RADIOLOGY

Panoramic Radiographs for Evaluation of Pathological Findings

Tushar Luthra[1)], Rahul Singh[2)], Subhash K[3)], Nidhi Yadav[4)], Santosh R Patil[5)], Mohammad Khursheed Alam[6)]

ABSTRACT

Objective: **To assess the frequency of significant radiographic findings in edentulous jaws and compare the results with the findings in previous surveys and to emphasize the need for a radiographic examination of edentulous patients before making complete denture prosthesis.**

Material and Methods: **Panoramic radiographs of 1000 completely edentulous patients attending the Out Patient Department were examined for the presence of significant radiologic conditions. The data obtained was tabulated and statistically analyzed.**

Results: **Positive radiographic findings were present in 18.2% of patients. The most common radiographic finding noted was impacted/unerupted teeth (35.1%), followed by fractures (27%). The least common finding was mucosal thickening (1.7%). Residual roots were noticed in 10.6 % of the cases.**

Conclusion: **Routine panoramic radiography of edentulous patients visiting a dentist is necessary for early diagnosis of pathological conditions which may later cause trouble to patient.**

KEY WORDS

Edentulous patients, pathology, panoramic radiograph

INTRODUCTION

Radiographic examination of the jaws of edentulous individuals is of paramount importance, not only for those who will have full dentures constructed for the first time but also for old denture wearers who return to the dental office for various reasons. The need for taking radiograph of edentulous patients prior to making complete denture was first reported by Logan WHG in 1921. He evaluated the radiographs of 35 edentulous jaws and found 8 root fragments and 2 embedded teeth in 28.6% patients[1)]. Various studies have been conducted across the world on different population groups of completely edentulous and/or partially edentulous persons with the aim of reporting various conditions, like retained root fragments, impacted/unerupted teeth, foreign bodies, radiopacities, radiolucencies (e.g. periapical infection, cysts), mental foramina located at the crest of the ridge, sequestra, fractures, cysts, vascular channels, calcified lymph nodes, anatomic variations, structural variations and atrophy, that may later cause problems in denture stability and retention[2-9)]. These studies have utilized taking radiographs (periapical, occlusal, panoramic and extraoral), prior to fabrication of dentures and also as a routine radiographic examination of edentulous jaws. There has been controversy regarding taking routine pre-treatment radiographs for edentulous patients with some panels/authors supporting it and others not in favour of it because of radiation hazards[10,11)].

Authors who have tried variety of radiographic techniques to assess the above mentioned radiographic findings support that panoramic radiograph is appropriate for edentulous patients radiographic examination both as a pre-treatment assessment tool for fabrication of new dentures and in routine radiographic examination. It is the most common diagnostic survey film in institutional practices which shows both maxilla and mandible on a single film and has a special value in treatment planning in edentulous patients. Other advantages of panoramic radiograph are small dose of radiation, time saving compared to full mouth intraoral periapical radiographs, rapidity and simplicity of the procedure (does not cause inconvenience to patient). Apart from revealing unerupted/impacted teeth, residual root fragments and infections, it also shows the condition of maxillary sinuses, abnormalities in condyle and coro-

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1) Department of Endodontics, Rama Dental College
Kanpur U.P. India
2) Department of orthodontics and dentofacial orthopaedics, Chandra Dental college and Hospital
Lucknow U.P. India
3) HKDET'S Dental college, Hospital and Research Institute
Humnabad, India
4) Oral Medicine and Radiology Consultant
Dr Bhim Sains Family Dental Clinic
Gurugram, India
5) Department of Oral Medicine and Radiology
New horizon dental college and research institute
Sakri, Bilaspur India
6) Orthodontics Unit, College of Dentistry, Jouf University
Kingdom of Saudi Arabia
Correspondence to: Santosh R Patil
(e-mail: drpsantosh@gmail.com)

Table 1: Distribution of Positive radiographic findings by gender and Demographic distribution of patients

Gender	Total no of patients	Positive	%
Men	587	101	17.20
Women	413	81	19.61
Total	1000	182	18.2
Demographics		Mean	SD
Age of patient (yr)		67.14	12.04
Years of edentulousness	maxillae	19.97	11.24
	mandible	18.61	12.01
Age of existing denture	maxillae	14.65	10.95
	mandible	12.41	10.87

Table 2: Number and percentage of pathological findings

Pathology		n	% of Patients	n	% of Anomalies
Unerupted/ Impacted teeth		154	15.4	54	35.1
Residual root		123	12.3	13	10.6
Migrated sinus		214	21.4	24	11.2
Osteosclerosis		151	15.1	15	9.9
Mucosal thickening		121	12.1	2	1.7
Sequestra		202	20.2	10	5.0
cysts		373	37.3	37	9.9
Periapical lesions		315	31.5	35	11.1
Fractures		274	27.4	74	27.0
Sialolithiases		113	11.3	3	2.7
Soft tissue calcifications		233	23.3	33	14.2
Foreign bodies		144	14.4	14	9.7
Atrophy		49	4.9	4	8.2
Calcified lymph nodes		258	25.8	25	9.7
Tumors		185	18.5	18	9.7
Maxillary sinus polyp		265	26.5	65	24.5
Residual infections		122	12.2	22	18.0
Mental foramina	Negative	121	12.1	12	9.9
	Positive	39	3.9	3	7.7

Table 3: Comparison of the findings of present study with other similar studies

Name of the Author	Year of Study	Number of Patients	Percentage of Positive Findings
Swenson HM[15]	1967	400	18
Prater WL[1]	1968	224	16.5
Barclay JK[16]	1970	100	44
Perrelet LA *et al*[13]	1977	287	41.1
Spyropoulous ND *et al*[17]	1981	368	37
Serman NJ1	1982	539	47.1
Jones JD *et al*[18]	1985	114	34.4
Edgerton M[3]	1991	308	23
Kaimenyi JT *et al*[4]	1993	180	26
Mehdizade M *et al*[7]	2005	192	
Masood F *et al*[5]	2007	327	42.5
Sumer AP *et al*[2]	2007	338	47.6
P Sesha Reddy[9]	2013	705	29.07
Present study	**2020**	**1000**	**18.2**

noid process, body and angle of the mandible, the relationship of the mandibular canal and mental foramen to the crest of the ridge, sialoliths and soft tissue calcifications. Its disadvantages are that structures that lie beyond the focal trough appear distorted and it does not demonstrate as good details as intraoral film. High cost of machine, unsharpness of image and machines unavailability is also its pitfalls[6,12,13]. One author who compared the diagnostic value of three types of panoramic radiographs i.e. Panorex (S.S. White), Orthopantomograph (Siemens Medical Systems, Houston, Tex.) and Panelipse (Gendex, Milwaukee, Wis.) found that Orthopantomograph was slightly more reliable in the production of radiographs for visualization of selected anatomic landmarks[14].

The objective of this study was (1) to carry out a quantitative study of all abnormalities that should be taken into account when making complete dentures and (2) to determine the value of routine panoramic radiography in giving useful information in edentulous persons in searching for lesions that may be responsible for future pathologic complications and to compare the findings of the present investigation with those found in the literature. So far no study has been conducted incorporating the radiographic criteria used in this study.

METHODS

Edentulous patients requiring prosthodontic treatment attending Out Patient Department were included in the study. Clearance was obtained from the institutional ethical committee for the study and consent was obtained from the patients. All the patients were routinely examined radiographically with panoramic radiograph prior to treatment. Poor quality radiographs (Poor density, contrast, resolution, insufficient accuracy of bony borders, magnification, distortion and images with artifacts), patients under radiation therapy and patients who were not willing to give the consent were excluded from the study. Name, age, gender, dentulous status of each jaw and history of recent extractions was noted. The radiographic apparatus used was Cranex (SOREDEX, Tuusula, Finland), tube current, 6 mA; tube voltage of 65kV; exposure time for 20 seconds at 50 Hz; inherent filtration, 1.8mm Al; and total filtration of 2.7mm Al. A total of 1000 orthopantomographs were interpreted without magnification for the presence of 18 radiographic conditions i.e. (1) unerupted/impacted teeth (2) residual root fragments (3) migrated sinus (4) osteosclerosis (5) mucosal thickening (6) sequestra (7) cysts (8) periapical lesions (9) fractures (10) sialolithiases (11) soft tissue calcification (12) foreign body (13) atrophy (14) calcified lymph nodes (15) tumours (16) maxillary sinus polyp (17) residual infections (18) mental foramen position near the alveolar ridge. The pathologies detected in the radiographs were classified according to their type and incidence. The findings were compared with those of other investigators.

RESULTS

Of the 1000 completely edentulous patients included in the survey 587 (58.7%) were men and 413 (41.3%) were women. The radiographic abnormalities were found in 17.2% (n = 101) of the male patients. Similarly female patients had 19.61% (n = 81) radiographic findings. For the total group a corresponding figure was 18.2% (Table 1). The difference between sexes was small and not significant ($Z = 0.2307$, $p = 0.8175$). The mean age of the patient was 67.14 ± 12.04 yrs. The mean length of time the maxillae had been edentulous was 19.97 ± 11.24 years, and for the mandible this mean time span was 18.61 ± 12.01 years. Similarly, the mean age of existing denture in maxillae was 14.65 ± 10.95 years, and for the mandible this mean age of existing denture was 12.41 ± 10.87 years (Table 1). The most common radiographic finding noted was impacted/unerupted teeth (35.1%), followed by fractures (27%). The least common finding was mucosal thickening (1.7%). Residual roots were noticed in 10.6% of the cases (Table 3). Table 3 gives comparison of present study with other studies which have also

used panoramic radiography to assess the radiographic findings in completely edentulous persons. It also gives the comparison of percentage of impacted/unerupted teeth and residual roots in various studies.

DISCUSSION

Today panoramic radiography is gaining importance as a routine radiographic investigation prior to any treatment in edentulous patients as edentulous jaws often lack clinical signs and symptoms and hence the abnormalities may be overlooked leading to delayed diagnosis[15-18]. Successful denture therapy is influenced by the biomechanical phenomena of support, stability and retention and this can be achieved if there is good foundation support, so the supporting bone must be free from intrabony and soft tissue pathosis. The current study sample included completely edentulous patients who reported for some complaint and may/may not have undergone panoramic radiographic examination before. Other studies have used different inclusion criteria's like completely edentulous patients who have never undergone panoramic radiography or only patients who wanted to get new set of dentures made.

Positive radiographic findings were observed in 18.2% of patients, which has a good correlation to the findings of Swenson HM (1967) who found 18% of patients with positive panoramic radiographic findings[15]. In present study the percentage of impacted/unerupted teeth in panoramic radiographs was 35.1% and this figure is highest when compared with other studies which have found 1.7-12.68% of impacted/unerupted teeth. This difference may be due to larger sample size of present study and also the fact that many edentulous patients visit a denturist directly for fabrication of complete dentures and hence radiographic examination of such patients is not done which leads to failure in identifying radiographic findings and delayed diagnosis. Authors differ in opinion on treatment of such asymptomatic unerupted/impacted teeth with some favouring removal as soon as they are detected while others in favour of leaving them as it is if they do not interfere with denture use. In a long term study on 15 patients with asymptomatic impacted teeth in edentulous denture bearing areas, who were followed for 10 years it was found that no problems were caused due to those teeth. It was also concluded that removal of asymptomatic impacted teeth in denture bearing areas or in areas undergoing pre-prosthetic surgery is not required as long as the integrity of the covering tissues is preserved[19].

The percentage of retained roots in this study was found to be nearly similar to studies of Prater WL.[1], Jones JD[18] and Masood F[5]. Some authors recommend that all retained roots should be removed while others see no justification for the routine removal of root fragments that are embedded in bone and reveal no clinical or radiographic signs of infection. It is said that non infected vital roots submerged in the alveolus may be a way of preserving alveolar bone for support of dentures[18]. But it is the duty of dentist to inform the patient about the existing condition and tell them about the possible future complications[13]. Radiographic examination should be repeated at predetermined intervals to keep a check on the status of retained roots and removal advised if radiolucent region is seen associated with them. The second most common radiographic finding in the present study was fractures of edentulous maxillary and mandibular arches (27%). In edentulous jaws the physical size of jaw (especially mandible) decreases with increasing atrophy. In atrophic jaws even very minor trauma can cause fractures. Another important finding to note in edentulous patients is the relationship of mental foramen to the crest of the residual alveolar ridge. The term positive, negative is used to describe whether the mental foramen is located at the tip of alveolar ridge or not. 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[1,8,18]. In present study the mental foramen was at the crest of the residual ridge in 7.7% of the radiographs. In such cases the changes in treatment plan include a selective pressure impression technique and providing relief in this region. Another alternative is pre-prosthetic surgery to increase the opening of the mental foramen downward toward the inferior border of the mandible, which will permit a lower level of exit for the nerve. Migrated maxillary sinus was found in 24 patients (11.2%) in this study. This finding is different form a study where 72.9% patients had migrated sinus[7]. Due to pneumatisation of maxillary sinus and atrophy of maxillary ridge the sinus floor is lowered almost to the crest of alveolar ridge in posterior maxilla. This finding holds important in cases of patients who want implant supported dentures and hence sinus lift procedure or sinus grafting is done[20].

CONCLUSION

The percentage of edentulous patients with positive radiographic findings on a routine panoramic radiograph points out the value of panoramic radiographic examination of all patients prior to denture construction and also at timely intervals. It is necessary for early diagnosis of pathological conditions which may later cause trouble to patient. This may help the dentist in modification of the treatment plan and choice of materials according to the condition of the denture bed.

Strengths and limitations of this study

- This is the first study to describe the assess the frequency of significant radiographic findings in edentulous jaws in a population
- The observations of this study demonstrate the necessity of routine radiographic examination of the edentulous jaws before fabricating the dentures.
- The results of the present study also emphasize the importance of panoramic radiographs for pre-prosthetic evaluation of partial and complete edentulous patients
- Samples of only Institute were incorporated in this study as it was not feasible for us to obtain the X-rays from other institutes.

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