Assessment of bone density after six months from dental implants placement using Computed Tomography

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ABSTRACT

Background: Determination of local bone mineral density (BMD) immediately after implant insertion play an important role in implant success rate, may offer comprehensive description of the bone, and give enough information to the surgeon prior to implant insertion and at follow up status. The aim of the present study is to evaluate the changes of local bone density in the dental implant recipient sites by using computerized tomography.

Material and method: The sample consisted of (20) dental implants recipient sites, bone density assessment was done twice, immediately after implants insertion and after six months.

Results: The mean HU of the bone around the implant insertion site, immediately after implant placement was 552.28 HU, and increased to761.33HU after six months. According to gender, with females, it was 539,54HU, and increased to 765.65HU after six months from implant insertion while with males, it was 565.02HU, and increased to 757.02HU after six months from implant insertion.

Conclusion: There was an increased in bone density around dental implant by time with non-significant differences according to the gender.

Keywords: Computed Tomography, dental implants, Hounsfield unit. (J Bagh Coll Dentistry 2014; 26(4):126-128).

الملخص

الخلفية: تحديد كثافة العظام قبل وبعدغرزالزرعات السنية من الامور المهمة جدا في نجاح زراعة الاسنان. إن الهدف من هذه الدراسة السريرية الحالية هو تحديد كثافة العظام بعد عملية زراعة الاسنان.

طرق البحث: تم قياس متوسط كثافة العظام ل 20 زرعة بوحدة الهاونسفيلدباستخدام الأشعة المقطعية ، ا لمنطقة ما حول الزرعهفي مختلف مناطق الفكين العلوي والسفلي.بعد الزراعة مباشرة وبعد مرور 6 اشهر من زراعة الاسنان.

النتائج: متوسط كثافة العظم حول الزرعة السنية مباشرة بعد غرز الزرعة كان ما يعادل 552.28وحدة قياس الكثافة, حيث انها ازدادت لتصل الى 761.33 وحدة بعد ستة اشهر من غرز الزرعة, معدل كثافة العظم بعد غرز الزرعة مباشرة عند الرجال 565.02 وحدة وبعد مرورستة اشهر ازدادت لتصل 757.02 وحدة اما عند النساء 539.54 وحدة مباشرة بعد الغرز وبعد ستة اشهر ازدادت لتصل 765.65 وحدة.

الاستنتاج :كثافة العظم تزداد بعد مرور 6 اشهر من زراعة الاسنان وتكون نسبة الزيادة متساوية عند الرجال والنساء بفارق غير محسوس احصائيا.

INTRODUCTION

It is important to evaluate the statement of jaw bone at the potential implant site, several methods to measure the bone dimension and density, determination of bone density may offer comprehensive description of the bone, its beneficial to give enough information to the surgeon prior to implant insertion and at follow up status. Quantitative computed tomography is used to determine bone density [1].

The internal structure of bone is described in terms of quality or density, which reflects a number of biomechanical properties, such as strength and modulus of elasticity. The external and internal architecture of bone controls virtually every facet of the practice of implant dentistry. The density of available bone in an edentulous site is a determining factor in treatment planning, implant design, surgical approach, healing time, and initial progressive bone loading during prosthetic reconstruction. This study presents the aspects of bone density related to overall planning of implant prosthesis [2].

An appreciation of bone density and its relation to oral implantology has existed for more than 25 years. Bone density was classified into three categories: Class I bone structure: This ideal bone type consists of evenly spaced trabeculae with small cancellated spaces. Class II bone structure: The bone has slightly larger cancellated spaces with less uniformity of the osseous pattern. Class III bone structure: Large marrow-filled spaces exist between bone trabeculae [3].

The amount of crestal bone loss also has been related to bone density, and further supports a different protocol for soft bone. Several researches proposed four bone density groups independent of the regions of the jaws, based on macroscopic cortical and trabecular bone characteristics. The regions of the jaws with similar densities were often consistent. Suggested treatment plans, implant design, surgical protocol, healing, and progressive loading time spans have been described for each bone density type.

These four macroscopic structures of bone may be arranged from the least dense to the densest, these four increasing macroscopic densities constitute four bone categories described by Misch (D1, D2, D3, and D4) located in the edentulous areas of the maxilla and mandible [4].

HU value was used to assess the bone density on the implants site, and the standard value of jaw bone density varies from one individual to other [5].

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Table 1: Bone Density Classification Scheme (8)

Bone density	Description	Typical anatomical location
D1	Dense cortical	Anterior mandible
D2	Porous cortical and coarse trabecular	Anterior mandible Posterior mandible Anterior maxilla
D3	Porous cortical (thin) and fine trabecular	Anterior maxilla Posterior mandible
D4	Fine trabecular	Posterior maxilla

MATERIALS AND METHODS

This study was performed in Baghdad from December 2012 to February 2014, the patients were selected from different centers of implantology in Baghdad. The sample consisted of twelve patients with twenty implants, ten in male and ten in female in premolar and molar region of upper and lower jaws.

CT scan was taken immediately after implant insertion to measure the bone density by using HU around dental implant, after six months after dental implant placement, another CT scan was performed, and bone density in HU unit was measured around the implant site to detect the osseointegration.

RESULTS

As shown in Table 2, the mean HU of the bone around the implant insertion site, the mean HU of jaw bone at immediate implant placement was 552.28 HU, and increased to 761.33HU after six months from implant insertion, and they showed statically significant differences ($p \leq 0.05$).

In Table 3, the mean of HU according to the gender, was 539,54HU in females, and increased to 765.65HU after six months from implant insertion, which is statistically significant ($p \leq 0.05$).

While in males it was 565.02HU, and increased 757.02HU after six months from implant insertion, which is also statistically significant ($p \leq 0.05$).

Table 2: Bone Density in Hounsfield Unit around the area of implant placement at immediate implant placement and after six months

	Mean ±SD
At immediate implant placement	552.28±104.5
Six months from implant insertion	761.33±156.7

Table 3: Bone Density in Hounsfield Unit according to the gender on the area of implant placement at immediate implant placement and after six months

	Female	Male
Immediate implant placement and	539.54±137.2	565.02±97.5
Six months from implant insertion	765.65±198.7	757.02±153.6

DISCUSSION

This study revealed that the density of jaw bone around dental implant increased with osseointegration, with the same rate in males and females using HU that measured by MSCT which is important in the measurement of bone density.

Table2 shows the differences of bone density around the implant immediately after insertion and after six months from the surgery. Mean HU value was increased significantly after implant placement. This result reveals that the density of the jaw bone around the dental implant increased, this is in agreement with Han and Park [(6)] when approved that there calcified tissue around implant surface by time.

Table 3 shows the differences of bone density according to the gender on the area of implant placement immediately and after six months from the surgery. Mean HU value show non-significant increasing between male and female, this study revealed that the density of bone increased in both male and female in the same rate. This study also agreed with Barunawarty, in his study approved that bone density increased around dental implant after placement of dental implants [(7)].

In conclusion; CT-Scan could be used to assess the changes of bone density around dental implants. The bone density increased with osseointegration, the increasing rate of bone density could be determined by quality of jaw bone before, and after implant insertion.

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