males is (385.1), and females is (271.1) Variation in the bone mineral density was found to be statistically highly significant ( $p=0.006$ hs).

Comparison of bone mineral density in incisors, canine, premolar and molars in the trabecular region of maxilla in the males and females in hounsfield unit (**Graph 1**).

Bone mineral density has been measured by photodensitometry, photon absorptiometry and computed tomography. Of these methods computed tomography is a noninvasive preoperative method and widely accepted as the most precise means of evaluating the architecture of potential implant sites in the mandible and maxilla.<sup>[2]</sup> Computed tomography has the major advantage of enabling trabecular and cortical bone density to be evaluated separately.<sup>[3]</sup>

When the bone mineral density in incisor, canine, premolar and molar areas in the trabecular region of maxilla in males is compared as intable II, it was seen that the bone mineral density in the incisor areas

was (591.0 H.U), canine areas was (534.3 H.U), premolar areas was (385.1 H.U) and molar areas was (341.1 H.U). Variation in the bone mineral density was found to be statistically highly significant. In females as intable V bone mineral density in the incisor areas was (460.5 H.U), canine areas was (329.5 H.U), premolar areas was (271.1 H.U) and molar areas was (250.1 H.U) in which density is more in the incisor areas and canine areas compared to the premolar and molar regions. Variation in the bone mineral density was found to be statistically highly significant.

The bone patterns in the maxilla comprises of fine trabeculae arranged in a lace like pattern. The trabecular arrangement produces smaller marrow spaces than seen in the mandible (of same person). The finer network of trabeculae (mesh) may vary from 1 mm to 3-4 mm. as a person grows older the bone loses some of its calcific content for various reasons: nutrition, atrophy, hormonal change, osteoporosis, etc.<sup>[4]</sup>

The study shows the bone mineral density is almost from incisor areas to molar areas in the buccal cortex and the bone mineral density may lie on nearly the same level over the entire palatal cortex. In the trabecular region bone mineral density is more in the incisor and canine areas compared to the premolar and molar areas. The bone mineral density in males is little higher than females, but implant therapy can be carried out with same degree of success.

This study also shows an insight into variable bone mineral density in anterior and posterior region maxilla. The higher bone mineral density in the anterior region of maxilla may be one of the reasons for increased success rate in osseointegration. Computed tomography is mandatory in prospective implant patient not only in assessing bone mineral density but also the height and width of the available bone.

### Conclusion

1. Computed tomography provides both quantitative and qualitative information of trabecular and cortical

bone separately, thus aiding in proper patient selection and facilitate proper assessment of potential recipient sites for implant placement.

2. The bone mineral density in incisor, canine, premolar and molar areas in the trabecular region of maxilla in the males and female subjects there is highly significant variation from incisor areas to molar areas.

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Source of Support : Nil, Conflict of Interest : None declared