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ORIGINAL ARTICLE

USE OF PANORAMIC RADIOGRAPHS FOR EVALUATION OF MAXILLARY AND MANDIBULAR RESIDUAL RIDGE RESORPTION: IN VITRO STUDY

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ABSTRACT: INTRODUCTION: Progressive ridge resorption is one of the main causes of loss of stability and retention of mandibular complete dentures. The location of the mental foramen can be identified easily on panoramic radiographs, and radiographic examinations are considered an important component of Prosthodontics diagnostic and treatment planning. Also the location of maxillary landmark is important to known how much resorption is there. Aim: To determine the average ratio of bone height with nearest constant anatomical landmarks in maxilla and in mandible. **OBJECTIVE:** To find out the association between radiographic findings & prosthodontics, such as measurements of the amount of resorption and the variation in the treatment planning of edentulous patients. **METHODS:** The subjects OPG was taken using standard radiographic procedural parameters. The measurement was done for distance 'c', 'a', 'x', 'y', 'z'. Then the calculations from measurements were done to calculate the ratio of c/a, to calculate the ratio of x/y, to calculate the ratio of x/z. **RESULT:** The descriptive statistics was done. The C/a ratio mean is 2.71 ± 0.31. The X/Y ratio mean is 1.49 ± 0.34 and the X/Z ratio mean is 1.51 ± 0.24. **CONCLUSION:** This ratio can be assessed in edentulous patients and then there further treatment plan can be decided according to the ratio. The implant placement can be assessed by using the measurements in this study.

KEYWORDS: Average alveolar bone, panoramic radiograph, mental foramen, mandibular ridge, zygomatic process, maxillary ridge.

INTRODUCTION: The most essential part of planning of advanced treatment is to access the quality of bone in options such as dental implants and in diagnosing patients with osteoporosis.[1] As such, panoramic and or periapical radiographs have become routine diagnostic tools for treatment planning. In edentulous patients, reduction of the residual ridge is one of the most important factors affecting denture support, retention, stability and masticatory function. The use of dental implants to provide support for prostheses offers a multitude of advantages compared with the use of removable soft tissue-borne restorations. Diagnostic imaging and techniques help to develop and implement a cohesive and comprehensive treatment plan for the implant team and the patient.

Resorption of the alveolar ridge has been estimated with various radiographic techniques, such as lateral cephalometric radiographs and panoramic radiographs. Panoramic radiography is commonly used in large institutional practices as the sole method of screening edentulous and dentate patients. Wical & Swoope (1974)[2] used panoramic radiographs to obtain a ratio of the height of the mandible at the mental foramen and the height of the mental foramen from the lower border. Atwood did an assessment of the maxillary ridge as it was never done before; it was done by measuring the constant landmarks of the maxilla and then deriving the ratios of anterior and posterior bone resorption.

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Hence no studies made use of both the ratios to evaluate the treatment planning. So this study was conducted to be used for the future treatment planning and for the betterment of the edentulous patients.

AIM: To determine the average ratio of bone height with nearest constant anatomical landmarks in maxilla and in mandible.

OBJECTIVES:

1. To calculate the 'c/a' ratio i.e. (from the inferior border of the mandible to the alveolar crest divided by from the inferior border of the mandible to lower edge of the mental foramen) in dentulous mandible.
2. To calculate the 'x/y' ratio i.e. (from line joining most inferior points of borders of bony orbits to line joining inferior margins of images of zygomatic processes divided by point from zygomatic process to alveolar crest in maxillary first molar regions) in dentulous maxilla.
3. To calculate the 'x/z' ratio i.e. (from line joining most inferior points of borders of bony orbits to line joining inferior margins of images of zygomatic processes divided by point from zygomatic process to alveolar crest in maxillary lateral incisor region) in dentulous maxilla.

METHODS: This study was conducted in the Department of the Prosthodontics and Crown & Bridge, K.M. Shah Dental College and Hospital, Piparia, Vadodara in the year 2013. There were 100 patients included in this study as per the inclusion and exclusion criteria. A sample size of 100 achieves 80% power to detect a difference of 0.3 between the null hypothesis mean of 2.5 and the alternative hypothesis mean of 2.2 with an estimated standard deviation of 1.0 and with a significance level (alpha) of 0.05000 using a t-test assuming that the actual distribution is normal.

INCLUSION CRITERIA:

a. Only soft copies of OPG of adult subjects with fully developed jaws and dentitions will be used.
b. Mandibular premolars and first molars must be present and in normal relationship.
c. Evidence of alveolar crest resorption in the premolar and first molar regions must be minimal or absent.
d. Radiographic images of the mental foramen and the borders of the mandible, orbits and zygomatic process of the maxillae should be distinct.
e. The OPG should not be grossly distorted.

EXCLUSION CRITERIA:

a. Patient with missing maxillary or mandibular teeth or with teeth in abnormal relationships.
b. Patent having caries, restoration or periodontitis.

MATERIAL & ARMAMENTARIUM:

1. OPG machine- Kodak C 8000.
2. Software to calculate the distance- Screen calipers v2.1

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METHODOLOGY: Ethical approval for the study was granted by the Institutional Ethics Committee, Sumandeep Vidyapeeth. All patients signed an informed consent form. All patients were informed about the nature of the study through patient information sheet. A patient proforma sheet was there.

A. **Taking the OPG:** The subject will be taken to the oral medicine & radiology department, and an OPG will be made there using standard radiographic procedural parameters.
B. **Measurement from OPG:** The measurement will be made by software, available in the department that will measure the distance between the radiographic landmarks.

The following measurements will be made (Fig.1 & Fig.2). To measure distance 'c': from inferior border of the mandible to alveolar crest. To measure distance 'a' from the inferior border of the mandible to lower edge of the mental foramen in dentulous mandible. To measure 'x': from line joining most inferior points of borders of bony orbits to line joining inferior margins of images of zygomatic processes. To measure 'y': point from zygomatic process to alveolar crest in maxillary first molar regions) in dentulous maxilla. To measure 'z': point from zygomatic process to alveolar crest in maxillary lateral incisor region) in dentulous maxilla.

C. **Calculation from measurements:** To calculate the ratio of c/a, the mean of both sides 'c' will be calculated and both sides 'a' will be calculated, then the ratio will be derived. To calculate the ratio of x/y, the mean of both sides 'x' will be calculated and both sides 'y' will be calculated, then the ratio will be derived. To calculate the ratio of x/z, the mean of both sides 'z' will be calculated and then the ratio will be derived.

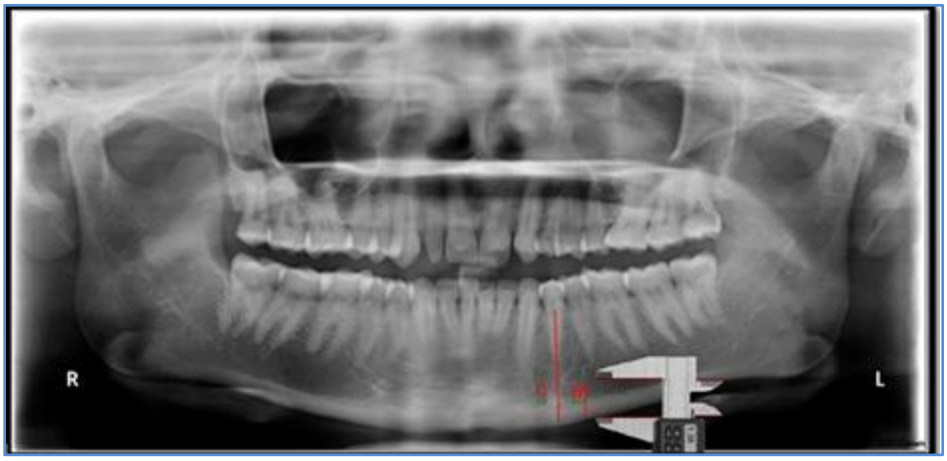

Figure 1

Figure 1: Mandibular landmarks -'c': is from the inferior border of the mandible to the alveolar crest. 'a': is from the inferior border of the mandible to lower edge of the mental foramen in dentulous mandible.

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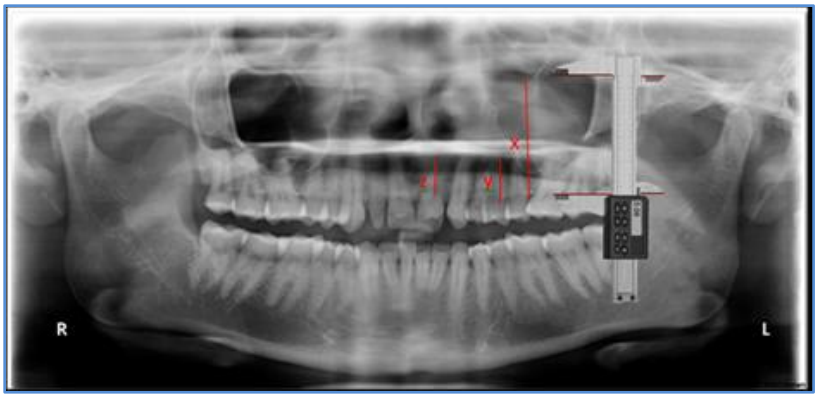

Figure 2

Figure 2: Maxillary landmarks- 'x': from line joining most inferior points of borders of bony orbits to line joining inferior margins of images of zygomatic processes. 'y': point from zygomatic process to alveolar crest in maxillary first molar regions) in dentulous maxilla. 'z': point from zygomatic process to alveolar crest in maxillary lateral incisor region) in dentulous maxilla.

OBSERVATION & RESULTS:

No.	Patient No./Age/Sex	Mean X	Mean Y	Mean Z	Ratio X/Y	Ratio X/Z	Mean C	Mean a	Ratio C/a
1.	Patient. 1/18Yr/F	2.4	1.4	1.6	1.7	1.5	3.0	1.6	1.9
2.	Patient. 2/20Yr/M	2.7	1.9	1.7	1.4	1.6	3.3	1.5	2.2
3.	Patient. 3/18Yr/F	2.1	1.7	1.8	1.2	1.2	3.1	1.3	2.5
4.	Patient. 4/19yr/M	2.1	1.6	1.8	1.3	1.2	3.2	1.7	1.9
5.	Patient. 5/18Yr/M	2.1	1.7	1.7	1.2	1.2	3.1	1.6	1.9
6.	Patient. 6/20Yr/M	2.7	1.5	1.6	1.8	1.7	3.6	1.5	2.4
7.	Patient. 7/18yr/M	2.2	1.0	1.3	2.2	1.7	3.1	1.1	2.8
8.	Patient. 8/ 18Yr/M	2.2	1.5	1.6	1.5	1.4	1.4	1.1	1.3
9.	Patient. 9/18Yr/M	2.3	1.2	1.3	1.9	1.8	3.0	1.3	2.3
10.	Patient. 10/18Yr/F	2.5	1.1	1.2	2.3	2.1	3.0	1.4	2.1
11.	Patient. 11/ 20Yr/M	2.6	1.6	1.8	1.6	1.4	3.3	1.4	2.4

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12.	Patient. 12/ 18Yr/F	2.8	1.6	1.5	1.8	1.9	3.7	1.6	2.3
13.	Patient. 13/ 19Yr/F	2.8	1.3	1.5	2.2	1.9	3.6	1.8	2.0
14.	Patient. 14/19Yr/F	2.8	1.4	1.6	2.0	1.8	3.9	1.8	2.2
15.	Patient. 15/20Yr/M	2.9	1.8	1.7	1.6	1.7	3.8	1.8	2.1
16.	Patient. 16/20Yr/M	2.9	1.7	1.9	1.7	1.5	3.9	1.7	2.3
17.	Patient. 17/19Yr/F	2.9	1.8	1.8	1.6	1.6	3.9	1.9	2.1
18.	Patient. 18/20Yr/M	2.9	1.8	1.8	1.6	1.6	3.7	1.6	2.3
19.	Patient. 19/20Yr/M	2.8	1.8	1.9	1.6	1.5	3.9	1.8	2.2
20.	Patient.20/ 19Yr/F	2.8	2.0	1.9	1.4	1.1	3.5	1.4	2.5
21.	Patient. 21/ 20Yr/M	2.9	2.0	1.9	1.5	1.5	3.8	1.7	2.2
22.	Patient. 22/ 19Yr/F	2.9	1.6	1.7	1.8	1.7	3.9	1.7	2.2
23.	Patient. 23/ 19Yr/M	2.9	2.0	1.9	1.5	1.5	4.0	1.8	2.2
24.	Patient. 24/20Yr/M	2.9	1.7	1.8	1.7	1.6	3.8	1.8	2.1
25.	Patient. 25/18Yr/F	2.4	1.9	1.3	1.3	1.8	3.5	1.3	2.7
26.	Patient. 26/ 20Yr/F	2.5	2	1.7	1.3	1.5	3.5	1.5	2.3
27.	Patient. 27 /20Yr/F	2.7	2	2.2	1.4	1.2	3.6	1.5	2.4
28.	Patient. 28/19Yr/F	2.2	2	1.8	1.2	1.2	3.1	1.5	2.1
29.	Patient. 29/18Yr/M	2.5	1.7	1.5	1.5	1.7	3.1	1.6	1.9
30.	Patient. 30/19Yr/M	2.4	2.1	2.2	1.1	1.1	3.2	1.3	2.5
31.	Patient. 31/ 19Yr/F	2.5	1.7	1.6	1.5	1.6	3.4	1.4	2.4
32.	Patient. 32/21Yr/F	2.4	2.6	1.9	0.9	1.3	3.4	1.6	2.1

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33.	Patient. 33/19yr/M	2.5	1.9	1.8	1.3	1.4	3.9	1.7	2.3
34.	Patient. 34/ 19Yr/F	2.7	2.4	1.9	1.1	1.4	3.4	1.6	2.1
35.	Patient. 35/ 20Yr/M	2.8	2.0	1.9	1.4	1.5	2.9	1.5	1.9
36.	Patient. 36/21Yr/F	2.5	1.9	2.0	1.3	1.3	3.5	1.4	2.5
37.	Patient. 37/22Yr/F.	2.6	2	1.9	1.3	1.4	3.4	1.5	2.3
38.	Patient. 38/ 20Yr/M	2.7	2	1.8	1.4	1.5	3.6	1.7	2.1
39.	Patient. 39/18Yr/M	2.9	2.1	1.8	1.4	1.6	3.2	1.4	2.3
40.	Patient. 40/20Yr/F	2.7	2.0	1.8	1.4	1.5	3.1	1.5	2.1
41.	Patient. 41/ 20Yr/F	2.5	1.9	1.7	1.3	1.5	3.1	1.5	2.1
42.	Patient. 42/19Yr/F	2.6	2	1.9	1.3	1.4	3.3	1.6	2.1
43.	Patient. 43/17/F	2.7	2	1.8	1.4	1.5	3.3	1.5	2.2
44.	Patient. 44/ 19Yr/M	2.5	2	1.9	1.3	1.3	3.6	1.5	2.4
45.	Patient. 45/ 17Yr/M	2.5	2.3	1.9	1.1	1.4	3	1.4	2.2
46.	Patient. 46/19Yr/M	2.6	2.4	1.9	1.1	1.4	3.5	1.5	2.3
47.	Patient. 47/ 20Yr/M	2.7	2.3	2	1.2	1.4	3.7	1.7	2.2
48.	Patient. 48/19Yr/M	2.7	2.3	1.9	1.2	1.4	2.9	1.6	1.8
49.	Patient. 49/ 21Yr/F	2.7	2.4	2.3	1.1	1.2	3.1	1.6	2.0
50.	Patient. 50/ 20Yr/M	2.7	2.3	1.8	1.2	1.5	3.4	1.4	2.4
51.	Patient. 51/ 20Yr/M	2.9	2.1	2.4	1.4	1.2	3.3	1.4	2.4
52.	Patient. 52/ 19Yr/M	2.9	2.2	2.4	1.3	1.6	3.7	1.7	2.2
53.	Patient. 53/ 19Yr/M	2.9	2.2	1.8	1.3	1.6	3.9	1.8	2.4

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54.	Patient. 54/21Yr/M	2.8	1.9	1.7	1.5	1.6	3.5	1.7	2.1
55.	Patient. 55/ 19Yr/F	2.4	1.9	1.7	1.3	1.4	3.3	1.4	2.4
56.	Patient. 56/ 19Yr/ F	2.5	2	2.1	1.3	1.2	3.4	1.7	1.9
57.	Patient. 57/ 19Yr/F	2.6	2.2	1.8	1.8	1.4	3.3	1.7	1.9
58.	Patient. 58/ 20Yr/F	2.8	2.4	1.8	1.2	1.6	3.7	1.7	2.2
59.	Patient. 59/ 19Yr/F	2.7	1.7	1.8	1.6	1.5	3.4	1.6	2.1
60.	Patient. 60/ 17Yr/M	2.6	2.0	1.9	1.3	1.4	3.5	1.5	2.3
61.	Patient. 61/ 19Yr/M	2.8	2.4	1.8	1.2	1.6	3.7	1.7	2.2
62.	Patient. 62/ 20Yr/M	2.8	1.8	1.7	1.6	1.6	3.6	1.8	2
63.	Patient. 63/ 19Yr/F	1.9	1.9	1.9	1	1	3.5	1.5	2.3
64.	Patient. 64/ 19Yr/M	2.3	1.9	1.9	1.2	1.2	3.6	1.5	2.4
65.	Patient. 65/20 Yr/ M	2.4	2.2	2.2	1.1	1.1	3.9	1.7	2.3
66.	Patient. 66/ 20Yr/M	2.2	1.8	2.0	1.2	1.1	3.3	1.6	2.1
67.	Patient. 67/20 Yr/ M	2.2	2.0	1.8	1.1	1.2	3.5	1.6	2.1
68.	Patient. 68/ 20Yr/M	2.8	1.8	1.9	1.6	1.5	3.4	1.5	2.3
69.	Patient. 69/19Yr/F	2.5	1.9	1.9	1.3	1.3	3.4	1.7	2
70.	Patient. 70/ 20Yr/F	2.5	1.9	1.7	1.3	1.5	3.5	1.5	2.3
71.	Patient. 71/ 21Yr/F	2.7	1.9	2.4	1.4	1.1	4.0	1.6	2.5
72.	Patient. 72/20Yr/F	2.9	1.6	1.6	1.8	1.8	3.8	1.5	2.5
73.	Patient. 73/ 19Yr/M	2.5	2.1	1.6	1.2	1.6	4.0	1.5	2.7
74.	Patient. 74/ 20Yr/F	2.8	1.6	1.7	1.8	1.6	4.0	1.6	2.5

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75.	Patient. 75/ 20Yr/M	2.3	1.8	1.5	1.3	1.5	4.0	1.6	2.5
76.	Patient. 76/ 18Yr/M	2.8	1.5	1.7	1.9	1.6	4.0	1.6	2.5
77.	Patient. 77/21Yr/M	2.9	1.4	1.8	2.1	1.6	4.0	1.6	2.5
78.	Patient. 78/ 19Yr/F	2.9	1.7	1.7	1.7	1.7	4.0	1.4	2.9
79.	Patient. 79/21Yr/M	2.8	2.5	2.3	1.1	1.2	4.0	1.9	2.1
80.	Patient. 80/ 19Yr/M	2.9	1.8	2.0	1.6	1.5	3.8	1.6	1.8
81.	Patient. 81/ 19Yr/M	2.9	1.6	1.6	1.8	1.8	4.0	1.6	2.5
82.	Patient. 82/ 20Yr/M	2.8	2.3	1.7	1.2	1.6	4.0	1.8	2.2
83.	Patient. 83/ 19Yr/F	2.9	1.6	1.6	1.8	1.8	3.7	1.6	2.3
84.	Patient. 84/ 20Yr/F	2.8	1.5	1.6	1.9	1.8	3.7	1.6	2.3
85.	Patient. 85/ 20Yr/M	2.8	2.4	2.1	1.2	1.3	4.0	2.0	2.0
86.	Patient. 86/ 21Yr.M	3.2	1.7	2.1	1.9	1.5	4.0	1.9	2.1
87.	Patient. 87/ 20Yr/F	2.7	1.4	1.7	1.9	1.6	3.7	1.5	2.5
88.	Patient. 88/19Yr/M	2.9	1.3	2.0	2.2	1.5	5.0	2.0	2.5
89.	Patient. 89/ 20Yr/M	2.7	1.6	1.8	1.7	1.5	4.3	1.6	2.7
90.	Patient. 90/ 19Yr/ M	2.9	1.9	2.1	1.5	1.4	4.5	2.0	2.3
91.	Patient. 91/ 19Yr/M	3.3	1.8	2.4	1.4	1.4	4.5	1.4	3.2
92.	Patient. 92/ 19Yr/M	2.9	1.4	1.1	2.1	2.6	2.0	1.1	1.8
93.	Patient. 93/ 20Yr/M	2.9	1.8	2.1	1.6	1.4	4.4	2.0	2.2
94.	Patient. 94/ 20Yr/M	3.6	2.0	2.4	1.8	1.5	5.1	2.0	2.6
95.	Patient. 95/ 20Yr/F	3.5	2.4	2.2	1.3	1.4	4.4	1.8	2.4

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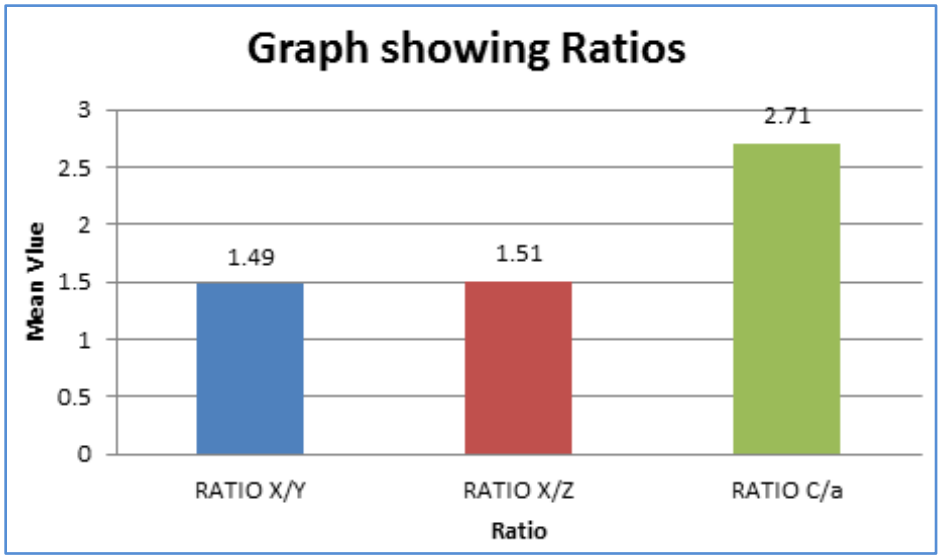
96.	Patient. 96/ 19Yr/M	3.0	1.8	2.1	1.7	1.4	4.2	1.7	2.5
97.	Patient. 97/ 21Yr/F	2.5	1.7	2.0	1.5	1.3	3.5	1.1	3.2
98.	Patient. 98/ 21Yr/F	2.7	2.0	2.2	0.5	1.2	4.5	2.0	2.3
99.	Patient. 99/ 19Yr/F	2.6	1.2	1.4	2.2	1.9	2.1	1.9	1.1
100.	Patient. 100/ 20Yr/F	2.5	1.0	1.6	2.5	1.6	2.0	1.5	1.3

TABLE 1: CALCULATION OF THE RATIO'S

RATIO	N	MEAN	S.D.	STD. ERROR	MIN.	MAX.	RANGE	SUM	VAR.
RATIO X/Y	100	1.49	0.34	0.03	0.50	2.50	2.00	149.30	0.12
RATIO X/Z	100	1.51	0.24	0.02	1.00	2.60	1.60	149.00	0.06
RATIO C/a	100	2.71	0.31	0.03	1.10	3.20	2.10	224.50	0.10

TABLE 2: DESCRIPTIVE STATISTICS

Table shows the descriptive statistics which consists of the number of patients, mean, standard deviation. The C/a ratio mean is 2.71 ± 0.31. The X/Y ratio mean is 1.49 ± 0.34 and the X/Z ratio mean is 1.51 ± 0.24.



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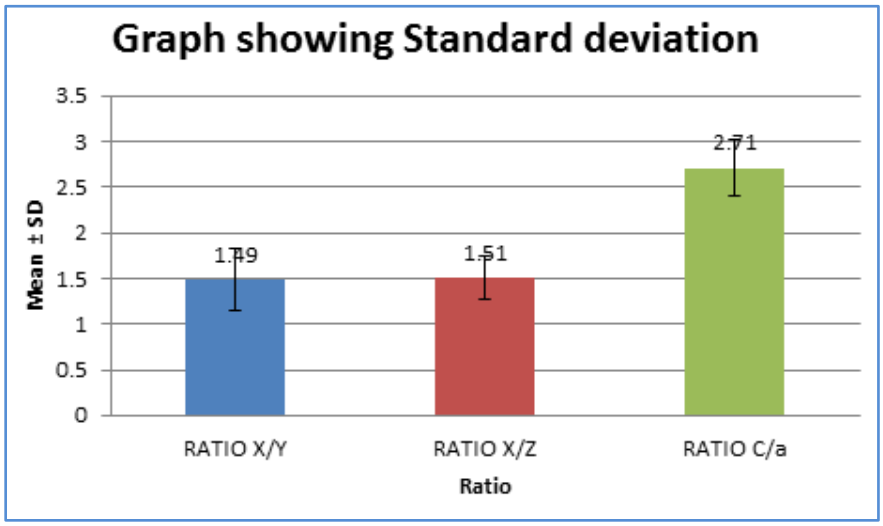

DISCUSSION: There was a need to do this study as the treatment plan can be planned out for the patients and since there appears to be only two reported articles on measuring intact alveolar bone height in the maxillae on radiographs and this may be the first study to estimate on orthopantomographs the height of the fully developed dentate maxillae and mandible together in an Indian population. According to Guler et al,[3] there is limited information in the literature about the maxillary and mandibular heights of edentulous patients. Most of the literature compared dentate and edentulous patients.

In the present study, only edentulous patients' measurements were evaluated and compared. Furthermore, maxillary sinus location, vertical distances from most inferior border of maxillary sinus to alveolar crest and position of mental foramen were assessed. Studies[4] of the mandible have used the mental foramen as a constant anatomic landmark based on the relative constancy of the relationship of the foramen to the inferior border of the mandible in spite of resorption of the edentulous alveolar process.

Wical and Swoope[2] believed the lower edge of the mental foramen to be a useful reference mark in panoramic radiographs for estimating the amount of alveolar bone lost. They rationalized that the bone below the foramen constitutes a predictable proportion of the total bone height in most normal patients and is not significantly affected by resorption until extreme atrophy occurs. The distance between the inferior borders of the orbits and the hard palate should be constant in the maxillae provided no asymmetry or developmental anomalies exist, therefore, these structures should be suitable as reference points.

Reason for using the dentate individuals and co-relating it with edentulous individuals was that in the edentulous mandible, because of the lack of a landmark for indicating the first molar site, and because the images of the mental foramen are invisible in some patient's panoramic radiographs, the proportions of the horizontal lengths were used to locate the measurements sites. In the present study, the 100 radiographs results showed that the C/a ratio mean is 2.71 ± 0.31. The X/Y ratio mean is 1.49 ± 0.34 and the X/Z ratio mean is 1.51 ± 0.24. In the study done by Naeem et al,[5] it was thought that by using a protractor to accurately determine the direction of the line perpendicular to the line joining the 'menton' and 'gonion', more consistent results could be obtained.

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Wical et al[2] study found ratio (c/a) to be 2.90 ± 0.23 in 130 radiographs G. Pakota et al[6] study found ratio (c/a) to be 2.60 ± 0.30 in 309 radiographs. In Naeem et al[5] study, the c/a ratio was 2.72 ± 0.29 from a total of 30 radiographs analysed in Indian population. In study done by Miller et al,[7] the mean ratio of height of mandible to height of mental foramen in dentate individuals used in the study was 2.92:1 for the repeat measurements. Hence this present study is in accordance with Naeem et al[5] study as it was also done in Indian population for the mandibular ridge.

The study by Chowdhary et al,[8] shows that posterior maxillary vertical bone height of Indian dentulous males is more than Indian dentulous females. But according to Saglam et al,[9] height of maxillae was not significantly different between men and women in dentulous patients of Turkish population. Ratio of X/Y is 0.74 for Indian males and females, so Infra-zygomatic-alveolar crest distance is 74% of Infra-orbital-zygomatic distance for Indian males and females. According to Packota et al,[6] ratio x/y of height is 1.2 in Canadian population which means that infra-zygomatic-alvealor crest distance is 83% of Infra-orbital-zygomatic distance and ratio of X/Z is 0.9.

This present study is shows a ratio slightly higher than in the study done by Chowdhary et al[8], even though both were done in the Indian population for the maxillary ridge. The reason can be due to patients in this study had larger maxillae with no bone resorption. It seems best to limit classifications of bone loss to numerical or proportional divisions, as such proportional estimations remain consistent in spite of varying sizes of mandibles and radiographic images.[10]

A comparative evaluation between edentulous and dentulous OPG were not done because only by using dentulous patients OPG, a standard ratio can be derived of all the constant landmarks, hence a standard ratio was be calculated and used for checking the amount of resorption in edentulous patients OPG.

This study increases the usefulness of the ratio reported here as “baseline” data to accurately estimate the degree of maxillary and mandibular alveolar bone loss in studying a panoramic radiograph of a person at different times. So, this method may be of greater value in studying sequential changes to estimate reduction in height of the maxillary and mandibular alveolar process of a patient after tooth loss. Another conceivable use for the data obtained might be the predicting of relative long-term success of complete dentures for patients.

For example, if the treatment plan for two patients of the same age includes full extractions and complete dentures, the individual with the higher x/y, x/z, c/a ratio may be able to wear complete dentures more successfully for a longer period of time, simply because more alveolar bone is available than in the other person. Patients with ratio on the low end of “normal” could more enthusiastically be encouraged to keep their teeth, if this is a reasonable treatment option. The relative sinus floor position from alveolar crest and the location of mental foramen from the ridge can help in implant length selection.

However there are few limitations of the study which are separate evaluation of the genders were not done, which could have been done to derive a clearer picture of the amount of bone loss in different genders. Also further study can be done including the bone width measurement which is also important in the assessment of the bone loss as it was not checked in this present study and in the reference studies.

CONCLUSION: Prosthodontics studies have indicated the importance of knowing the location of mucosal tissues, the integrity presence of alveolar extensions of the maxillary sinus, mental foramen as factors that can affect pre-prosthetic surgery and denture design. More recently, the increased use

of dental implants to treat edentulous patients introduces an important element for Prosthodontics treatment planning. The assessment of edentulous patients as candidates for implant therapy depends on radiographic imaging.

It can be concluded that this method may be of greater value in studying sequential changes to estimate reduction in height of the maxillary and mandibular alveolar process of a patient after tooth loss. It can also be used for predicting of relative long-term success of complete dentures for patients. It can also be helpful in the implant placement. Hence, according to the ratio the treatment plan of a patient can be decided.

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