Radiographic recommendations for the primary dentition: comparison of general dentists and pediatric dentists

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Abstract

A survey which included brief case histories and intraoral photos of four primary dentitions ranging from healthy to severely carious was mailed to a random sample of 2000 general dentists and 1000 pediatric dentists. Radiographic options were listed, from which the dentist was to indicate all films needed for each child's examination. Surveys were received from 1273 (43%) dentists, including 713 (36%) general dentists and 560 (56%) pediatric dentists.

The pediatric dentists recommended significantly more diagnostic radiographs than did the general dentists across all four primary dentition cases. This trend was apparent in the absence of clinically visible caries. When radiographs were recommended, bite-wing radiographs were the most frequently ordered films. The most frequently ordered combination among all respondents was bite-wing radiographs plus anterior periapical films.

The results suggest that, frequently, neither general dentists nor pediatric dentists prescribe radiographs for the primary dentition patient that conform to the USDHHS guidelines for radiographic examination (1987).

Introduction

A dental examination for a young child during the primary dentition stage requires appropriate radiographs for the detection of significant pathology and anomalies. In conducting this examination, the dentist must make every attempt to minimize the child's exposure to ionizing radiation. Radiographs are essential for the detection of interproximal carious lesions and pulp pathology in the primary dentition (Murray and Majid 1978) and for detecting dental developmental anomalies (Turner and Hill 1986; Pilo et al. 1987). A definitive diagnosis of such anomalies during the primary dentition stage may not be possible, however, due to the timing of dental development. Accordingly, treatment of such dental developmental anomalies is seldom initiated at an early age. In addition, the child's ability and willingness to cooperate at a young age may preclude the possibility of obtaining diagnostic radiographs.

Consideration should be given to the possible long-term effects of low-dose ionizing radiation (Committee on Biological Effects of Ionizing Radiation 1980; National Research Council 1980; Goepp 1981; Preston-Martin et al. 1988). Very young children may be at a greater risk of suffering ill effects from ionizing radiation than older individuals because growing tissue usually is more radiosensitive (Modan et al. 1974; UN Scientific Committee 1977; Gibbs 1982). Although improvements in dental radiographic equipment have resulted in significant reduction in patient exposure to ionizing radiation (Council on Dental Materials and Devices 1984), enough concern exists about the potential harmful effects of ionizing radiation to prompt the dental profession to develop guidelines for radiographic examinations (Nowak et al. 1981; Pierce et al. 1990). In addition, the US Department of Health and Human Services (USDHHS), after considerable research and input by the dental profession, recently has issued guidelines for prescribing dental radiographs (USDHHS 1987). These guidelines recommend that radiographs be exposed only as indicated by the findings of a clinical examination.

There is little information as to whether dentists prescribe radiographs appropriately for children's dental examinations during the primary dentition. Both general dentists and pediatric dentists are primary dental care providers for children and regularly take radiographs for diagnostic purposes. The final decision regarding a radiographic examination rests with the knowledge and clinical judgment of the practicing dentist. The purposes of this project were to characterize the radiographic examination practices of general dentists and pediatric dentists for children in the primary dentition stage of development and to determine if there are differences between the recommendations of the two groups of practitioners.
Method

A mail survey developed by the Medical College of Georgia Department of Pediatric Dentistry in conjunction with the Office of Research Computing and Statistics was designed to elicit information pertaining to radiographic examination practices for children. The survey included a series of eight simulated clinical cases with intraoral photographs. Four of the cases represented common clinical conditions encountered in the primary dentition and are the subject of this paper (Fig 1). Some general assumptions were included in a cover letter that indicated the following: 1) All patients were healthy and cooperative; 2) There were no parental objections to radiographs; 3) Finances were not a factor; 4) None of the patients had been examined previously by a dentist; 5) All the patients lived in optimally fluoridated areas. Given these assumptions, along with the patient's age and the intraoral photographs, each dentist was asked to indicate all radiographs they would prescribe for each case. Radiographic options included the following: 1) No radiographs; 2) Bite-wing radiographs (BX); 3) Panoramic radiographs (PN); 4) Posterior periapical radiographs (Post PAs); 5) Occlusal films; 6) Maxillary occlusal radiographs; 7) Mandibular occlusal radiographs. On the survey, maxillary and mandibular occlusal films were separate categories, but for scoring, both were grouped together under the heading anterior periapical films (Ant PAs).

The survey was mailed to 2000 general dentists and 1000 pediatric dentists selected randomly from the American Dental Association national membership through the Association’s Data Processing Service. A follow-up survey was not conducted.

All survey responses were transferred to optical scan sheets for computer scoring. For each case, comparisons were made between the radiographic selections of general dentists and pediatric dentists. Comparisons also were made for combinations of radiographs selected individually for each case based on probable diagnostic value. Eighty to 95% of the recommendations for each case were included with these combinations. The percentages of general dentists and pediatric dentists who recommended the various single films and combinations of films were compared using a Chi-square analysis.

Results

The survey was returned by 1273 (43%) of the dentists, which included 713 (36%) general dentists and 560 (56%) pediatric dentists.

Case one was a 4-year-old child with a clinically caries-free spaced primary dentition (Fig 1-A). The recommendations are listed in Table 1. In this case both the general dentists (58%) and pediatric dentists (49%) most frequently elected not to prescribe any radiographs. More than one-fourth of the general dentists recommended bite-wing radiographs only for a new patient examination on this child, while less than 2% of pediatric dentists selected bite-wing radiographs only in the same situation. Less than 20% of the pediatric dentists recommended either anterior periapical films or a combination of bite-wing radiographs and anterior periapical films. For this case there was a highly significant difference ($X^2 = 253.19, P < .001$) between general dentists and pediatric dentists with the pediatric den-

![Fig. 1. Series of intraoral photographs simulating four clinical cases in the primary dentition.](image-url)
tists recommending different films resulting in more exposures.

The second case was a 4-year-old child with a non-spaced clinically caries-free primary dentition (Fig 1-B).

**Table 2. Percentages of Dentists Who Prescribed Various Radiographs for the Non-spaced Primary Dentition Case**

<table>
<thead>
<tr>
<th>Radiographs</th>
<th>General Dentists (%)</th>
<th>Pediatric Dentists (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td>33</td>
<td>15</td>
</tr>
<tr>
<td>BX</td>
<td>42</td>
<td>24</td>
</tr>
<tr>
<td>PN</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Ant PAs</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>BX + PN</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>BX + Ant PAs</td>
<td>13</td>
<td>45</td>
</tr>
<tr>
<td>BX + Ant PAs + PN</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2 lists the recommendations for this case. Forty-two per cent of the general dentists recommended bite-wing radiographs only as the choice for radiographic examination while 33% recommended no films be exposed. Twenty-four per cent of the pediatric dentists recommended bite-wing radiographs only, with 15% recommending no radiographs. Forty-five per cent of pediatric dentists recommended a combination of films, including bite-wing radiographs and anterior periapical films. Thirteen per cent of the general dentists selected the same combination. One third of the general dentists recommended that no radiographs be exposed, compared to 15% of the pediatric dentists who made the same recommendation. This case also illustrated a highly statistically significant difference between the radiographic recommendations of general dentists and pediatric dentists ($X^2 = 258.77, P < .001$).

The third case presented a 4-year-old child with carious molars and interproximal caries on the maxillary central incisors (Fig 1-C). The recommendations for this case are shown in Table 3. Bite-wings only were chosen by 22% of the general dentists and 5% of the pediatric dentists. Thirty-one per cent of the general dentists recommended a combination of bite-wing radiographs and multiple posterior periapical films, with 5% of the pediatric dentists making the same recommendation. Forty-seven per cent of the pediatric dentists recommended bite-wing radiographs, anterior films, and multiple posterior periapicals, while only 19% of the general practitioners recommended that combination. Two other combinations (BX + BN, and BX + Ant PAs) were recommended by 16% and 17%, respectively, of the pediatric dentists. These same combinations were recommended by 11% and 6% of the general dentists. For this case 20% of those surveyed recommended radiographs that did not fall into any of the predetermined categories. There was a high statistically significant difference ($X^2 = 286.05, P < .001$) between the recommendations of the general dentists and the pediatric dentists. Again the pediatric dentists recommended more radiographs.

The fourth primary dentition case was a 4-year-old child with extensive caries (Fig 1-D). The recommendations are presented in Table 4. Both general dentists (37%) and pediatric dentists (47%) frequently recommended combinations of radiographs one including bite-wing radiographs, and anterior and posterior periapical films. Only, one other category was recommended by more than 15% of the dentists: a combination of bite-wing radiographs and a panoramic film that was recommended by 17% of the general dentists. Less than 8% of the pediatric dentists selected that combination. More than 86% of the pediatric dentists recommended some combination of radiographs that included anterior periapical films. Fifty-nine per cent of the general dentists recommended combinations which included anterior periapicals for the same case. Approximately 21% of the dentists recommended combinations of radiographs that were not included in the preselected categories. There was a statistically significant difference ($X^2 = 128.40, P < .001$) in the recommendations made by the two groups of dentists.
Discussion

Research indicates that even with a response rate as low as 43% for a once-mailed survey, the possibility of nonresponse bias is small (Horland et al. 1980). This report compares the overall responses of general dentists and pediatric dentists without regard for geographic location or age group. Geographic location and age distribution will be addressed in a subsequent manuscript.

Each of these cases involved a 4-year-old child with a primary dentition. The US Department of Health and Human Services Guidelines for Prescribing Dental Radiographs (USDHHS 1987) recommends a posterior bite-wing radiographic examination for new patients in the primary dentition only if the proximal surfaces of the primary teeth cannot be seen or probed. The recommendations are subject to clinical judgment which underscores the need to complete a clinical examination prior to prescribing radiographs.

Based on the USDHHS document, no radiographs should be exposed in the first case which depicted a spaced primary dentition without clinical signs and/or symptoms. Fifty-eight per cent of the general dentists and 49% of the pediatric dentists conformed to the guidelines for the spaced primary dentition and did not recommend radiographs. However, for this same case, 26% of the general dentists prescribed bite-wing radiographs. The pediatric dentists who recommended radiographs chose anterior periapical films with or without bite-wing radiographs. To summarize, 42% of the general dentists and over 50% of the pediatric dentists recommended radiographs for the spaced primary dentition case which, according to the USDHHS document, should not have required radiographs.

For the nonspaced primary dentition case (Fig 1-B), 42% of the general dentists and 24% of the pediatric dentists recommended bite-wing radiographs only, which corresponds to the guidelines (USDHHS 1987). Thirty-three per cent of the general dentists and 15% of the pediatric dentists did not recommend radiographs in spite of the proximal contacts. The most frequent recommendation of the pediatric dentists was for bite-wing radiographs and anterior periapicals. For this case, including a primary dentition with proximal contacts, approximately 58% of the general dentists and more than 74% of the pediatric dentists did not follow the suggested guidelines (USDHHS 1987), either by not prescribing radiographs (no bite-wing radiographs) or by prescribing excessive radiographs (anterior periapicals).

For case three, which had occlusal and anterior interproximal carious lesions, 22% of the general dentists prescribed bite-wing radiographs only. Based on the guidelines (USDHHS 1987), these dentists appear to have recommended an incomplete radiographic examination. The presence of anterior contacts and interproximal caries suggests the need for an anterior film. The potential for pulpal involvement of the primary second molars suggests the need for molar periapical radiographs, unless the bite wings clearly show the furcation and periapical areas.

The highest percentage of dentists in both groups recommended for case four a combination of radiographs including bite-wing radiographs, anterior periapical films and selected posterior periapical films.

Cases three and four (Fig 1 C-D) were more complex in terms of radiographic decisions because of the clinical evidence of carious lesions. Most of the dentists agreed on radiographs needed to be exposed, and the majority for both groups recommended combinations of films. In both of these cases, the pediatric dentists recommended combinations of films which included bite-wing radiographs, anterior periapical films, and selected posterior periapical films more frequently than did the general dentists. Eleven per cent of the general dentists and 16% of the pediatric dentists limited their recommendations to bite-wing radiographs and a panoramic film in case 3, 17% and 7%, respectively, in case 4. These recommendations may not provide adequate diagnostic information due to the potential pulp involvement by deep carious lesions. In order to make a complete and accurate diagnosis, maxillary anterior periapical and posterior periapical radiographs in all quadrants should be ordered.

Overall, for these four primary dentition cases, a limited number of panoramic radiographs was prescribed. This is in agreement with the guidelines (USDHHS 1987) which suggest that no radiographs be made until the first permanent tooth erupts, unless clinical conditions suggest the need for earlier radiographs. There were more panoramic radiographs recommended by both general dentists and pediatric dentists for cases three and four, which presented clinical evidence of caries, than for the first two cases. This finding suggests the inappropriate use of a panoramic radiograph because it is not an accurate film for caries diagnosis.

Conclusions

This study determined that there were significant differences between general dentists and pediatric dentists in the recommendations for radiographic examination of the primary dentition. The general dentists prescribed fewer radiographs and relied primarily on bite-wing radiographs for caries detection. The pediatric dentists recommended more radiographs and tended to recommend combinations that included anterior periapical films expected to assess developmental
anomalies such as supernumerary or missing teeth.

The Department of Health and Human Services guidelines (USDHHS 1987) indicate that in this age group caries detection is the primary purpose of the radiographic examination. Therefore, the pediatric dentists’ recommendations for radiographs in some instances go beyond the guidelines (USDHHS 1987) and may be premature. Identification of anomalies such as supernumerary teeth in young children may be informational, but in most cases the diagnosis does not lead to immediate treatment in the primary dentition. One of the risks is the temptation to evaluate the condition by exposing additional radiographs on a regular basis until treatment is appropriate. Dentists who treat very young children should not be expected to diagnose all dental developmental conditions which may ultimately develop. Waiting to expose radiographs to assess growth and development until the first permanent teeth erupt, as the guidelines (USDHHS 1987) suggest, minimizes the child’s exposure to ionizing radiation. Diagnostic radiographs then are more likely to be exposed at a time when treatment decisions are required.

This study was limited solely to the evaluation of radiographic recommendations. It was not in the context of this study to assess either diagnostic or treatment recommendations which may have been implied from the various radiographic examination recommendations.

The results of this study indicate that for the cases selected for this study neither general dentists nor pediatric dentists regularly prescribed radiographs that conformed to the 1987 USDHHS guidelines. This finding suggests that there is a need for education of dental practitioners relative to appropriate radiographic examinations for primary dentition age children.

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Errata

Due to an oversight, the December, 1989 cover photograph was not attributed to photographer Jim Ziv of Chicago, Illinois. Pediatric Dentistry regrets this omission.