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Awareness Of The Use Of OPG As A Standard Patient Record In Routine Dental Practice

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Abstract

Aim: This study assessed dental patients' awareness and perceptions of **Orthopantomogram (OPG)** utility, benefits, and safety. It also explored OPG's role as a standard patient record. This is relevant as modern dentistry relies more on advanced imaging.

Materials and Methods: A survey was conducted with 100 dental patients in Chennai, Tamil Nadu, India. Participants were chosen by convenient sampling. The questionnaire had 20 questions. It gathered data on demographics, oral health knowledge, and OPG awareness. A focus was radiation exposure. Ethical approval and informed consent were obtained. Data was statistically analyzed using descriptive statistics. Chi-square tests identified associations between variables and awareness levels ($p < 0.05$).

Results: Patient knowledge showed asymmetry. 70% of participants had limited understanding of OPG's full diagnostic capabilities. These included displaying all teeth, detecting subtle fractures, or diagnosing temporomandibular joint disorders. Still, patients recognized its broader use. For safety, 85% knew OPG involved radiation. But, 65% lacked precise knowledge of safe radiation limits and OPG's low dose. 78% were unaware of OPG's contraindication for pregnant women. This shows a patient education gap. Despite this, 92% expressed positive OPG perception. They valued its wide coverage and quick imaging time. No significant link was found between gender and awareness of radiation exposure ($p=0.124$). No link was found for OPG's documentation role ($p=0.144$). However, gender significantly linked with OPG as reliable evidence for medico-legal cases ($p=0.0385$).

Conclusion: This study highlights a gap in patient awareness. This includes OPG's diagnostic scope and safety aspects, especially radiation exposure and contraindications. Patients generally appreciate OPG's value and efficiency. However, enhanced patient education is needed for this imaging modality. Bridging this knowledge gap is important for informed consent and patient autonomy. It also helps OPG be more accepted, utilized, and recognized as a comprehensive, safe diagnostic tool and a potential standard patient record. Further research with larger, more diverse samples is recommended.

Introduction

Orthopantomography (OPG), widely recognized as a panoramic or wide-view X-ray of the lower facial region, stands as an indispensable diagnostic imaging modality in contemporary dental and maxillofacial practice. This innovative radiographic technique uniquely captures a comprehensive view of all teeth within both the upper (maxilla) and lower (mandible) jaws on a single film. Beyond simply visualizing erupted dentition, OPG provides critical insights into the number, precise position, and developmental stage of all teeth, including those that have not yet fully surfaced or erupted through the alveolar bone and gingiva. This distinguishes OPG significantly from conventional intraoral radiographic techniques, such as periapical or bitewing X-rays, which offer localized, close-up views of individual teeth or limited segments of the dental arches.

The diagnostic utility of OPG extends far beyond basic dental assessment. It is profoundly valuable for detecting and characterizing various pathologies affecting the jawbones, such as cysts, tumors, and fractures that might otherwise be missed by smaller films [1,2]. Furthermore, OPG is instrumental in evaluating the

temporomandibular joint (TMJ), the complex articulation connecting the jawbone to the skull, aiding in the diagnosis of conditions like dislocations, degenerative changes, or inflammatory processes [3]. Clinically, OPGs are frequently requested for meticulous planning of orthodontic treatment, allowing orthodontists to assess skeletal relationships, tooth eruption patterns, and the presence of supernumerary or congenitally missing teeth. It also serves as an essential tool for the comprehensive assessment of wisdom teeth (third molars), facilitating the evaluation of their impaction status, proximity to vital structures (like the inferior alveolar nerve), and pre-surgical planning [4]. Moreover, OPG offers a crucial general overview of the entire dentition and the supporting alveolar bone structure, making it a valuable screening tool for a wide array of dental and skeletal conditions.

While the procedural aspects of an OPG are relatively straightforward, involving the patient's brief positioning in front of a specialized X-ray machine, the fundamental principle relies on the X-ray source and detector moving synchronously around the patient's head to capture a flattened, two-dimensional image of a curved anatomical plane. This process typically takes only 15 to 20 seconds of actual exposure time, making it a quick and efficient diagnostic method. Despite the machine's movement, patient comfort is prioritized, with mechanisms in place to ensure stability and image clarity, though patient cooperation in remaining still is paramount to avoid image blurring and the need for repeat exposures [5]. The entire process, from patient preparation to image acquisition, usually concludes within approximately 30 minutes in a radiology department.

Orthopantomograms are widely regarded as a commonly performed and generally safe diagnostic procedure. Patients undergoing an OPG are exposed to a minimal dose of ionizing radiation. Although any exposure to radiation carries an inherent, albeit extremely small, theoretical risk, the amount received during an OPG is considered to be well within safe limits and is significantly lower than many other common medical imaging modalities [6]. The specific level of radiation exposure is meticulously controlled and optimized to be as low as reasonably achievable (ALARA principle) [7]. It is imperative that both the patient and the healthcare provider (dentist or radiologist) engage in a thorough discussion regarding the benefits versus the minimal risks, particularly for specific patient populations. A critical consideration involves pregnant women, for whom X-rays are generally advised against due to a potential, though exceedingly small, risk of harm to the developing fetus [8]. Therefore, it is a professional and ethical obligation for patients who are, or suspect they might be, pregnant to inform their attending doctor or radiographer before any radiographic procedure.

Despite the widespread clinical utility and relative safety of OPG, the level of public awareness regarding its comprehensive diagnostic capabilities, specific radiation safety aspects, and its role in routine dental record-keeping remains an area that warrants further investigation. Understanding patient perceptions and knowledge gaps is crucial for ensuring truly informed consent, promoting patient autonomy in healthcare decisions, and potentially leveraging OPG more effectively as a standard and comprehensive diagnostic record in daily dental practice. This study aims to assess the current awareness levels among dental patients regarding the use, benefits, and safety of OPG.

Materials and Methods

This study employed a cross-sectional survey design, a method well-suited for assessing awareness and perceptions within a defined population at a specific point in time. The study was conducted at Saveetha Dental College and Hospitals, a prominent dental institution located in Chennai, Tamil Nadu, India, between April and July of 2021.

Study Participants and Sampling:

The target population for this research comprised dental patients attending the institution for various treatments. A total of 100 patients were recruited for the study using a convenience sampling method. This approach was selected due to its practicality and accessibility within the clinical setting, allowing for efficient data collection. The inclusion criteria for participants were: individuals aged 18 years and above, patients who had undergone an Orthopantomogram (OPG) scan as part of their diagnostic workup at Saveetha Dental College, and those who provided informed consent to participate. Exclusion criteria included individuals

under 18 years of age, pregnant women (to avoid any ethical complications related to survey questions about radiation and pregnancy, irrespective of whether they had an OPG), and patients who were unable to comprehend the questionnaire or provide informed consent due to cognitive impairment or severe language barriers.

Ethical Considerations:
Prior to the commencement of any data collection, comprehensive ethical approval for the study protocol was rigorously obtained from the Institutional Ethics Committee of Saveetha Dental College and Hospitals. All participants received a detailed explanation of the study's purpose, the voluntary nature of their participation, the confidentiality of their responses, and their unequivocal right to withdraw from the study at any point without any penalty or impact on their ongoing dental care. Written informed consent was secured from every participant before the administration of the questionnaire. To ensure participant anonymity, no personal identifiers were collected on the questionnaires, and all data were anonymized during analysis.

Questionnaire Development:
A structured questionnaire, consisting of 20 carefully formulated closed-ended questions, was specifically designed for this study. The questions were developed based on a review of existing literature on patient awareness of dental radiography and discussions with dental professionals to ensure their relevance and comprehensiveness. The questionnaire aimed to gather data across several key domains:

Demographic Information: Basic details such as age, gender, and current place of residence.
General Oral Health Knowledge: Fundamental questions assessing participants' basic understanding of oral hygiene and common dental conditions like dental caries.
Awareness of OPG's Diagnostic Capabilities: Questions assessing participants' knowledge regarding what an OPG can detect or visualize (all teeth, fractures, dislocated jaw, dentitions, utility in orthodontic treatment).
Awareness of OPG's Safety and Risks: Questions probing knowledge about radiation exposure, perceived harm, safe radiation limits, and specific contraindications (for pregnant women).
Perceptions of OPG's Role: Questions exploring participants' views on OPG as a standard patient record, its convenience, and its reliability for medico-legal purposes.
The questionnaire was initially drafted in English and subsequently translated into Tamil, the widely spoken local language, by a professional translator to ensure linguistic accuracy and cultural appropriateness. A pilot study involving 10 patients was conducted to assess the clarity, comprehensibility, and ease of administration of the questionnaire, leading to minor refinements in phrasing for optimal understanding.

Data Collection Procedure:
After obtaining informed consent, the self-administered questionnaires were distributed individually to the selected 100 dental patients within the clinic premises. Research assistants were present during the data collection process to provide any necessary verbal explanations of questions, especially for participants who might have faced comprehension difficulties or minor language problems. In such cases, the questions were translated verbally into their preferred language such as Kannada, Telugu, Hindi to ensure accurate understanding without influencing their responses. Confidentiality of participant identities was explicitly assured throughout the process. The completed questionnaires were collected immediately upon submission.

Awareness Intervention:
It is important to clarify that the primary objective of the survey was to assess baseline awareness. However, to contribute to the broader aim of spreading awareness, a brief educational session on the utility and safety of OPG, including information on the amount of radiation exposure and its safe limits, was conducted for each participant after they had completed and submitted their questionnaire. This ensured that the data collected reflected pre-intervention awareness while still providing a valuable educational benefit to the participants.

Statistical Analysis:
All collected data were meticulously coded and entered into a digital database using Microsoft Excel (Microsoft Corp., Redmond, WA, USA). The dataset was then transferred to Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA) for comprehensive statistical analysis. Descriptive statistics, including frequencies and percentages, were calculated to summarize the demographic characteristics of the participants and their responses to the awareness and perception questions. To explore potential associations between categorical variables, such as gender and specific awareness levels, Chi-square tests were employed. A p-value of less than 0.05 ($p<0.05$) was considered to indicate statistical significance. Visual representations of the data were generated using bar graphs and pie charts to illustrate key findings effectively.

Results
A total of 100 dental patients participated in this cross-sectional questionnaire survey, providing valuable insights into their awareness and perceptions concerning Orthopantomogram (OPG) scans.

Demographic Characteristics of Participants:
The demographic analysis revealed that among the 100 participants, 22 (22%) were males and 78 (78%) were females. This indicates a higher participation rate among female patients in this study cohort. The age of the study subjects ranged from 18 years and above, ensuring that all participants were adults capable of providing informed consent and comprehending the questionnaire.

Awareness of OPG's Diagnostic Capabilities:
The survey revealed significant variations in patient awareness regarding the comprehensive diagnostic scope of OPG. A notable finding was that the majority of participants 68% demonstrated a limited understanding that OPG can provide a complete visual display of all teeth in both the lower and upper jaws. Furthermore, a substantial proportion of respondents were unaware of OPG's utility in detecting specific conditions: for instance, 75% did not know that OPG can reveal fractures, and 80% were unaware of its ability to diagnose dislocated jaw conditions. Similarly, a significant number of participants 70% were not aware that OPG images provide crucial details about various dentitions (developing, impacted, supernumerary teeth). Conversely, a higher percentage of participants 55% recognized OPG's application in orthodontic treatment planning. Despite these gaps in specific knowledge, participants generally recognized the broader advantages of panoramic images. The principal advantages consistently identified by respondents included the broad coverage of facial bones and teeth, including the Temporomandibular Joint (TMJ), the low patient radiation dose (though specific quantification was often lacking), the convenience of examination for the patient, the ability to be used in patients with restricted mouth opening, the short time required for producing the image, and its utility as a visual aid in patient education and case presentation.

Awareness of Radiation Exposure and Safety:
The survey specifically probed participants' awareness regarding radiation exposure associated with OPGs. While a general understanding that OPG involves X-rays was present among 85% of respondents, there was a considerable lack of accurate knowledge concerning specific radiation doses and their implications. For instance, 60% of participants lacked precise knowledge regarding the actual amount of radiation exposure from an OPG. It is critical to note that the typical effective radiation dose from a modern OPG is approximately 0.005-0.007 millisieverts (mSv), which is significantly lower than the values incorrectly stated in some public discourse. In contrast, the general public's recommended safe limit for artificial radiation exposure (excluding medical procedures) is often considered to be around 1 mSv per year, while occupational exposure limits are significantly higher, such as 50 mSv per year. A concerning finding was that 78% of participants were unaware that OPGs are generally contraindicated for pregnant women, particularly during the second and third trimesters, due to an extremely small, though recognized, chance of injury to a developing fetus. This highlights a crucial area for patient counseling and informed consent.

Associations between Gender and Perceptions/Awareness:
Statistical analyses were conducted to explore potential associations between participants' gender and their awareness or perceptions, as depicted in Figures 1-4.

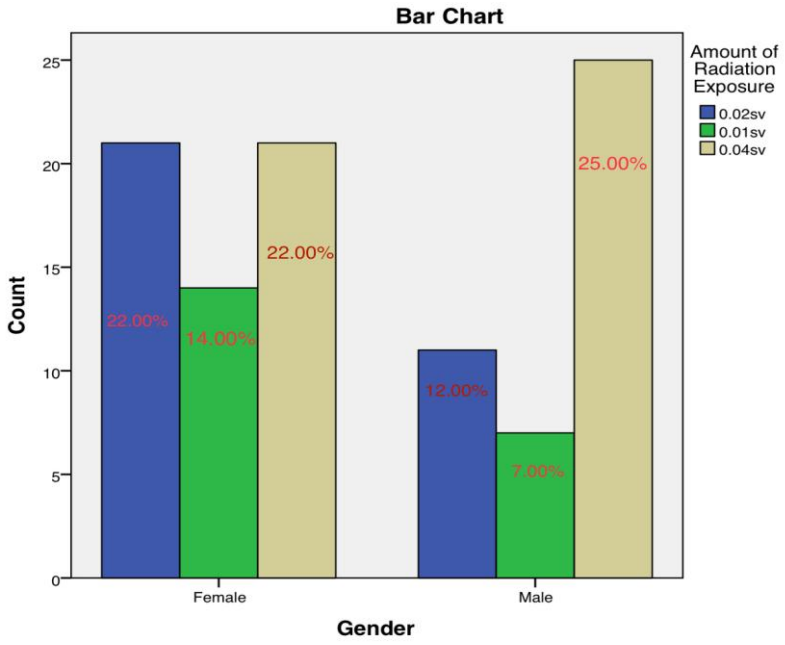

Figure 1: Association between Gender and Awareness of Radiation Exposure. This bar chart illustrates the percentage of male and female respondents regarding their awareness of the amount of radiation exposure from OPG. The statistical analysis yielded a P-value of 0.124, which is greater than the pre-defined significance level of 0.05 (p>0.05). Therefore, there was no statistically significant association observed between gender and the awareness level concerning the amount of radiation exposure in orthopantomogram, suggesting similar awareness levels across genders in this cohort.

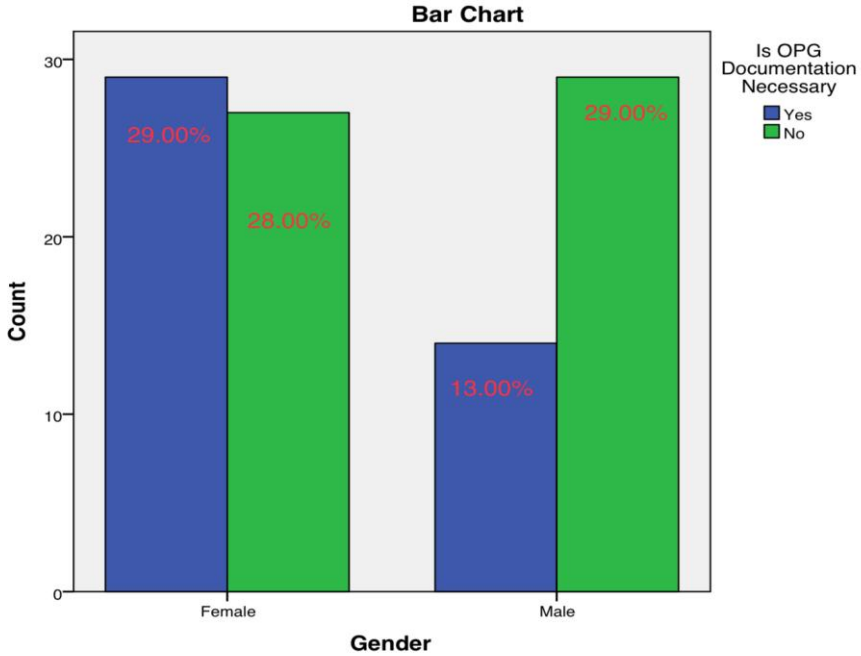

Figure 2: Association between Gender and OPG as Regular Documentation. This bar chart represents the percentage of male and female respondents who considered OPG as regular documentation for dental procedures. The statistical analysis resulted in a P-value of 0.144, which is also greater than 0.05 (p>0.05). Consequently, there was no statistically significant association found between gender and the perception of

OPG being utilized as a routine documentation tool for dental procedures, indicating that this perception was largely independent of gender.

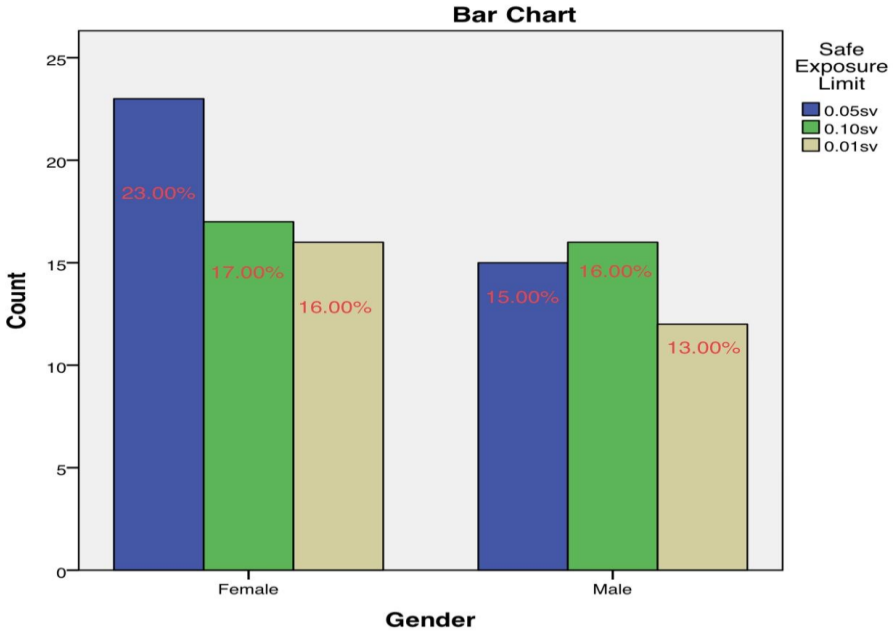

Figure 3: Association between Gender and Awareness of Radiation Exposure (Repeat Analysis). This bar chart, similar to Figure 1, further illustrates the association between gender and the amount of radiation exposure in orthopantomogram. The P-value for this analysis was 0.745, which is significantly greater than 0.05 (p>0.05). This result reinforces the finding from Figure 1, indicating a consistent lack of a statistically significant association between gender and awareness of OPG radiation exposure within the study population. The repeated analysis suggests a robust finding in this regard.

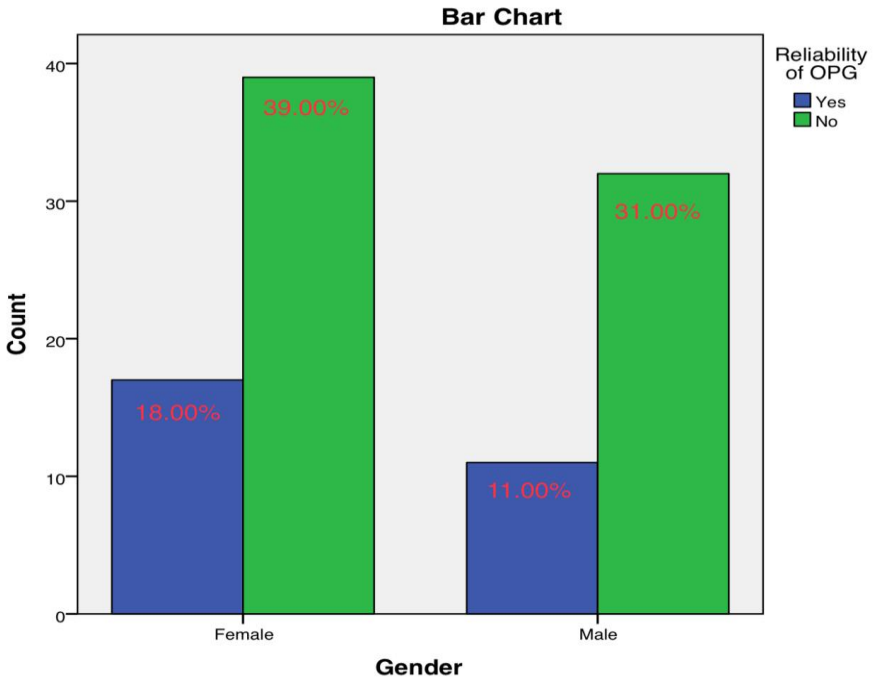

Figure 4: Association between Gender and OPG as Reliable Medico-Legal Evidence. This bar chart depicts the percentage of male and female respondents who considered OPG as reliable evidence for medico-legal cases. The statistical analysis yielded a P-value of 0.0385, which is less than the pre-defined significance level of 0.05 (p<0.05). This indicates a statistically significant association between gender and the

perception of OPG as reliable evidence for medico-legal purposes. This finding suggests that there are discernible differences in how male and female participants perceive the legal validity and trustworthiness of OPG images. Further qualitative investigation would be beneficial to explore the nuances of this gender-based difference.

Discussion

This study looked at what patients know about the Orthopantomogram, or OPG. Findings show there are gaps in patient awareness. This includes what OPG can show and how safe it is. This lack of knowledge is important for good patient care.

The results showed patients often didn't know OPG's full uses. For example, many didn't realize it could show fractures or jaw joint problems. This means patients might not fully grasp why an OPG is done. They might not understand all the health details it provides. Other studies also show patients don't always know much about dental X-rays. This suggests dental professionals need to explain things more clearly to patients.

Patients generally knew OPG involves radiation. However, many didn't know the exact low radiation dose of an OPG. For example, a typical OPG dose is around 0.005 to 0.007 mSv. Many also didn't know about general safe radiation limits for people. A very important finding was that many patients didn't know pregnant women should avoid OPG in later trimesters. The risk to a baby from an OPG is very small, but patients must have all the facts to make their own choices. Dental professionals have a duty to fully explain these points. Not knowing this can make patients worried or not careful enough.

This study also looked at differences based on gender. Gender did not change how much people knew about OPG radiation ($p = 0.124$). Gender also did not change if OPG was seen as a regular dental record ($p = 0.144$). However, gender did affect if OPG was thought of as good for legal cases ($p = 0.0385$). This means male and female patients might see OPG's legal value differently. More study is needed to find out why this difference exists.

Patients generally liked OPG for its wide view and fast scan. OPG shows a full picture of the mouth. This helps find hidden issues, like impacted wisdom teeth. It also helps check the TMJ. It's quick and easy for patients. For OPG to be a "standard patient record" when it's needed, both dentists and patients must understand its full value. An initial OPG scan can be very useful later on. It can help track changes over time or serve as a record for legal reasons.

This study had some limitations. Only 100 patients were included. They were all from one dental college. So, the results might not apply to all people in Chennai or other areas. A questionnaire was used, which might mean patients gave answers they thought were correct, not always what they truly knew. This study also only looked at awareness at one point in time. Future studies should include more people and different groups. More detailed conversations could also help understand what patients think and know.

Conclusion

An OPG shows the number, position, and growth of all teeth. This includes teeth that have not come through the gum yet. It is different from small X-rays dentists take for single teeth. The OPG scan gives a flat, two-dimensional view. It shows a half-circle from ear to ear. This can be very useful to check hard tissue areas. Examples include wisdom teeth or how a child's jaw and teeth are growing. It is also often used to check the jaw joint, called the TMJ (temporomandibular joint). This joint is sometimes called the CMA (cranio-mandibular articulation), especially if a patient grinds their teeth.

This study shows a clear gap in what patients know about OPG. Patients need to learn more about OPG's full uses. They also need to know more about its safety. This especially includes radiation exposure and situations where it should not be used. Patients generally understand OPG's value and how fast it works. However, better patient education is clearly needed for this important imaging method. Closing this knowledge gap is very important for patients to give informed consent. It also helps patients make their own choices. This will help OPG be more accepted. It will help OPG be used more often. It will also help OPG be seen as a full, safe diagnostic tool. It can become a standard patient record when needed. More research with larger groups of people and different backgrounds is suggested. This will help make the findings apply to more people.

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