



RESEARCH ARTICLE

ENHANCING RADIOGRAPHIC PRACTICES IN SPECIAL CARE DENTISTRY: NAVIGATING MEDICAL COMPLEXITIES

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ARTICLE INFO

Article History:

Received 20th October, 2024
Received in revised form
17th November, 2024
Accepted 24th December, 2024
Published online 31st January, 2025

Key Words:

Dental radiography,
Special care needs,
IOPA, OPG, CBCT.

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ABSTRACT

This review emphasizes customizing dental radiographic practices for individuals with special needs, using techniques like IOPA, Panoramic imaging, and CBCT. Case reports demonstrate successful alternatives, highlighting the importance of patient cooperation. The tell-show-do method, particularly in panoramic imaging, improves patient confidence. Overall, the conclusion stresses inclusive dental practices and ongoing research for comprehensive care. This review advocates for tailoring radiographic approaches for special-needs patients, showcasing techniques like IOPA and Panoramic imaging. Case reports underscore successful alternatives and the importance of patient cooperation. In conclusion, it emphasizes inclusivity in dental practices and ongoing research for comprehensive care refinement.

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Citation: Praveen Kumar, Dr. Deivanayagi, Dr. Narmadha Chandran and Dr. Elamparithi. 2024. "Enhancing Radiographic practices in special care dentistry: Navigating Medical complexities". *International Journal of Current Research*, 17, (01), 31626-31629.

INTRODUCTION

Patients with special needs are those individuals who have physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairments¹. Adjusting radiographic methods for special needs individuals in dentistry is vital. It involves minimizing radiation exposure while customizing the approach according to specific indications for each patient^{2,3}. Maintaining oral health proves challenging for individuals with special needs due to factors such as low socioeconomic status, limited education, lack of health/dental insurance, heightened anxiety, and physical obstacles, such as uncertainty about access to dental facilities for those using wheelchairs. A comprehensive dental appointment includes a crucial diagnostic radiographic exam. Nevertheless, obtaining radiographs for patients with special needs can pose certain difficulties. Among this vast population, a significant proportion comprises elderly individuals. The global aging trend is anticipated to result in millions of people with systemic medical conditions that impact oral health and dental care.

Managing the dental needs of these medically compromised patients can be challenging, involving issues related to oral complications, dental procedures, and emergency care. Managing the dental care of medically compromised patients involves obtaining a thorough health history, which should be gathered through both a written questionnaire and a verbal account from the patient. Dentistry should be an inclusive practice, and with proper planning, it can effectively cater to a diverse range of patients. Special-needs individuals demand a more thorough dental treatment strategy to ensure optimal oral health. This diverse group includes adult gaggers, wheelchair-bound individuals, pediatric patients, and those with cognitive impairments. These unique circumstances present challenges, especially when it comes to fundamental procedures such as taking radiographs, diagnosing issues, and devising treatment plans. This review aims to outline the existing complications and management strategies associated with oral radiology diagnostic challenges in individuals who are medically compromised or have special care needs.

Radiographic techniques for special care need patient:

Intraoral periapical radiography: The paralleling technique offers a superior diagnostic image when exposing periapical dental radiographs, utilizing various techniques, images, and equipment. Utilizing an external aiming device, which includes a rod, ring, and bite block, is employed to secure the image receptor for targeted exposures. However, the challenge lies in its bulkiness and difficulty in placement, particularly for some individuals. The bisecting angle technique utilizes a universal sensor holder tailored for capturing both anterior and posterior periapical radiographs. This technique proves beneficial for patients with limited oral cavity space and anatomical constraints. Additionally, it can be applied to individuals with special needs, especially those facing challenges in biting and exhibiting a hypersensitive gag reflex. Suyalan et al in 2022 studied described two case reports in which intraoral radiographic techniques were demonstrated for a bedridden patient. An 80-year-old bedridden individual, was referred for comprehensive tooth radiographs and proper treatment planning. Due to limited mouth opening, the paralleling radiographic technique was impractical. Instead, a bisecting-angle technique was employed using a Snap-A-Ray Xtra phosphor plate holder, intraoral phosphor plates, and a VistaScan Mini Plus imaging plate scanner for periapical radiographs of all remaining teeth.

OCCCLUSAL RADIOGRAPH: The occlusal technique in radiography enables dental providers to examine larger-scale anatomical areas in both the maxilla and mandible. This method involves exposing a single image for either the maxilla or mandible and allows for modifications using an image receptor holder. This approach is particularly beneficial for patients with special needs, enhancing their tolerance during the radiographic examination. There are two types of occlusal projections that can be utilized: cross-sectional and topographical. Patients with restricted mouth opening or a sensitive gag reflex can benefit from the occlusal technique in radiography. Its simplicity makes it a viable alternative to periapical images, and it might be the preferred radiographic method for individuals with special needs^{7,8}.

Because of difficulties in positioning the patient for panoramic radiography, only occlusal topographic radiography was conducted. The mobile hospital bed's head support was inclined approximately 45°. Using a size-4 imaging plate positioned with the exposure side toward the maxilla and a vertical angulation of around 65°.

PANORAMIC IMAGING TECHNIQUES: Panoramic radiography for special care patients employs a tell-show-do method. Patients are informed that they will undergo dental X-ray is used to visualize all of their teeth and jaws. They are then visually presented with the movements of the X-ray machine, demonstrating its up, down, & rotational motions through test cycle. The proper patient positioning the machine may exemplified using the accompanied parents or caregiver, who stands with a straight neck and lays their chin on the chin rest^{11,12}.

Orthopantomogram: The SBT (inhale, exhale, swallow, close your lips, and remain extremely still.) instruction is clinical advancement designed to offer a straightforward and efficient technique. This method can be applied universally by dental and radiography professionals when taking care of patients across various age groups & level of capability.

The primary goal is to enhance the diagnostic abilities using panoramic radiography, especially in the maxillary incisor region. The dentist or radiographer communicates the SBT instructions to the patient through a combination of verbal communication, through nonverbal communication cues, & body language. Subsequently, the dental radiologist provides a demonstration, guiding the patient on the slow inhalation through nose, exhalation, & swallowing with closed lip. Patient is then encouraged to practice these SBT instruction with dental professional before being placed in the panoramic X-ray machine - whether sitting, standing, or in wheelchair^{11,13}. During this process, the patient was prompted to bite on bite block while keeping lip closed. For those unable to bite block, an alternative positioning may involve using the anterior chin guide. If feasible, cotton roll introduced to separate teeth or fill the space of missing anterior teeth. The final adjustment involves positioning the head the light beam guides are aligned on the midline sagittal plane & the FH plane^{11,13}.

The instruction reiterated deliberately 5s after the exposure to ensure that the tongue is in touch with the palate when the X-ray exposure begins. A particular timing was established through experimentation with a Sirona Orthophos XG Plus DS/Ceph, which has total exposure time of 14.1 seconds. Adjustments to the timing might be necessary for other panoramic machines to guarantee the accurate positioning of the tongue at commencement of exposure of X-ray¹⁴. Therefore, the SBT serves as an efficient method of behavior modeling and aids in building confidence of patient, a crucial factor for successfully completing all of our radiographic examinations.

OBLIQUE LATERAL: In situations where certain patients are unable to maintain a standing position for the entire duration of an OPG (Orthopantomogram) procedure, oblique lateral radiographs are frequently employed as a suitable alternative^{16,17}. Individuals with medical and/or mental health challenges, and elderly patients may find traditional dental radiographic techniques challenging. In such cases, alternative approaches, such as oblique lateral radiographs, can be employed. In this method, either the patient or their caregiver hold a cassette with an analog film or a photostimulable phosphor storage plate against the side of the face. Simultaneously, the X-ray machine is directed at the opposite side at an angle of 90 degrees towards the radiographic aperture created between the posterior border of the ramus of the mandible and the cervical spine, with the patient's head rotated to the side being investigated. For optimal diagnosis of caries, the central X-ray beam is ideally directed along the occlusal plane. The utilization of a circular collimator allows for a comprehensive view of both maxillary and mandibular teeth.

Case report on management of autistic child with diagnostic challenge on extraoral radiographic technique mentioned in the literature. A 19-year-old male diagnosed with autism and congenital blindness, without a history of prior extractions and clinically lacking wisdom teeth, was referred for panoramic radiography to assess the presence or absence of impacted teeth. Due to concerns about the patient's behavior and the potential for movement during the 15-second exposure time of a panoramic radiograph, an alternative extraoral technique called "oblique lateral" was chosen. This technique significantly reduced the exposure time to 0.25 seconds. The patient's mother assisted in preventing movement during

exposure by holding his head and the cassette with lead apron protection. The oblique lateral radiographs revealed impacted mandibular third molars on both the right and left sides with incomplete root formation¹⁰.

Cone beam computed Tomography: Patient positioning errors are the major drawbacks in the diagnostic radiograph part of special care need patients. CBCT reconstruction algorithms currently lack the capability to factor in potential movement of patient, as there is no information regarding such movements recorded or incorporated into the reconstruction algorithms. Addressing this limitation necessitates the development of clearly stated procedures for detecting patient movement across all planes. In response to this need, we have proposed a unique three-dimensional technique for recording patient head movements, leveraging an AG tracking system^{19,20}.

CONCLUSION

In conclusion, the review underscores the critical importance of adapting radiographic practices to meet the unique needs of patients with special care requirements and those who are medically compromised. The challenges faced by these individuals in maintaining oral health necessitate a thoughtful and customized approach to radiography in dentistry. The discussed techniques, including Intraoral Periapical (IOPA), Occlusal radiography, Panoramic imaging, and Oblique Lateral radiographs, exemplify the diversity of methods available to cater to the varying circumstances of special-needs patients. The case examples provided throughout the review demonstrate the practical application of these techniques in real-life scenarios, showcasing successful alternatives to traditional approaches. From addressing limited oral space and hypersensitive gag reflexes to accommodating patients with physical or cognitive impairments, the various radiographic methods discussed serve as valuable tools for dental practitioners.

It is evident that an inclusive dental practice requires not only technical proficiency however, a deep comprehension of the individualized requirements and difficulties posed by special-needs patients. The tell-show-do method, as exemplified in Panoramic Imaging Techniques, stands out as an effective means of improving patient cooperation and confidence during radiographic procedures. As dentistry continues to advance, it is imperative for practitioners to remain committed to inclusivity and patient-centered care. Ongoing research and the exchange of best practices within the dental community will contribute to refining and expanding the repertoire of radiographic techniques tailored to the diverse range of patients with special care needs. Ultimately, this commitment ensures that every individual, regardless of their unique challenges, can receive comprehensive and effective dental care, promoting optimal oral health and overall well-being.

REFERENCES

- American Academy of Pediatric Dentistry. Council on Clinical Affairs. Guideline on management of dental patients with special health care needs. *Pediatr Dent* 2012;34:160-5.
- White SC, Scarfe WC, Schulze RK, Lurie AG, Douglass JM, Farman AG, et al. The image gently in dentistry campaign: promotion of responsible use of maxillofacial radiology in dentistry for children. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2014;118:257-61.
- Kuhnisch J, Anttonen V, Duggal MS, Spyridonos ML, Rajasekharan S, Sobczak M, et al. Best clinical practice guidance for prescribing dental radiographs in children and adolescents: An EAPD policy document. *Eur Arch Paediatr Dent* 2020;21:375-86.dentalcare.com/en-us/ce-courses/ce559.
- Vartanian, B. People with disabilities still face barriers accessing dental care. Available at: deltadental.foundation/blog/people-with-disabilities-still-face-barriers-accessing-dental-care. Accessed June 30, 2023.
- Espinoza K, Hayashi J, Shimada Y, Tagami J, Sadr A. Optical coherence tomography for patients with developmental disabilities: a preliminary study. *Sensors (Basel)*. 2021;21:7940.
- Tsvetanov T. *Dental Management of the Medically Compromised Patients*. LAP LAMBERT Academic Publishing; 2016.
- <https://www.dentistryiq.com/dental-hygiene/clinical-hygiene/article/16353192/erase-the-boundaries-for-dental-care-the-right-technology-makes-it-possible-to-treat-special-needs-patients>
- Williamson GF. Intraoral imaging: basic principles, techniques and error correction. Available at: dentalcare.com/en-us/ce-courses/ce559. Accessed June 30, 2023.
- Thompson EM, Johnson, ON. *Essentials of Dental Radiography for Dental Assistants and Hygienists*. 10th ed. New York: Pearson Education Inc; 2018;159:215-225.
- Suyalan S, Chaikantha S, Pornprasertsuk-Damrongsri S. Dental Radiography of Special Needs Patients: Report of Two Cases. *Journal of Indian Academy of Oral Medicine and Radiology*. 2022 Jan 1;34(1):112-5.
- Iannuci JM, Howerton LJ. *Dental Radiography, Principles and Techniques*. 5th ed. St. Louis: Elsevier/Saunders; 2017;175:228-284.
- Scott AM, Reed WM. Panoramic radiography and patients with disability: a new simple breathing technique to reduce common airspace error. 2022 Jun.
- Farhat-McHayleh N, Harfouche A, Souaid P. Techniques for managing behaviour in pediatric dentistry: comparative study of live modelling and tell-show-do based on children's heart rates during treatment. *J can Dent Assoc* 2009; 75: 283.
- Systems SD. Sirona Orthophos XG Plus DS/CephOperating Instructions Manual. 2002 [cited 202126.10.21]. 54-6].
- Peltier B. Psychological treatment of fearful and phobicspecial needs patients. *Special Care Dent* 2009;29:51-7.
- Pradhan A, Gryst M. The use of lateral oblique radiographs in dental treatment planning for patients with special needs. *J. Disabil. Oral. Health*. 2016 Dec 1;17:154-8.
- Greenwood G. Tips on radiology for those challenging moments. *British Dental Journal*. 2013 Feb 22;214(4):199.
- Aps JK, Scott JM. Oblique lateral radiographs and bitewings; estimation of organ doses in head and neck region with Monte Carlo calculations. *Dentomaxillofacial Radiology*. 2014 Sep;43(6):20130419.

19. Spin-Neto R, Costa C, Salgado DM, Zambrana NR, Gotfredsen E, Wenzel A. Patient movement characteristics and the impact on CBCT image quality and interpretability. *Dentomaxillofac Radiol*. 2018 Jan;47(1):20170216.
20. Spin-Neto R, Matzen LH, Schropp L, Gotfredsen E, Wenzel A. Detection of patient movement during CBCT examination using video observation compared with an accelerometer-gyroscope tracking system. *Dentomaxillofac Radiol* 2017; 46: 20160289
