

Estimation of Proper Implant Length in the Posterior Region of the Maxilla by using Digital and Conventional Panoramic Radiographs "Comparative Study"

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Abstract

This Study was done to compare between the digital and conventional panoramic radiography in the estimation of the distance between the crest of alveolar bone to the floor of maxillary sinus for proper dental implant in the posterior region of maxilla.

Twenty patients were selected, they need multiple implants in different posterior edentulous regions of the maxilla, in the period from (January 2006-April 2006), 11 were males and 9 females of age between (37-52). All the patients were sending for digital and conventional panoramic radiographic examination. Comparison was done for the two types of radiographs with tracing chart readings of Friadent system for the measurement of implant length.

The study shows that obvious differences between the digital and conventional panoramic radiography in comparison to tracing chart, while no differences were detected between the digital panoramic radiographs and the tracing chart.

The study reported that the digital panoramic radiography is more accurate in estimation of proper bone measurement than conventional radiographs for precise dental implant selection.

Key ward: Dental implant, digital panoramic radiograph, maxillary sinus

Introduction

An important objective of the preoperative radiographic evaluation of the implant is to determine the height and width of the bone available for implant insertion. Ideally the bone should allow complete coverage of all implant threads on both buccal and the lingual sides. The available bone height must therefore be estimated from that part of the alveolar bone in which a sufficient bone width and height is found to a site specific anatomic boarder in the vertical direction, e.g. the lower boarder of the maxillary sinus^(1, 2, 3).

A preoperative planning for implant surgery in the posterior region of the maxilla is more complicated than other regions^(4, 5).

The extension of the maxillary sinus limits the amount of bone available for implant placement both in horizontal and vertical directions⁽⁶⁾.

An accurate estimation of the distance between the marginal bone crest and the floor of the nasal cavity or the maxillary sinus is necessary in order to select implants of appropriate length for placement in the maxilla⁽⁶⁾.

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Digital and conventional panoramic radiograph can be used for preliminary estimate of the available bone height between the marginal bone crest and the floor of the maxillary sinus. The estimation of the horizontal dimension of the potential implant site can be made from panoramic radiograph. Rather than choosing an implant that dose not reach the border, an implant should be used that just penetrate the cortical border to obtain the necessary anchorage⁽⁷⁾.

Material and Methods

Twenty consecutive patients were referred from Oral and Maxillofacial Surgery Department to the Oral Radiology Department, College of Dentistry, University of Baghdad, and To the Hospital of the Specialized Surgery, in the period from (January 2006-April 2006). Eleven were males and nine females, of age (37-52) years, (table 1).

All patients were send for both digital panoramic radiograph by dimax system Figure (1), with different kVp and mA according to the patient gender and age, and conventional panoramic radiographs by using Planmeca orthopantomograph machine PM 2002, CC Proline, made in Finland, 15 second exposure time with different value of kVp, mA according to the age and gender of the patient.

Digital and conventional panoramic radiographs were examined by two ways:

1. By using computerized analysis (by software of dimax system), by measuring the distance from the crest of alveolar bone of edentulous posterior region to the floor of maxillary sinus (figure 1).
2. By using ruler to measure the distance from the crest of bone to the floor of maxillary sinus in

conventional panoramic radiographs.

3. The examination and measurements for both digital and conventional radiographs were done by two highly professional radiologist and Maxillofacial Surgeon separately. The data were compared together, and with the tracing chart readings with excluded any wrong measurements that results from that readings.

The twenty patients were divided into four groups according to the site of missing teeth:

- A- Five patients at first premolar
- B- Five patients at second premolar
- C- Five patients at first molar
- D- Five patients at second molar

The mean value of the five patients in each group was compared:

- 1- Through digital panoramic with conventional panoramic radiograph.
- 2- Through digital panoramic radiograph with tracing chart readings.
- 3- Through conventional panoramic radiograph with tracing chart readings.

Results

The current study shows that the mean value of estimation the distance from crest of alveolar bone to the floor of maxillary sinus by digital panoramic radiographs is obvious different from the mean value of measurements of the four groups patients by conventional panoramic radiographs, as shown in table (2).

Table (3); shows that the mean value of estimation the distance from crest of alveolar bone to the floor of maxillary sinus at different site regions in the four groups, by using

conventional panoramic radiograph is obvious different from that of tracing chart readings .

No obvious differences between digital panoramic radiographs and tracing chart readings in the estimation the mean value of the distance from crest of alveolar bone to the floor of maxillary sinus, at the four site regions of the four groups patients, as shown in table (4).

Discussion

One of the potential complications of implant is improper angulations or position of the implants, and perforation of the maxillary sinus.

Variation in the position or angulations of the implant result, when the anatomy found at surgery implant placement different from that planned preoperatively.

This can be avoided nowadays by using digital panoramic radiograph with the help of software dimax system.

Sinus perforation occurring during drilling for implant placement is unlikely to cause serious squeals .shorter implant length that planned may be necessary to prevent the implant from extending too far into the sinus .

Usually the resistance provided by the cortical bone of the floor of maxillary sinus is encountered before a perforation results and can serve as an indicator that maximum depth has been reached.

The current study reported that there are obvious differences between the conventional and digital panoramic radiographs in the estimation of the accurate length of implant that necessary for placement far from the floor of the sinus. These differences in measurement value are due to the followings:-

- 1.Less superimposition of bone structures in the molar bone, and zygomatic process, are present in digital panoramic radiographs than the conventional one.
- 2.More magnification will appear in the conventional panoramic radiographs than the digital radiographs.
- 3.Can easily change the contrast, and increase the resolution of the radiographs by digital technique with the help of computerized analysis (by using software dimax system).

Also, the study shows that obvious differences were detected between the conventional panoramic radiographs and the tracing chart readings, in the measurement of appropriate length of implant that necessary to placement in the posterior region of the maxilla far from the floor of the maxillary sinus.

These differences are due to the same reason that mentioned in the panoramic readings, beside that the tracing chart readings were as standard measures for both implant length and diameters that supply with the implant system, in which the oral surgeon depend on this standard measurements for selections the proper implant and diameter. In the comparison between the mean value of the measurements data obtained from both digital panoramic radiographs and tracing chart readings, the study shows non significant differences.

Conclusions

- 1-Digital panoramic radiographs are more accuracy to use for estimation of the appropriate implant length.
- 2-No significant differences are obtained between the reading of digital panoramic radiographs and tracing chart for estimation of implant length.
- 3-Significant differences are reported between the reading of

conventional panoramic readings and tracing chart in the estimation of implant length.

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Table (1); Distribution of the patients according to the age, and gender.

| No. of patients | Average age (years) | Gender | |
|-----------------|---------------------|-----------|----------|
| | | Males | Females |
| 20 | 37-52 | 11 | 9 |

Table (2); Mean value of measurements of distance from the crest of different edentulous posterior region to the floor of maxillary sinus, by conventional panoramic radiographs in comparison to tracing chart readings.

| No. of patients | Site of teeth | Digital Panoramic by Computerized analysis | | Conventional Panoramic Radiographs | |
|-----------------|-----------------------------|--|-----------------|------------------------------------|---------------------|
| | | Right side | Left side | Right side | Left side |
| A(5) | First premolar | 15 mm | 13 mm | 16.1 mm | 13.8 mm |
| B(5) | Second Premolar | 11 mm | 10 mm | 12.3 mm | 11.3 mm |
| C(5) | First molar | 10 mm | 11 mm | 11.8 mm | 11.9 mm |
| D(5) | Second molar | 11 mm | 11 mm | 12.2 mm | 12.9 mm |
| 20 | First premolar-Second molar | 10-15 mm | 10-13 mm | 11.8-16.1 mm | 11.3-13.8 mm |

Table (3); Mean value of measurements of distance from the crest of different edentulous region to the floor of maxillary sinus, by conventional panoramic radiographs in comparison to tracing chart readings.

| No. of patients | Site of teeth | Tracing chart readings | | Conventional panoramic radiographs | |
|-----------------|-----------------------------|------------------------|-----------|------------------------------------|--------------|
| | | Right side | Left side | Right side | Left side |
| A(5) | First premolar | 15 mm | 13 mm | 16.1 mm | 13.8 mm |
| B(5) | Second premolar | 11 mm | 10 mm | 12.3 mm | 11.3 mm |
| C(5) | First molar | 10 mm | 11 mm | 11.8 mm | 11.9 mm |
| D(5) | Second molar | 11 mm | 11 mm | 12.2 mm | 12.9 mm |
| 20 | First premolar-Second molar | 10-13 mm | 10-13 mm | 11.8-16.1 mm | 11.3-13.8 mm |

Table (4); Mean value of measurements of distance from the crest of different edentulous posterior region to the floor of maxillary sinus, by digital panoramic radiographs in comparison to tracing chart readings.

| No. of patients | Site of teeth | Tracing chart readings | | Digital Panoramic radiographs | |
|-----------------|-----------------------------|------------------------|-----------|-------------------------------|-------------|
| | | Right side | Left side | Right side | Left side |
| A(5) | First premolars | 15 mm | 13 mm | 14.9 mm | 13.1 mm |
| B(5) | Second premolars | 10 mm | 10 mm | 10.7 mm | 9.8 mm |
| C(5) | First molar | 11 mm | 11 mm | 10.3 mm | 10.8 mm |
| D(5) | Second molar | 11 mm | 11 mm | 11.4 mm | 10.7 mm |
| 20 | First premolar-second molar | 10-13 mm | 10-13 mm | 10.3 mm-14.9mm | 9.8-13.1 mm |



Figure (1); digital orthopantomography by using Dimax system that show the estimation of the proper length of the implant in the region of missing upper right