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ORIGINAL ARTICLE

The Value of Panoramic Radiograph as a Screening Tool Prior to Complete Denture Construction: A Restrospective Study

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ABSTRACT

Objective: The aim of this study was to determine the frequency of detecting abnormal radiographic findings from a diagnostic panoramic radiograph of edentulous patients prior to complete denture constructions. **Methods:** We reviewed the dental records and panoramic radiographs of 194 edentulous patients receiving complete denture treatment over a 5-year period. We identified cases with recorded abnormal radiographic findings which did or did not require intervention prior to complete denture fabrication. **Results:** Radiographic abnormalities were detected in 24 of 194 cases (13%), of which 11 cases (6%) required intervention prior to denture construction. Of those 11 cases, 7 had a retained root which required extraction and 4 had irregular ridges which required alveoloplasty. The remaining 170 patients (87%) had no abnormal findings detected on their panoramic radiographs. **Conclusion**: Abnormal radiographic findings that affect denture construction were only found in 6% of patients, similar to the previous reports. Therefore, taking panoramic radiographs prior to complete denture construction offers insignificant clinical value and should, thus, be discontinued as a screening tool.

Key words: complete denture, edentulous patient, panoramic radiograph, radiation, radiographic abnormalities

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INTRODUCTION

Panoramic radiographs are a useful screening tool before complete denture construction to disclose bony lesions undetected by tactile or visual examination of the oral cavity, unless there is an associated bony expansion. Many lesions remain symptom-free until they become infected, which has caused many dentists to radiographically screen patients before making complete dentures.[1,2] Logan (1921)[3] and Eusterman (1921)[4] were the first to recommend the use of panoramic radiograph for edentulous patients seeking complete dentures. This practice still continues in many teaching institutions and dental practices worldwide, including our institution in Malaysia. However, due to the recent cut in government funding for higher education,[5] the rising cost of oral healthcare including the cost of taking x-rays,[6] and the rising concern about health effects of radiation,[7] this practice must be reviewed to determine the actual value of panoramic radiograph as a diagnostic tool before fabricating complete dentures.

Previous studies have reported the frequency of positive radiographic findings in panoramic radiograph of edentulous patients in the range of 16% -8%.[8–12] This large range is likely due to different definitions of positive radiographic findings. Studies which report a low percentage of positive findings commonly only include pathologies such as deeply embedded tooth impactions, localized sclerotic bone, and foreign bodies. Studies which report a large percentage of positive

findings usually also include stylohyoid ligament calcification, pneumatization of the maxillary sinus, and location of mental foramen in their reports.[13–14] Furthermore, there are few reports on the proportion of these detected pathologies which require intervention prior to denture construction; therefore, the clinical significance of panoramic radiograph in this patient cohort is not conclusive. Masood *et al*. (2007) examined 327 patients, 42.5% of which showed positive radiographic findings yet only 3.8% required surgical intervention before denture constructions.[15] More recently, Kratz *et al.* (2016) found that 101 of 169 patients (60%) showed positive radiographic findings, but only 6 patients (3.6 %) required management.[16] Taken together, these two reports suggest that panoramic radiographs offer little clinical value.

Axelsson *et al*. (1988) examined 225 edentulous patients, finding 50 (22.2%) with positive radiographic findings, while 11.1% had retained roots.[14] Other pathologic findings were reported as cystic lesions, foreign body, spontaneous fracture, residual periapical abscess, sialolithiasis, and several cases of questionable osteitis. However, how many of these pathologies required surgical management was not revealed. Similarly, Jones *et al.* (1985) found a large number (34.4%) of positive radiographic findings, with root fragments accounting for 12.3% of those positive findings.[17] The rest were unerupted teeth, abnormal radiopacities, and foreign bodies, yet the number which required intervention was not mentioned.

Therefore, the purpose of this study was to determine the frequency of detecting abnormal radiographic findings in panoramic radiographs which would have a direct impact on complete denture construction for edentulous patients in our institution. The findings of this study will not only add further evidence to the diagnostic value of a panoramic radiograph but also chiefly form the basis for a review in our Complete Denture Prosthodontic Curriculum in our institution and contribute towards cost-cutting measures to address the recent cut in our institutional operating budget. We hypothesized that taking panoramic radiograph will add little clinical benefit and therefore should be discontinued.

METHODS

Record retrieval

Ethical approval for this retrospective study was obtained from the Universiti Teknologi MARA Malaysia Research Ethics Committee (REC/190/17). We retrieved all records of patients receiving complete dentures made by dental students at this institution from 2012 to 2016. We anticipated 200–250 records, based on the number of complete denture patients treated by dental students in the institution averaging about 40–50 patients a year. The records retrieved had complete examination charts, good quality panoramic radiographs with their radiographic findings/interpretation recorded, treatment planning, and detail notes of referral for surgical management if any, as approved by clinical supervisors. Panoramic radiographs were made on a digital panoramic machine (Instrumentarium OP 300, Finland) but the images had to be printed due to the lack of online record management system for student use during that period. These panoramic radiographs were closely scrutinized for radiographic abnormalities by both students and their clinical supervisors during history taking and examination sessions prior to complete denture construction. The radiographs were scrutinized for the presence of retained root tips, impacted teeth, irregular ridges, bony spicules, radiolucent and radiopaque areas, and foreign bodies.

Data analysis

Radiographic abnormalities were divided into three categories. The first category was for pathologies detected but no intervention required such as deep retained root tip, foreign bodies, and impacted or embedded teeth. The second category was for pathologies detected which required intervention such as root tip at the crest of residual ridge which required extraction. The last category was for no pathology detected. These data were analyzed using basic descriptive statistics.

RESULTS

A total of 194 complete denture patient records and their panoramic radiographs were reviewed and analyzed. Several records were excluded because they were either incomplete or panoramic radiographs were missing. Positive radiographic findings detected were mostly retained roots, impacted teeth, and irregular alveolar ridges. Figure 1 shows that positive findings were detected in 24 radiographs (13%), out of which only 11 (6%) required surgical intervention before denture construction. Seven had a retained root that required extraction and four had irregular ridges that were referred for alveoloplasty. The other 13 patients (7%) had positive findings which did not require intervention. For the majority of patients (87%), no pathology was detected.

Table 1 demonstrated that out of the 6% (11 patients) that required intervention, 7 had retained roots that required extraction prior to complete denture construction and 4 patients had irregular ridges that needed alveoloplasty. Of the 7% (13 patients) that did not require intervention, 4 had retained roots that were deeply embedded, 4 had irregular ridges, 4 had impacted teeth, and 1 had a hairline fracture.

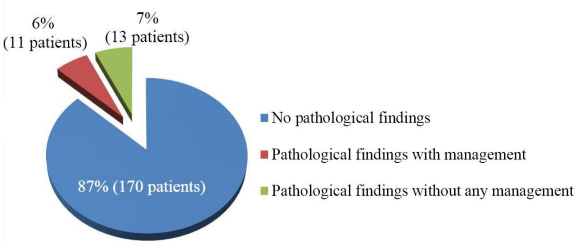

Figure 1. The rate of pathological findings detected from panoramic radiographs.

Table 1. Categorized pathological findings with differential diagnosis and intervention.

Category	Differential Diagnosis
Pathological findings which require intervention	Seven retained roots that require extractions Four irregular ridges that need alveoloplasty
Pathological findings which require no intervention	Four retained roots Four irregular ridges Four impacted teeth One hairline fracture

DISCUSSION

The objective of this retrospective study was to analyze the frequency of detecting abnormal radiological findings in panoramic radiograph before complete denture fabrications by dental students in a teaching institution. We included both radiographic findings that may or may not have a direct effect on the denture construction. In our study, positive radiographic findings were found in only 24 patients out of 194 (13%) cases analyzed. Out of these 24 patients, only 11(6%) of them required some interventions before denture construction. Hence, these data support our hypothesis that routine panoramic radiographs taken prior to complete denture construction add little clinical benefit. Our findings are consistent with a previous work showing that only 3.6%–3.8% of positive radiographic findings required surgical intervention before denture construction, suggesting that routine pretreatment panoramic radiographs should be discontinued.[15–16]

However, this is not a universal recommendation as it is dictated by the needs, type of treatment, and oral condition of a specific population. Jindal *et al.*[18] reported significantly high positive findings of above 30% which required surgical intervention prior to complete denture construction; therefore, their recommendation for routine pretreatment panoramic radiograph is mandatory for their edentulous population. Kose et al[19] also reported >30% positive radiographic findings in their population. However, the required surgical intervention was dictated by the type of treatment the patients were receiving. Out of 331 positive radiographic findings, 52.9% (n = 175) required surgical treatment prior to the construction of implant-supported fixed prosthesis. However, only 6% (n = 20) required surgical intervention prior to complete denture construction.

In our study, retained root forms the most common pathology detected, similar to previous reports.[12,18–20] Out of these 11 patients with retained roots, 7 required extraction prior to complete denture construction. However, most of these retained roots could be detected visually during intraoral examination as recorded in the patient folders. Some studies have reported a high occurrence of retained roots or root fragments but it was not disclosed if these roots affect complete denture construction.[21–22] The other four patients had irregular ridges that needed alveoloplasty. These irregular ridges were noted as sharp bony protuberance when palpated clinically. Together, these findings suggested that most of these positive radiographic findings could be detected clinically and therefore further reduce the value of taking panoramic radiographs. If confirmation is required by radiograph, perhaps a small periapical radiograph with much lower radiation exposure would be sufficient. It appears that the taking of panoramic radiographs should be determined on a patient-by-patient basis, particularly because previous reports have shown that the use of selection criteria can reduce the number of total radiographs by 43% and number of panoramic radiographs by 73% without missing undiagnosed disease.[23–24] As such, screening radiography for new, edentulous patients has been criticized because of the assertion that screening does not yield sufficient clinically relevant information.[25–26] There are some limitations to this study which warrant discussion. First, the sample size of 194 is relatively small, but was based on the total number of patients who came for complete denture treatment in this institution during the 5-year period containing complete records and available panoramic radiographs. In addition, this was a retrospective study which used patient records and radiographs and did not involve direct assessment of patients to verify clinical findings. Despite these limitations, we are confident that the documented patients' records and radiographic findings are accurate because they undergo a checking and verification procedure by clinical supervisors. Finally, the panoramic radiographs reviewed in this study were only of patients referred for complete denture treatment, and not the entire panoramic radiographs taken in the Radiology Department in the institution. Hence, the types of pathologies found are limited to those commonly found in the edentulous patients seeking complete dentures.

CONCLUSION

We conclude that abnormal radiographic findings which affect denture construction were found in only

6% of patients. Therefore, we suggest that panoramic radiographs prior to complete denture construction offer insignificant clinical value as a screening tool and thus should be discontinued. The need for specific radiographs should be assessed on a patient-by-patient basis based on signs and symptoms, thorough medical and dental histories, and clinical examination prior to complete denture construction.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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