1
History of Dental Radiography

Objectives

Following successful completion of this chapter, the student should be able to:

1. Define the key words.
2. State when x-rays were discovered and by whom.
3. Trace the history of radiography, noting the prominent contributors.
4. List two historical developments that made dental x-ray machines safer.
5. Explain how rectangular PIDs reduce patient radiation exposure.
6. Identify the two techniques used to expose dental radiographs.
7. List five uses of dental radiographs.
8. Become aware of other imaging modalities available for use in the detection and evaluation of oral conditions.

Key Words

Bisecting technique

Computed tomography (CT)

Cone

Cone beam computed tomography (CBCT)

Cone beam volumetric imaging (CBVI)

Digital imaging

Dosage

Oral radiography

Panoramic radiography

Paralleling technique

Position indicating device (PID)

Radiograph

Radiography

Radiology

Roentgen ray

Roentgenograph

Sensor

Tomography

X-ray

X-ray film

Chapter Outline

I. Introduction

II. Discovery of the x-ray

- A. Wilhelm Conrad Roentgen discovered the x-ray (roentgen ray)
- B. November 8, 1895
- C. Discovery called the “x” ray

III. Important scientists and researchers

- A. Dr. Otto Walkhoff
  1. Developed prototype of first dental radiograph in 1896
  2. Performed 25-minute exposure on himself
- B. First dental radiograph made—possibly three individuals—1896
  1. Dr. William Herbert Rollins
     a. First advocate for radiation protection procedures
     b. Wrote paper warning of dangers of x-radiation in 1901
  2. Dr. William James Morton
  3. Dr. C. Edmund Kells
- C. William David Coolidge; introduced first hot cathode tube—the output could be predetermined and accurately controlled—1913

D. Howard Riley Raper
    1. Wrote first dental radiology textbook in 1913
    2. Introduced bitewing radiographs in 1925

IV. Dental x-ray machines
    A. William David Coolidge and GE introduced first shockproof dental x-ray machine in 1919
    B. Original PID was pointed cone that was later found to cause scatter radiation
    C. Best PID is lead-lined rectangular collimation
    D. Panoramic radiography introduced in 1960
    E. Digital imaging continues to enhance patient treatment
    F. Tomography used for medical CT scans being adapted for dental use
        1. CBCT (cone beam computed tomography)
        2. CBVI (cone beam volumetric imaging)

V. Dental x-ray film
    A. Eastman Kodak Company produced first hand-wrapped intraoral dental x-ray film packet in 1913
    B. Eastman Kodak Company produced the first machine-wrapped intraoral dental x-ray film packet in 1919

VI. Digital image receptors
    A. Francis Mouyen introduced digital radiography called RadioVisioGraphy in 1987
    B. Film is replaced with a sensor

VII. Dental x-ray technique
    A. Dr. Weston A. Price suggested basics of both techniques in 1904
    B. Bisecting technique—earliest technique—A. Cieszynski introduced the Rules of Isometry in 1907
    C. Paralleling technique—newest technique—Dr. Franklin McCormack introduced in 1920

D. G. M. Fitzgerald designed a “long cone” to be used with the paralleling technique in 1947

VIII. Advances in dental radiographic imaging

A. Digital radiography has the potential to enhance 2- and 3-dimensional imaging that better represents real-life conditions

B. Future technological advances will assist in improving diagnosis and enhancing radiation safety

Learning Activities for Students

1. Following the in-class lecture, cut several sheets of paper in half the long way. Write the name of one of the noteworthy scientists and researchers in dental radiography on a sheet of paper. Next, write the historical accomplishments on additional slips of paper. Hand out the slips of paper to the students and have them find the match. Additional slips of paper may include the dates that go with the accomplishments. Direct the students to match these as well.
2. Assign two or three uses of dental radiographs to each student and have him or her write out a scenario where this use would be of value. For example:

   To detect missing and extra teeth
   Scenario: Brandon is seen at our dental office for his routine exam. He is 14 years old and appears to have almost all of his permanent teeth. A clinical examination reveals that the only primary tooth Brandon has left is the right primary mandibular second molar. This primary molar does not appear to be loose and is in a position sunken down below the teeth on either side of it. It is suspected that Brandon may be missing the right permanent mandibular second premolar. A radiograph would aid in determining if the right permanent mandibular second premolar is congenitally missing.
3. Assign students to small groups. Give each group a name of one of the scientists/researchers of early radiographic discoveries and direct the groups to write a one-page summary of the scientist’s contributions to

how we use radiography in the treatment of oral diseases today. Students may use the Internet, but must reference their data to determine accuracy. Give each group five to seven minutes to present its research to the class.

Discussion Questions

1. Why study the contributions of the early scientists and researchers in the field of radiography?
2. What dangers did early researchers face when experimenting with x-radiation?
3. What would oral health care be like today if dental radiographs were not invented?
4. Why was the paralleling technique an important discovery?
5. Based on the historical perspective presented in this chapter, what are some predictions for the future of dental radiography?

Teaching Tips

1. Provide students with a strong rationale for learning radiology history. Explain and relate why a look back at the early discoveries and uses of radiation can assist with improving oral health care today and in the future.
2. Visit Web sites, especially those of university-based radiological sciences, e.g.
   www.physics.isu.edu/radinf/hist.htm
   www.lixi.com/xray_history.htm
   to obtain additional information regarding the early discoveries and developments in the areas of equipment, techniques, and safety protocols used today. Add interesting details to supplement the historical perspective presented in this chapter. Interesting, amusing (the use of radiation in carnivals), and tragic (the eventual suicide of C. E. Kells) help the student to remember and understand the impact of these early pioneers.

3. Help students link the historical significance of Roentgen's discovering the glowing phosphors of his photographic plates during the experiments he was conducting with the cathode ray. Place your hand over a piece of phosphor-coated intensifying screen while presenting during the lecture period. After several minutes (time will depend on the intensity of the overhead room lighting and the stability of your hand), or toward the end of the session, turn off the overhead room lights. An outline of your hand should be clearly recorded on the screen.