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Pathological conditions detected on panoramic radiographs of two Johannesburg populations.

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SUMMARY

In the diagnosis of pathological lesions of the oral cavity and surrounding tissues, radiographs are used to supplement clinical examination. In this study the objectives were to describe the prevalence of pathological conditions in radiographic records of a dental school patient population and to compare the prevalence in Caucasoid and Negroid subsamples. One thousand panoramic radiographs were examined for specified tooth and bony lesions. The sample comprised radiographs from 514 Caucasoid and 486 Negroid patients. With regard to what was termed tooth lesions, in all groups missing teeth were the commonest finding, followed by impacted teeth and periapical radiolucencies. Bone lesions in decreasing prevalence were residual roots, focal radiopacities and unilocular radiolucencies. When subgroups, by ethnic group and sex, were compared, statistically significant differences in prevalence were noted although no consistent pattern emerged. The investigation has shown that screening studies of filed panoramic radiographs of South African hospital populations is a useful method for assessing prevalence trends of defined pathological lesions.

OPSOMMING

Benewens kliniese ondersoekmetodes word röntgenologiese opnames as hulpmiddel gebruik in die diagnose van patologiese letsels van die mond en omringende strukture. Die doel van hierdie ondersoek was om die prevalensie van patologiese toestande, soos waargeneem op röntgenfoto's van die pasiëntebevolking van 'n tandheelkundige opleidingshospitaal, te bepaal en om die prevalensie in Kaukasiër- en Negroïede subgroepe te vergelyk. Eenduisend panoramiese röntgenopnames van 514 Kaukasiërs en 486 Negroïede pasiënte is ondersoek vir die voorkoms van gespesifiseerde tand- en beenletsels. Van sogenaamde tandletsels was afwesige tande die algemeenste waarneming in alle groepe, gevolg deur geïmpakteerde tande en periapikale ontsteking. In dalende orde van voorkoms van beenletsels is die volgende waargeneem: tandwortelreste, fokale radio-opasiteite en lokulêre radiodeurskynende areas. Vergelyking van subgroepe, verdeel op etniese en geslagtelike basis, toon statistiesbeduidende verskille in pervalensie maar geen standhoudende patroon is vasgestel nie. Die ondersoek toon dat sifting van geliasseerde panoramiese röntgenopnames van pasiëntebevolkings van Suid-Afrikaanse hospitale 'n nuttige metode bied vir die vasstelling van die voorkomsneigings van sekere patologiese toestande.

INTRODUCTION

In the diagnosis of disease of the oral cavity, following the recording of a good history and an examination of the entire oral cavity, dental radiographs provide an additional source of information. Several types of radiograph may be used: for example, intra-oral periapical and bitewing radiographs for the diagnosis of periodontal disease and caries as well as occlusal plane radiographs for the diagnosis of unerupted teeth.

Panormaic radiographs show an uninterrupted view of the entire maxillary and mandibular region (Updegrave, 1966). This technique does not replace the conventional intra-oral dental film but supplements it as a comprehensive radiographic survey of the entire dentition and supporting structures (White and Weissmann, 1977; Langland et al, 1982). The radiographs are made using either an intra-oral or an extra-oral source of radiation. The latter type is also termed rotational panoramic radiography (Langland et al, 1982). In the present paper the terms panoramic radiography and panoramic radiograph refer to rotational panoramic radiography.

Several screening panoramic radiographic studies have been undertaken. The studies of Meister, Simpson and Davis (1977) on United States airmen; Johnson (1970), Allatar, Baughman and Collett (1980) and Barret, Waters and Griffiths (1984) on hospital populations in the United States and Australia showed clear methodology in contrast to those done by Christen et al (1967), Cuttino et al (1969) and Langland et al (1980) on groups of dentists. In general all these studies showed that impacted and unerupted teeth were the most common finding on all panoramic radiographs.

In the case of airmen and dentists, the second most common abnormality was periapical radiolucencies, while in the hospital populations this was retained roots. Thus a variation in prevalence of various pathological lesions in different populations does exits. No such reports on general screening studies in South African populations exist although Farman, Joubert and Nortje (1978) have studied the prevalence of focal osteosclerosis and apical periodontal pathoses in European and Cape Coloured hospital populations.

We believe that there is a need to determine the prevalence of

radiographically diagnosable lesions in different populations as an aid to public health service planning. Ideally in such investigations, radiographs should be taken of subjects randomly selected from the general population. It is not acceptable in the RSA to subject persons ro radiation solely for research purposes (World Medical Assembly 1964) thus hospital populations within which diagnostic radiographs are made must be used.

The aims of the present study were firstly to determine the prevalence of pathological lesions in a series of panoramic radiographs in a hospital population in Johannesburg; and secondly to determine whether the prevalence of the lesions in radiographs differ between Caucasoid and Negroid patients.

Materials and methods

One thousand panoramic radiographs of patients attending the Oral and Dental Teaching Hospital of the Witwatersrand for treatment were examined with the approval of the University's Committee for Research on Human Subjects. In order to obtain a representative sample, every second panoramic radiograph in the hospital files was examined until 1000 had been studied. No selection was made on the basis of clinical diagnosis but to qualify for inclusion in the study the radiograph had to be that of a Caucasoid or Negroid (International Dictionary of Medicine and Biology 1986), past the mixed dentition stage, and with at least one permanent tooth present. Since the radiographs are filed by patient number which is the sequence in which patients present to the hospital irrespective of age, sex, or diagnosis, the sample is a random one of a hospital population.

For each patient the age, sex, ethnic group and reason for the radiograph were recorded. Each radiograph was examined, without magnification, using a standard viewing box in the horizontal position in order to mimic general dental practice. All the radiographs were examined by one examiner (MBF). Intra-examiner diagnostic reproducibility was checked by re-examining 25 randomly selected radiographs. On the first examination 148 lesions were diagnosed and on the second 146, identical for lesion type and site to the first viewing, were recorded. This 99 per cent reproducibility was considered acceptible for the study.

Recording sheets were compiled divided into two sections. The first dealt with what were termed tooth lesions: missing teeth, impacted teeth, hypercementosis, periapical radiolucencies, fractured teeth and unerupted teeth. In the second section, focal or diffuse radiopacities, unilocular or multilocular radiolucencies, mixed radiolucency/radiopacity, odontomes, supernumerary teeth, retained roots and radiolucencies related to retained roots were noted. These were termed bone lesions. Definitions used for all the lesions are listed in Table I.

The data were analysed using descriptive statistics and the Non-parametric Chi-square test without Yates' correction (SAS 1985). The test populations for the sub-groupings of the tooth and bone lesions were the total numbers of lesions in each instance, not the numbers of radiographs. For example the total number of tooth lesions among Caucasoids was 3205 and among Negroids was 2548. For bone lesions the numbers were 269 and 363, respectively. The Chi-square tests were only perfomed when a lesion prevalence was 30 or more. The critical level of statistical significance chosen was $p<0,05$.

RESULTS

The sample of 1000 patients consisted of 293 male Caucasoids, 294 male Negroids, 221 female Caucasoids and 192 female Negroids. These ranged in age from 11-90 y and most panoramic radiographs had been taken during the third decade in all subgroups.

Of the 1000 radiographs examined, 786 showed tooth lesions and there were 130 with bone lesions. In the remainder of this article the denominators for percentage prevalence calculations will be the total numbers of lesions per group and subgroup, not the number of radiographs. Among the tooth lesions, missing teeth were the common abnormality comprising 3946 (69 per cent), followed by 931 (16 per cent) impacted teeth and 531 (9 per cent) periapical radiolucencies. Of the bone lesions there were 484 (75 per cent) residual roots, 81 (13 per cent) focal radiopaque areas and 41 (6 per cent) unilocular radiolucencies.

The prevalence of missing teeth differed significantly when all combinations of ethnic group and sex were examined (Fig. 1). The lower prevalence of impacted teeth in females (Fig. 2) was statistically significant as was the lower prevalence in Negroid females as compared to negroid males. All other combinations did not show statistically significant differences.

Unerupted teeth were significantly more common in Caucasoids compared with Negroids and also when males were compared with males and females with females within the ethnic grouping (Fig. 3).

The most prevalent bone lesions were residual roots and focal radiopacities. With regard to residual roots, these were significantly more common among males compared with females (ethnic groups combined), Negroid females compared with Negroid males and Negroid females compared with Caucasoid females (Fig. 4). Focal radiopacities (Fig 5) were significantly more frequent among Caucasoids than Negroids and females compared with males of all ethnic groups. No radiographs showed mixed radiolucency/radiopacity or complex odontomes.

DISCUSSION

Patients attending our dental hospital can be subdivided into three groups. The largest group are those who would not in the first instance consult private practitioners. The next comprises University staff and students, while the smallest consists of patients requiring specilized treatment. The results presented in this article are thus comparable only to populations of similar composition and not to the general population. Comparison is possible with several studies done elsewhere. Johnson (1970) investigated a male population in a United States Veterans hospital. He found unerupted teeth to be most frequent followed by retained roots and periapical radiolucencies, a pattern similar to males in the present study. Another United States hospital population study was that of Allatar et al (1980). In their population the lesions seen in descending prevalence were impacted teeth, retained roots and periapical radiolucencies. The results of our investigation are similar.

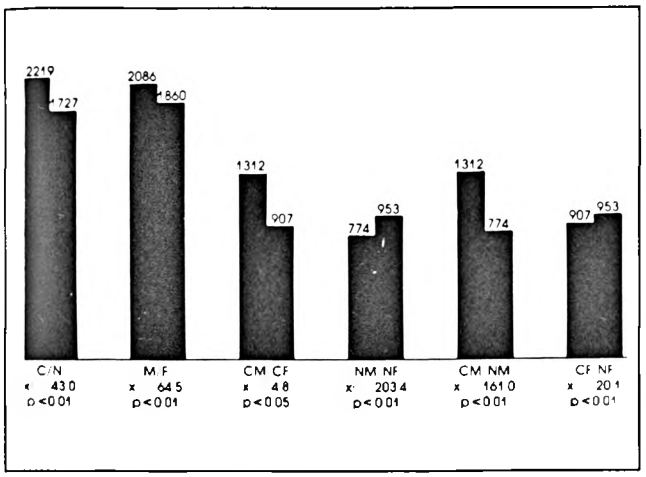


Figure 1: **Prevalence of missing teeth by ethnic group and sex.**

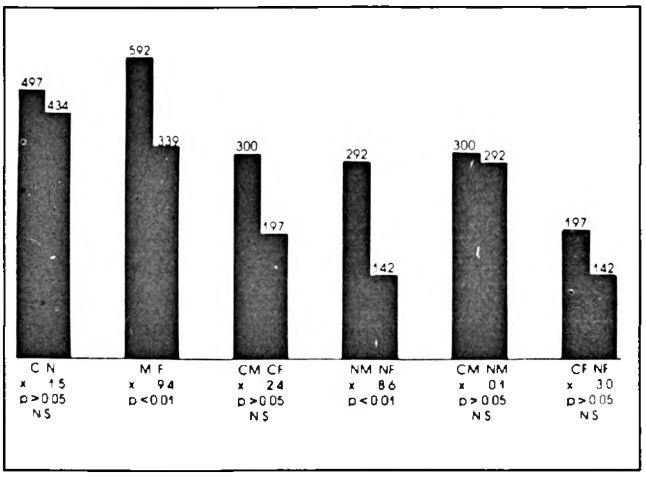


Figure 2: **Prevalence of impacted teeth by ethnic group and sex.**

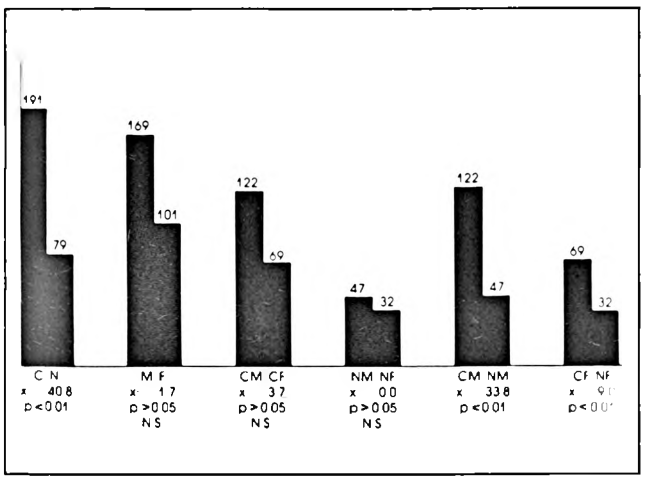


Figure 3: **Prevalence of unerupted teeth by ethnic group and sex.**

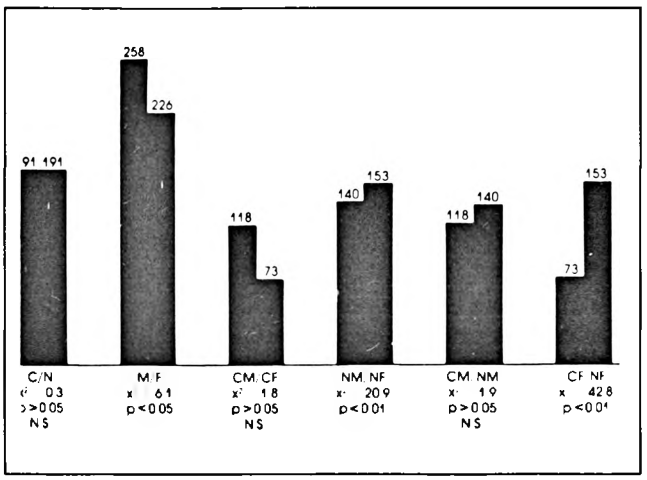


Figure 4: **Prevalence of residual roots by ethnic group and sex.**

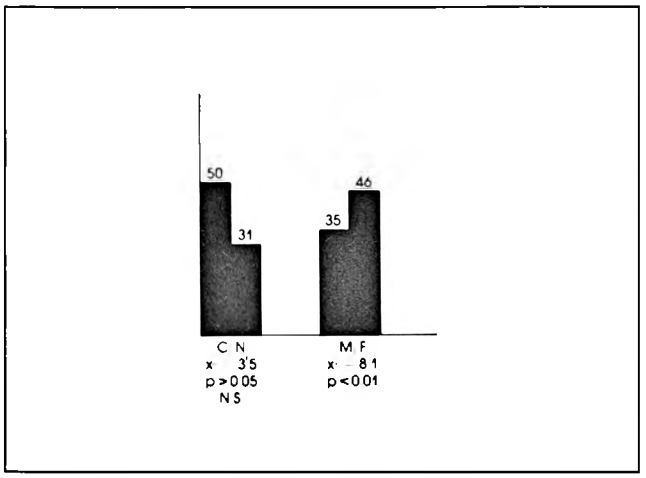


Figure 5: **Prevalence of focal radiopacities by ethnic group and sex.**

In South Africa, Farman et al (1978) examined prevalences of focal osteosclerosis and apical periodontal pathoses in panoramic radiographs of European and Cape Coloured dental outpatients. Focal osteosclerosis was more frequently seen in their European group and apical periodontal pathoses among the Cape Coloureds. In the present investigation focal radiopaque areas were more common among Caucasoids but apical periodontal pathoses showed similar prevalences among Caucasoids and Negroids. The absolute prevalence of focal radiopacities in the present study was approximately half that seen in the European group.

Table I. **Definitions used in this investigation**

Missing teeth. All permanent teeth not on the radiograph.

Unerupted teeth. Teeth which had not reached the occlusal plane and which were not impeded from doing so.

Impacted teeth. Teeth with fully or incompletely formed roots impeded by hard tissue from reaching their correct relationship to the occlusal plane and surrounding bone.

Hypercementosis. Formation of excessive cementum on tooth roots.

Periapical radiolucency. Radiolucency associated with the apex of a tooth root.

Tooth fracture. Fracture of the crown and/or root of a tooth.

Remaining roots. Roots which cannot be restored because of insufficient remaining healthy tooth tissue and/or supporting tissues.

Focal radiopacity. A well circumscribed radiopacity in bone.

Diffuse radiopacity. A radiopacity within the bone with poorly defined margins.

Unilocular radiolucency. A single radiolucency within bone not related to the apex of a tooth.

Multilocular radiolucency. Multiple radiolucent areas within bone not related to tooth apices.

Mixed radiolucency/radiopacity. Radiopacity within a radiolucency.

Supernumerary tooth. An additional tooth present in a patient with a full complement of teeth.

Compound odontome. Ondontome which bears superficial anatomical similarity to normal teeth. (Shafer, Hine and Levy 1983)

Complex odontome. Odontome with an irregular mass of hard tissue bearing no morphological similarity to even rudimentary teeth. (Shafer, Hine and Levy 1983).

Mesiodens. A supernumerary tooth in the midline.

In general, the Caucasoid: Negroid and male: female patterns of lesions seen in this study have been irregular; no consistent pattern has emerged. The most striking difference seen was the high prevalence of residual roots seen in Negroid females compared with the other subgroups.

CONCLUSIONS

The present investigation has shown that it is possible to diagnose a series of lesions on panoramic radiographs with high reproducibility. The panoramic radiograph is thus a useful one for monitoring the prevalence of lesions that can be seen on such radiographs. It is suggested that screening of such lesions at intervals could be a useful aid to planning of hospital services.

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