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# Assessment of Peri Implant Osteal Changes by Radiographic Evaluation Using Standard Orthopantomograph and Periapical View a Retrospective Study

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**الخلاصة**

**الاهداف**: يهدف البحث الى تقييم استخدام أشعة البانوراما والأشعة الذروية على التغيرات في الأنسجة العظمية حول زرعة الأسنان الحاصلة عند وضع الزرعة وبعدها بأربعة أشهر واعتبارها معيارا للتوقع بنجاح الزرعات. **المواد وطرائق العمل**: تم مشاركة تسعة عشر مريضا وباستخدام أربعة وعشرين زرعة وتم اخذ أشعة بانوراما وأشعة ذروية للأسنان وباستخدام جهاز الديماكس لتحليل واخذ القياسات للعظم السنخي حول الزرعة بجانبيها الإنسي والوحشي بعد وضع الزرعة وقياسات أخرى بعد أربعة أشهر. **النتائج**: تراوحت أعمار المرضى بين ٢٢ و٦٥ سنة و كان معدل فقدان العظم في الجانب الإنسي عند وضع الزرعة بمعدل ٠,٥٩ملم و ٠,٦ ملم للجانب الوحشي، كما وكان معدل الفقدان للجانب الإنسي ٠,٩٨ ملم و ١,١١ ملم للجانب الوحشي لذا يعد إحصائيا ذا فرق معنوي لنسبة فقدان العظم والذي سيؤثر بصورة سلبية على مدى وعمر الزرعة. **الاستنتاجات**: يعد استخدام أشعة البانوراما والأشعة الذروية معيار مهم في تقييم نجاح الزرعات ومتابعتها ومراقبة الثباتية وقوة التحمل خاصة وان هذا النوع من الأشعة متوفر في معظم العيادات وبكلفة مناسبة.

## ABSTRACT

**Aims:** The aims of the study are to evaluate the radiographical views, OPG and periapical views on the changes in peri- implant bony tissue around dental implant at time of placement and another reading after 16 weeks before functional prosthetic loading and regard it as a prognostic parameter. **Material and methods:** Nineteen cases with 24 implant were enrolled for standardization. Radiographical measurement undertaken by a periapical and OPG radiographs after implant placement, then after16 weeks later, again a second periapical and OPG radiographs were taken for measurements using Dimaxis 3.2.1. Software program to estimate marginal bone height of both sides of implant and its changes during times of evaluation. **Results:** 19 medically fit patients, male and female with age 22-65 years, twenty four implants with average bone loss 0.59 mm mesialy and 0.60 mm distally at T0 as standered base line in compared to 0.98mm mesialy and 1.11mm distally at T1as average bone loss. There was a significant bone resorption in both sides in relation of implant size and in comparison to time of placement and after 16 weeks according to statistical analysis. **Conclusion:** OPG and periapical views are a good parameter for evaluation of successful implant and monitoring of the prognosis and stability and durability, as these radiographs more available in most dental centers and clinics with less cost.

**Key words**: Periimplant, osteal changes, orthopantomograph, periapical radiograph.

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## INTRODUCTION

Modern dental practitioners often put implant therapy as the first choice of treatment option to replace lost teeth instead of traditional methods that have been modified. Morphological osteal changes should be expected after lost teeth and fixture placement that may result in problematic conditions and affects aesthetics [1,2]. Osteal resorption occurs after the placement of implant fixture, up to the first thread of the implant fixture body or to first contact of the alveolar bone with the rough surface, peri-implant osteal resorption can be assessed by radiographic films, and is usually not more than 1.5 mm in the first 12 months [3]. Dental implants are used for replacement of multiple loss teeth in jaw bones. Preoperative preparation for surgical part of implant includes the radiographic assessment that provides informations related to the localization of anatomical findings and the amount and type of bone available for fixture placement in the appropriate places, pre surgical radiographic examination in extraction area is a critical factor when choosing places for an ideal number, an appropriate size, and a accurate location of implants [4]. The choice of time for radiographic assessment is important. Longitudinal studies within initial radiographs gained at fixture position expose significant bone loss prior to placing of the definitive restoration. Such osteal resorption may depend upon the position of the coronal division of the dental implant in relation to the alveolar base, the construction of an boundary (micro space) among the implant apparatus, and the type of collar and platform of fixture[3]. Golden method to estimate the triumph rates of implants are stability, deficiency of distress, and relentless contamination; nonexistence of ache; and no persistent periapical radiolucence [5]. Radiographs are regularly applied to imagine anatomic structures like alveolar bone. Conventional intra-oral radiographs show inter dental alveolar bone levels [6]. Peri-implant bone level assessment is broadly conventional by radiological imaging techniques. Conventional intraoral or OPG radiographs are commonly used. In the severely resorped jaw bone, anterior mandible. OPG radiographs are preferable to intraoral radiographs for evaluating osteal resorption around fixture [7]. Standard periapical view of radiograph and OPG is usually used in preparation of patient to dental implant as these views show the fine details in oromandibulomaxillary area. Rotational OPG is a popular form of radiography in dentistry generally that no other imaging modality gives as much information about the jaws with such a small radiation dose [8-10].

**Aims of study:**

This study aims to estimate the changes in peri- implant bony tissue at time of placement and another reading after 16 weeks before functional prosthetic loading and regard it as a prognostic parameter.

## MATERIALS AND METHODS

A retrospective study done in Implant Unit College of Dentistry University of Mosul with follow- up time of 4 months. Between Jan. 2013 and May 2014.Among more than 40 cases of successful implant as followed till end of prosthetic part, 19 case where included as it matches the criteria of the study which contain inclusion criteria age more than 18 and no augmentation to bone and medically fit with complete radiographic and other information. Exclusion criteria heavy smoker parafunction, medically compromised, shortage of information [11], and radiographical measurement undertaken by a periapical and OPG radiographs, then after four months later again additional periapical and OPG radiographs taken for measurements. Radiographical analysis was conducted by using Dimaxis 3.2.1. Software program by estimation of marginal bone height of both sides of implant, and its changes during that's time of evaluation [12-14]. We put reference points in mesial, distal sides of implants. So to evaluate the resorption, choose highest point in the alveolar ridge in the radiograph at the day of implant appointment to the point at the contact with implant and referred as T0 (time 0) the periapical view as seen in Figure (1) A and B and OPG view as seen in Figure (2).

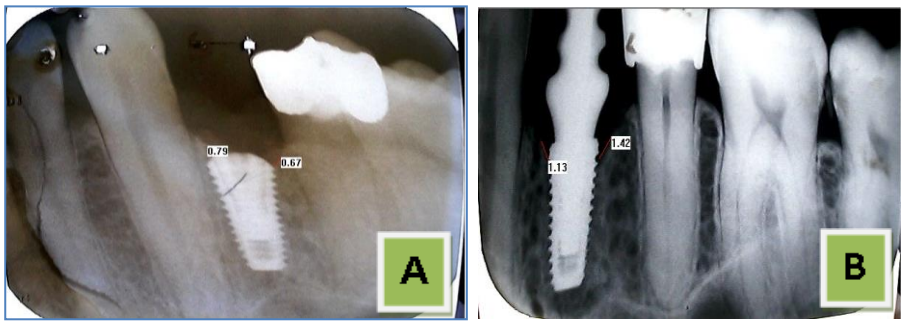


Figure (1): Periapical view show (A: Implant at the base line. B: after 4 months).

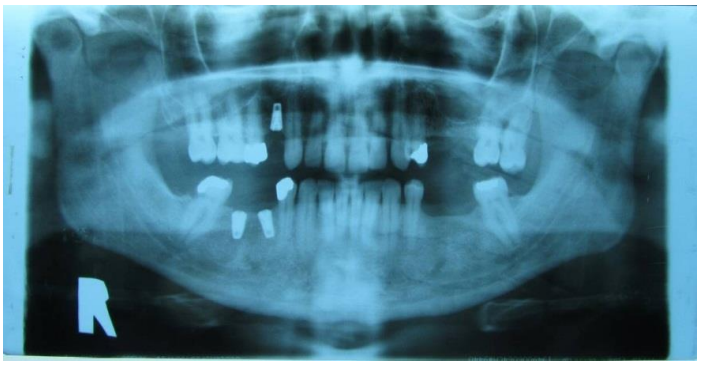


Figure (2): Orthopantomograph used as a parameter for bone loss.

After 4 months, when patient came again to put gingival former, another radiograph took for other measurement and referred as T1 (time 1) by using the Dimaxis 3.2.1.radiographic program all data where recorded then the data base was analyzed by SPSS software program version 14.0 and the Wilcoxon signed ranks test.

## RESULTS

Nineteen patients, 24 implant, male 42% and female 58%with age 22-65 years, checked for the following information: gender, age, site of implant, implant's length, and implant's diameter. With average bone loss 0.59 mm mesialy and 0.60 mm distally at T0 in compared to 0.98mm mesialy and 1.11mm distally at T1. There was significant osteal resorption in mesial and distal surface in relation to implant size in comparison to time of placement and after 16 weeks according to statistical analysis Wilcoxon signed ranks test with Mean bone resorption between two times according to location and size of the implant as showed in Table (1), and other comparisons done between two times mesialy and distally and the relation between bone loss around implant and size of fixture size as shown in Table (2).

Table (1): Mean value of bone loss between two times according to location and size of implant

| Variables | No. of implant | | T0* mesial- T1* Mean | T0 distal- T1 Mean | P -value** |
|---|---|---|---|---|---|
| Location | Maxilla | 14 | 0.63-0.99 mm | 0.62-1.14 mm | 0.00 |
| | Mandible | 10 | 0.59-0.96 mm | 0.55-1.08 mm | 0.00 |
| Implant diameter | ≤ 3.8mm | 8 | 0.58-0.92 mm | 0.58-1.10 mm | 0.00 |
| | ≥ 4.3mm | 16 | 0.62-1.01 mm | 0.60-1.12 mm | 0.00 |
| Implant length | ≤ 10 mm | 19 | 0.60-1.01 mm | 0.59-1.10 mm | 0.00 |
| | ≥ 14 mm | 5 | 0.63-0.86 mm | 0.63-1.18 mm | 0.00 |

* T0=time at placement, T1=time after 16 weeks, **statistically significant ($P < 0.05$).]

Table (2): The mean ranks of different variables measured

| Variable comparison | Mean Ranks | P- Value* |
|---|---|---|
| T0 m- T1m | 2.50- 12.93 | 0.00 |
| T0 d- T1 d | 0.00- 12.50 | 0.00 |
| T0d- L and D | 0.00- 12.5 | 0.00 |
| T0m- L and D | 0.00- 12.5 | 0.00 |
| T1m- L and D | 0.00- 12.5 | 0.00 |
| T1 d- L and D | 0.00- 12.5 | 0.00 |

T0=time at placement, T1=time after 16 weeks, m=mesial side, d= distal side, L= length, D= diameter. *statistically significant ($P < 0.05$).

## DISCUSSION

In this study, measurements in the mesial and distal surfaces of implant bone was done at the baseline of implant appointment and after 16 weeks, The parameters that relate to implant stability include osteal type and amount, surgical method, and implant shape, which may affect the period of loading for each individual situation. Despite the high success rates, post-operative sequel and failures still may occur [(15)]. In our study there was a significant difference when measured the osteal resorption in mesial and distal site after 16 weeks, this is agreeing with Bhardwaj et al. which found, the crestal bone loss during the follow-up period, showing mean value ranging from baseline 0.25mm ± 0.11mmto 0.31mm ± 0.08mm at 3 weeks, to 0.67mm ± 0.13mm at 3 months. Thus reported statistically significant ($P < 0.05$) bone loss in the region of the implants placed in the maxilla, as compared to those in mandible. Higher mean osteal resorption on mesial and distal surfaces could be due to the truth that all the implants were positioned in the spongy bone (D3) by Misch classification. Bone loss occurs frequently in 1st year post surgery; authors showed that a great proportion of primary

bone loss occurred during the 1st month in one step implant. Subsequent to the 1st year of function, an instantaneous restoration did not seem to cause a greater average amount of bone loss [13]. Bone level changes ranged from 0 mm to 3.35 mm after one year and from 0 mm to 3.15 mm after 2 years of follow –up. No increase was found in the range from 1 year to two years of follow –up as reflected by the increasing percent of bone level changes after 1 year (61.9% ≤ 1 mm) and 2 years (60.6% ≤ 1 mm)[13]. Bone resorption increased during first 4 months may be due to extreme thermal generation during work and load of occlusal power. The osteal type and implant size have been assumed to be significant issue on bone to implant contact and hence on implant primary stability [16]. Marginal bone loss (MBL) around implants is an vital parameter for implant accomplishment and soft tissue esthetics and is known to be significantly affected by implant design. The first three years of implant use are crucial for MBL, and it has been shown that most resorption occurs during the first 12 months after surgery, despite the consequences of implant type and this process slows down during the second year and stabilizes to an average 0.05–0.15 mm/year bone loss rate. Implants placed in the mandible tended to have smaller MBL than in the maxilla after 3 years, the denser mandibular bone can more effectively survive loading while undergoing slower remodeling around the bone necklace than the maxilla, which contain higher marrow bone. A larger diameter requires the implant to be inserted in more posteriors regions of the ridge, where tissue structural design is dissimilar and mechanical loads are higher. Larger implants are therefore expected to be subject to higher compressive forces and these may have caused more bone loss. Possible causes of fixture osteal resorption include surgical disturbance, occlusal overwork, peri-implantitis, micro-gap, biologic width and others [17, 18]. This loss of crestal bone could be attributed to the fact that whenever bone is uncovered of its periosteum, its vascular blood supply is affected, which could result in some amount of loss of the crestal bone. Elevation of the mucoperiosteal flap during surgical work steps is regarded as an important factor that may relate to implant bone resorption during the healing period [19]. Repetitive measurements of 16 implants indicated that the discrepancy owing to inaccuracy in the interpretation of radiographs was small for both Astra technique and Branmark implants, being 1-4% of the total disagreement [20].

## CONCLUSIONS

OPG and periapical views are a good parameter for evaluation of successful implant and monitoring of the prognosis and stability and durability, as these radiographs

more available in most dental centers and clinics with less cost.

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