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Significance of pre-treatment panoramic radiographic assessment of edentulous patients-A Survey

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Abstract

Objectives: The present study was undertaken to review the significance of pre-treatment panoramic radiographic assessment of edentulous patients, in the dental patient population of Haryana, India.

Study Design: In this study a total of 525 completely edentulous patients were selected randomly. A panoramic radiograph was taken using Panoramic machine (Rotagraph plus) and all the radiographs were evaluated by 2 oral radiology specialists for the following clinically significant radiographic findings: retained root fragments, embedded teeth, radiolucencies, radiopacities and location of the mental foramen at the crest of the residual alveolar ridge. The data were analyzed using the chi square test.

Results: A total of 245 radiographic findings were seen in 168 (32%) patients. Out of total 525 cases 16.4% (n=86) patients had submucosal or intrabony root stumps, 4.8% (n=25) had embedded teeth, 2.5% (n=13) had radiolucencies, 9.9% (n=52) had radiopacities and 1.7% (n=9) had mental foramen at the crest of the residual alveolar ridge.

Conclusion: The results of this study suggest that Routine radiographic examination of completely edentulous patients is critical before construction of complete denture.

Key words: *Panoramic radiography, edentulous patients, mental foramen, embedded teeth, retained root stumps.*

Introduction

Maximum benefits from dentures can only be achieved through denture's stability and retention. It can only be achieved if there is good foundation support, so the supporting bone must be free from all of the intrabony and soft tissue pathosis. The early diagnosis of such abnormalities located in the jaws, which are otherwise asymptomatic, can only be achieved through radiographic examination because alveolar ridges of an edentulous patient covered by a healthy looking mucosa are usually not suspected of harboring any abnormality.

Logan W. H. G. was the first person to conduct radiographic examination of edentulous patients in 1921 (1). He evaluated the radiographs of 35 edentulous jaws and found 8 root fragments and 2 embedded teeth in 28.6% patients. Since then there have been many studies that have helped to detect and localize radiological findings such as retained root stumps, impacted teeth, periapical infections, cysts, osseous alterations and foreign bodies.

But because of radiation hazards it has frequently been argued that only those patients should be examined radiographically who presents definite clinical evidence of disease (2-5). But the discovery of potentially complicating conditions in various studies indicates radiographic examination of edentulous patients and moreover the radiographic guidelines titled "The Selection of Patients for X-Ray Examination" developed in 1987 by a panel of dental experts convened by the Center for Devices and Radiological Health of the U.S. Food and Drug Administration (FDA) and endorsed by the American Dental Association recommends a full mouth intraoral or panoramic radiographic examination for newly edentulous patients (2). But in contrast European Guidelines on Radiation Protection in Dental Radiology doesn't recommend radiographic examination in case of healthy edentulous patients (6).

The justification for routine pre-treatment radiographs for edentulous patients, as stated in textbooks and by the FDA expert panel, is the high percentage of positive findings disclosed by the previous studies (7-11).

In addition, the radiographic examination may reveal anatomic considerations that could influence prosthetic treatment, such as the location of the mandibular canal, the position of the mental foramen and maxillary sinus, and relative thickness of the soft tissue covering the edentulous ridge.

Similar studies have been conducted in different parts of the world like USA, Australia, Canada, Iran, Saudi Arabia, Kenya, Switzerland, Greece, Finland, Turkey, Jordan etc. but no similar study has been documented till now in North India. The present study was undertaken to review the significance of pre-treatment panoramic radiographic assessment of edentulous patients, in the dental patient population of Haryana, India.

Materials and Method

In this study a total of 525 completely edentulous patients reporting to M.M. College of Dental Sciences and Research, Mullana, Haryana, India were selected randomly. The completely edentulous patients were reporting for either fabrication of a new denture or for correction of any problem associated with the previous dentures.

The clinical examination was carried out and then the radiographic procedure along with its aim and objectives was explained verbally to the patient and written consent was taken for performing radiographic examination. Then panoramic radiograph was taken using Panoramic machine (Rotagraph plus, panoramic and cephalometric machine, VILLA SISTEMI MEDICALI, 2002, Made in Italy) with kVp of 60 – 85 and standard 10 mA provided with a total filtration of 2.5mm aluminium. Exposure parameters selected were 65kVp and 10mA. Exposure time was standard 17 seconds for adults. X ray films used were 5X12 inches Kodak T-MAT green light sensitive panoramic dental films made in U.S.A. by Eastman Kodak, Rochester, New York in a 5X12 inches curved rigid aluminium cassette with green light sensitive intensifying screens (Konika KR-II).

Then all the radiographs were evaluated by 2 oral radiology specialists using dental viewing box without any magnification for the following clinically significant radiographic findings: retained root fragments, embedded teeth, radiolucencies, radiopacities and location of the mental foramen at the crest of the residual alveolar ridge. The vertical ramus, mental foramen, maxillary tuberosity, zygomatic process, and canine fossa were used as anatomical landmarks for recognizing the tooth to which the retained root belonged.

If, after an initial viewing of the panoramic radiograph, any area where pathology was suspected on the radiograph was not depicted clearly enough, periapical radiographs were taken. All abnormalities were documented and quantitatively studied. Categorical data was analysed by Chi-square test for possible associations. A p-value lower than 0.05 was considered significant.

Results

Out of 525 patients 45% (n=236) were females and 55% (n=289) were males.

The mean age of the patients was 58.04 years with a range of 30-90 years and standard deviation of ± 10.451 . Out of 236 females 53.4% (n=126) were already wearing dentures and 46.6% (n=110) were newly edentulous patients. Out of 289 males 47.4% (n=137) were already wearing dentures and 52.6% (n=152) were newly edentulous patients.

A total of 245 radiographic findings were seen in 168 (32%) patients. Out of 168 positive cases 48.2% (n=81) were females and 51.8% (n=87) were males.

Out of 168 positive cases 56.5% (n=95) were already wearing dentures and 43.5% (n=73) were newly edentulous patients. Statistically the difference was found to be significant.

The most frequent finding was retained root fragment, followed by radiopacities.

Out of total 525 cases 16.4% (n=86) patients had submucosal or intrabony root stumps, 4.8% (n=25) had embedded teeth, 2.5% (n=13) had radiolucencies, 9.9% (n=52) had radiopacities and 1.7% (n=9) had mental foramen at the crest of the residual alveolar ridge (Fig. 1).

Root stumps

A total of 135 root stumps were found in 16.4% (n=86) patients. Single root was found in 51 patients, two roots were found in 25 patients and 3 roots were found in 6 patients. Maximum number of root stumps found was four which were found in 4 patients. Out of 86 positive cases 53.5% (n=46) were females and 46.5% (n=40) were males. Out of 86 cases having retained root stumps 58.1% (n=50) were already wearing dentures and 41.9% (n=36) were newly edentulous patients. Most of the roots were located in maxillary left quadrant (n=43) followed by maxillary right quadrant (n=36), mandibular left quadrant (n=32) and mandibular right quadrant (n=24). Statistically there was no significant difference found in the ratio of retained root stumps in all the four quadrants.

Out of 56 retained roots in mandible 33 were present in molar region, which was significant statistically with p-value of less than 0.0001. 9 root stumps were found in premolar region, 6 in canine region and 8 in incisors region.

Out of 79 roots in maxilla 44 were present in molar re-

gions, which was significant statistically with p value of less than 0.0001. 20 root stumps were found in premolar region, 12 in canine region and 3 in incisors region.

Embedded teeth

A total of 34 embedded teeth were found in 25 patients. Single embedded tooth was found in 17 patients and two embedded teeth were found in 7 patients. Maximum number of embedded teeth found was three which were found only in 1 patient.

Out of 25 positive cases 36% (n=9) were females and 64% (n=16) were males. Out of 25 positive cases 48% (n=12) were already wearing dentures and 52% (n=13) were newly edentulous patients.

Most of the embedded teeth were located in the mandibular left quadrant (n=11) followed by mandibular right quadrant (n=8) and maxillary right quadrant (n=8). Maxillary left quadrant was found to harbor 7 embedded teeth.

Out of 19 embedded teeth in mandible 15 were present in molar region which was significant statistically with p value of less than 0.001. 4 embedded teeth were found in canine region.

Out of 15 embedded teeth in maxilla 13 were present in molar region which was significant statistically with p value of less than 0.0003. 2 embedded teeth were found in canine region.

Radiolucencies

A total of 13 radiolucencies were found in 13 patients. Out of 13 positive cases 46.2% (n=6) were females and 53.8% (n=7) were males. Out of 13 positive cases there were 38.5% (n=5) already wearing dentures and 61.5% (n=8) were newly edentulous patients.

Out of these 13 radiolucencies 3 were diagnosed as resid-

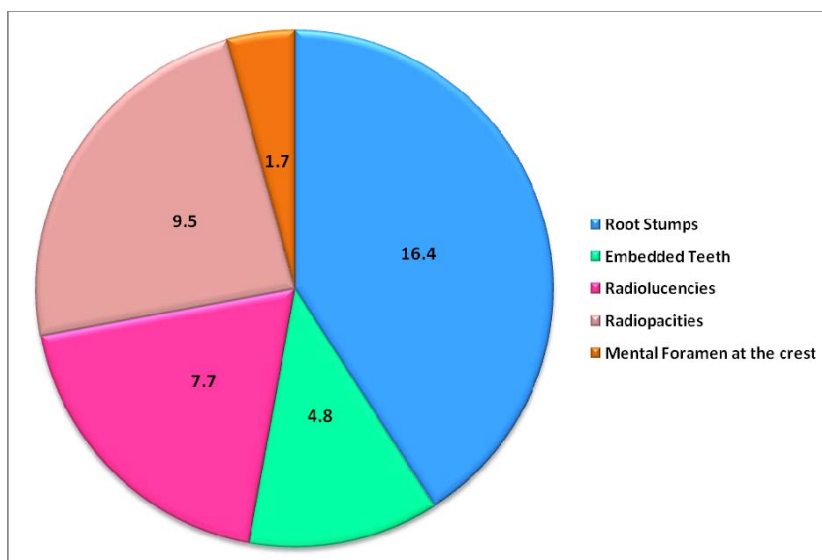


Fig. 1. Percentage of radiographic findings out of total cases.

ual cysts, 2 as Stafne bone cyst, 1 as carcinoma of alveolus, 2 as residual infection and 5 as osteoporotic areas.

Radiopacities

A total of 54 radiopacities were found in 52 patients. Out of 52 positive cases 44.3% (n=23) were females and 55.7% (n=29) were males. Out of 52 positive cases 58% (n=29) were already wearing dentures and 42% (n=21) were newly edentulous patients.

Out of these 54 radiopacities 31 were diagnosed as osteosclerosis, 17 as calcifications of soft tissues like lymph nodes, tonsils, lips and alveolar mucosa, 2 as polyp in maxillary sinus, 1 as mucous retention cyst in maxillary sinus, 1 as osteoma, 1 as submandibular sialolith and 1 as foreign body in alveolar mucosa which was most likely an amalgam particle.

Mental foramen at the crest of residual alveolar ridge

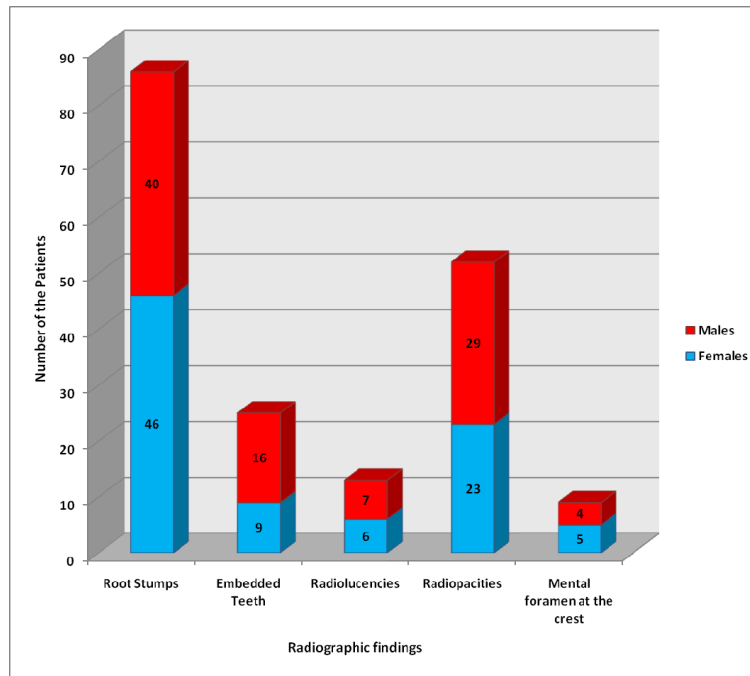


Fig. 2. Distribution of positive findings among males and females.

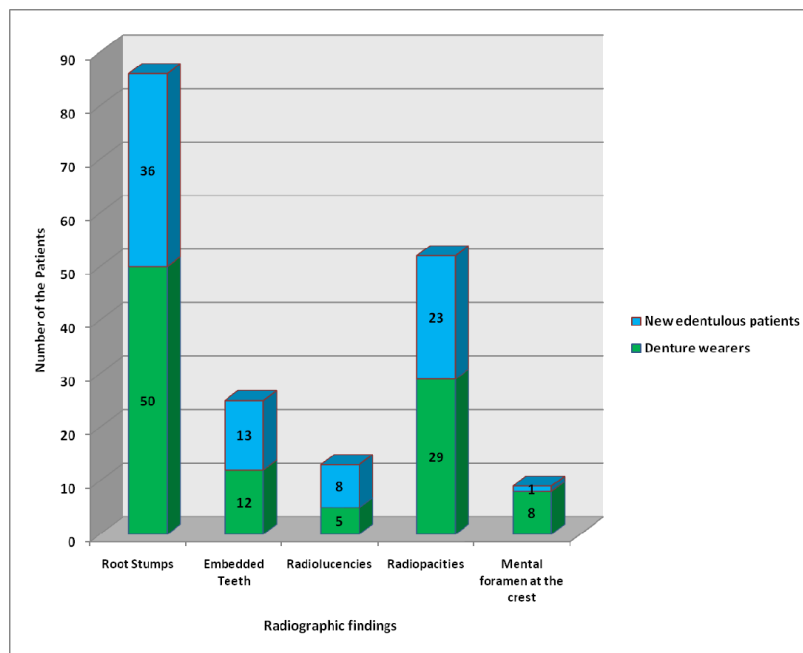


Fig. 3. Distribution of positive findings among denture wearers and newly edentulous patients.

In 9 patients the mental foramen was situated at the crest of the residual alveolar ridge. Out of 9 positive cases 56.6% (n=5) were females and 44.4% (n=4) were males.

Out of 9 positive cases 88.9% (n=8) were already wearing dentures and 11.1% (n = 1) were newly edentulous patients. Statistically the difference in the ratio of mental foramen at the crest of the residual alveolar ridge among denture wearers and newly edentulous patients was significant with a p-value of 0.019.

Distribution of positive findings among male and females and among denture wearers and non denture wearers is shown in (Fig. 2 and Fig.3) respectively.

Discussion

The panoramic radiographic examination of 525 completely edentulous patients revealed positive radiographic findings in 32%. This study shows that there is almost equal prevalence of positive radiographic findings in completely edentulous patients in Haryana, India, like other parts of the world. Comparison of the results of the present study with the previous ones is tabulated in (Table 1).

Our study has shown that majority of the patients (56.5%) with positive radiographic findings were already wearing denture while Lyman S et al in 1990 discouraged the routine radiographic examination of patients who were already wearing complete denture as he found only one embedded tooth that required extraction out of total 150 already denture wearing patients (4).

Most of the retained roots are found in the molar region of the maxilla. Out of total 135 root stumps, 57% (n=77) are present only in molar region of maxilla and mandible. 44 root stumps were found exclusively in maxillary molar region and 33 in mandibular molar regions. The reason may be attributed to the wrong technique of extraction and not using the radiographs before and after the extraction regularly.

Another important aspect is the quadrant in which retained root stumps are present. In our study majority of the retained root stumps are found in maxillary left quadrant (n=43). Out of 56 root stumps in mandible, 32 were exclusively found in left quadrant. Here it is important to note that many reports did not record the side of disclosure. We emphasize on the need of careful extraction in maxillary left quadrant.

Removal of retained root stumps is a controversial subject. Until there is associated pathologic change root stumps can be retained to preserve the integrity of the edentulous ridges but as they serve as a potential source of infection should be extracted as soon as possible. Otherwise the patient should be informed of all such situations so that the dentist is not held responsible for any complication that may arise in future. But follow up examinations and radiographs should be done at regu-

lar intervals and findings should be entered into the patient's record.

The relationship of mental foramen to the crest of the residual alveolar ridge is very important. If mental foramen exits directly at the crest of the residual alveolar ridge it can lead to pain or numbness in the area due to compression caused by denture. In present study, the mental foramen was at the crest of the residual ridge in 1.7% (n=9) of the radiographs.

Out of 9 cases in which mental foramen were exiting directly at the crest of the residual alveolar ridge, 8 were already wearing denture which is highly significant statistically. The reason can be attributed to the fact that the occlusal forces are transmitted directly to the mucosa beneath the mucosa-borne dentures and can cause overloading, which might lead to bone resorption and shift in the position of the mental foramen to the tip of the residual ridge.

The present study reported the prevalence of positive radiographic findings in panoramic radiographs of asymptomatic patients. Three of the categories of findings were clearly identified, but two were given only the general descriptive terms of radiolucencies and radiopacities without diagnostic interpretation. Because most of the radiolucencies and radiopacities have no recorded impact on treatment planning but it is in the interest of both the patient and the dentist to be aware of the presence of such innocuous findings even if the treatment is required or not.

Furthermore, due to difficulties in differential radiographic interpretation, radiolucencies and radiopacities should be further evaluated clinically and radiographically. Biopsies should be made if a lesion appears suspicious, or it should be observed periodically to detect possible changes in location or size that could endanger the patient's health or affect the fit of the denture.

Although we did not assess the impact of their observations on treatment, we can say that the high incidence of positive findings reemphasize the need for radiographic examination of all edentulous.

Our results refute the view of those dentists who downplay the importance of panoramic radiographs and make prostheses for patients after a brief clinical examination. The reasons may be attributed to the high cost of panoramic radiographs and/or clinically healthy looking edentulous arches but our study has shown high incidence of positive findings in healthy looking edentulous arches.

Another concern may be the radiation dose but due to utilization of the rare earth screens, fast films and the digital radiography radiation dose to patient from panoramic radiographic examination is extremely low, so can be used with minimal risk (12).

Finally we suggest that for a successful prosthodontic treatment pre-treatment panoramic radiographs should

Table 1. Comparison of results of present study with the previous studies.

Name of the author	Reporting year	Category	Radiographic Technique used	Number of patients examined	Percentage of positive cases	Percent of patients with retained roots
Logan	1921	CE	Not Reported	35	28.6	22.9
Eusterman	1921	CE+PE	Not Reported	290	38.3	30.7
Cook	1927	CE	Not Reported	500	38.0	29.0
Gardner & Stafne	1929	CE+PE	Not Reported	2112	-	22.2
Cheppe	1936	CE	Not Reported	190	35.1	30.5
Waggnner & Austin	1941	CE+PE	Not Reported	1380	24.6	23.8
Swenson	1944	CE	-	381	40.8	31.2
Smith	1946	CE+PE	Not Reported	1000	22.4	15.7
Ennis & Berry	1949	CE+PE	Occl + Periapi	1002	38.3	24.4
Edwards	1951	CE+PE	Not Reported	1050	35.5	26.1
Roy Storer	1957	CE	Occl + Periapi	500	37.2	29.4
Carlsson	1959	-	Occl + Periapi	408	34.0	21.0
Crandell	1959	CE	Occl + Periapi	100	36.0	28.5
Crandell & Trueblood	1960	CE+PE	Occl + Periapi	519	28.5	-
Dachi & Howell	1961	CE	Occl	611	26.4	23.7
Korduner	1965	-	Periapi + e	217	33.6	-
Coy & Wing	1966	CE	Periapi	452	28.8	16.8
Swenson & Hudson	1967	CE	PAN	400	18.0	16.0
Michaeli et al	1968	CE	Occl + e	117	17.1	8.5
Glestad et al	1968	-	Occl + Periapi + e	476	38.2	25.5
Prater	1968	-	PAN	224	16.5	8.9
Mourshed	1969	CE+PE	-	1000	-	39.7
Bremmer & Grant	1969	-	PAN + e	237	41.5	-
Barclay	1970	-	PAN	100	44.0	40.0
Gasser	1970	CE	-	250	18.4	4.4
McCroie	1971	-	PAN	100	34.0	29.0
Etting-er	1971	CE	Periapi	538	-	33.0
Lysell	1972	-	PAN + Occl	100	32.0	-
Scandrett et al	1973	-	PAN + Occl + Periapi	212	31.1	-
Keith	1973	CE+PE	-	1000	-	10.1
Perrelet et al	1977	CE	PAN	287	41.1	15.3
Ritchie et al	1979	CE	PAN + Periapi	250	45.0	-
Keng et al	1981	-	PAN + e	125	24.8	14.4
Spyoropolous et al	1981	CE	PAN	368	37.0	31.0
Serman & Nortje	1982	-	PAN	539	47.1	-
Dhooria et al	1982	CE	Periapi	50	44.0	36.0
Jones et al	1985	CE	PAN	114	34.4	12.3
Dhooria	1985	CE	PAN	60	33.3	18.0
Keur et al	1987	CE	PAN + e	1135	33.8	33.4
Axelsson	1988	CE+PE	PAN	225	22.2	11.1
Dias et al	1988	CE	PAN + e	488	20.0	9.6
Angulo F	1989	CE+PE	PAN	200	38.5	-
Kharat	1990	CE+PE	PAN + Periapi	530	-	40.0
Edgerton et al	1991	CE	PAN	308	23.0	8.0
Seals RR et al	1992	CE	PAN	448	11.6	1.1
Kaimenyi et al	1993	CE	-	180	26.0	17.3
Soikkonen et al	1994	CE	PAN + e	124	-	9.0
Mehdizade et al	2005	CE	PAN	192	-	25.5
Masood et al	2007	CE	PAN	327	42.5	11.90
Sumer et al	2007	CE	PAN	338	47.6	15.38
Ardakani et al	2007	CE	PAN	447	-	32.4
Present study	2008	CE	PAN + e	525	32.0	16.4

be made mandatory in order to ensure the delivery of the highest quality of care to each of its individual patients.

References

1. Michaeli Y, Hermel J, Gizenfeld E, Michman J. Pathologic radiographic findings in clinically symptom-free edentulous subjects. *Oral Surg Oral Med Oral Pathol.* 1968;26:27-30.
2. Bohay RN, Stephens RG, Kogon SL. A study of the impact of screening or selective radiography on the treatment and postdelivery outcome for edentulous patients. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1998;86:353-9.
3. Ansari IH. Panoramic radiographic examination of edentulous jaws. *Quintessence Int.* 1997;28:23-6.
4. Lyman S, Boucher LJ. Radiographic examination of edentulous mouths. *J Prosthet Dent.* 1990;64:180-2.
5. Kogon SL, Stephens RG, Bohay RN. An analysis of the scientific basis for the radiographic guideline for new edentulous patients. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1997;83:619-23.
6. Martínez Beneyto Y, Alcaráz Banos M, Pérez Lajarin L, Rushton VE. Clinical justification of dental radiology in adult patients: a review of the literature. *Med Oral Patol Oral Cir Bucal.* 2007;12:E244-51.
7. Masood F, Robinson W, Beavers KS, Haney KL. Findings from panoramic radiographs of the edentulous population and review of the literature. *Quintessence Int.* 2007;38:e298-305.
8. Matteson SR. Radiographic guidelines for edentulous patients. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1997;83:624-6.
9. Keur JJ, Campbell JP, McCarthy JF, Ralph WJ. Radiological findings in 1135 edentulous patients. *J Oral Rehabil.* 1987;14:183-91.
10. Axelsson G. Orthopantomographic examination of the edentulous mouth. *J Prosthet Dent.* 1988;59:592-8.
11. Ritchie GM, Fletcher AM. A radiographic investigation of edentulous jaws. *Oral Surg Oral Med Oral Pathol.* 1979;47:563-7.
12. Keur JJ. Radiographic screening of edentulous patients: sense or nonsense? A risk-benefit analysis. *Oral Surg Oral Med Oral Pathol.* 1986;62:463-7.