

X – RAY DEPARTMENT

Lecture 1

د. سناء القصاب

INTRODUCTION TO X- RAY

The dental radiographer cannot appreciate the x-ray technology of today without looking back to the discovery and history of x-radiation. A thorough knowledge of x-radiation begins with its discovery, a review of the pioneers in dental x-radiation, and the history of dental x-ray equipment, film, and radiographic techniques. In addition, before the dental radiographer can begin to understand x-radiation and its role in dentistry, an introduction to basic dental radiography terms and a discussion of the importance of dental radiographs are necessary. The purpose of this lecture is to introduce basic dental radiography terms, to detail the importance of dental radiographs, and to review the history of x-radiation.

DENTISTRY AND X-RADIATION

Basic Terminology

Prior to detailing the importance of dental radiographs and the discovery and history of x-rays, an understanding of a number of basic terms pertaining to dentistry and x-radiation is necessary.

Radiation: A form of energy carried by waves or a stream of particles.

X-radiation: A high-energy radiation produced by the collision of a beam of electrons with a metal target in an x-ray tube.

X-ray: A beam of energy that has the power to penetrate substances and record image shadows on photographic film.

Radiology: The science or study of radiation as used in medicine; a branch of medical science that deals with the use of x-rays, radioactive substances, and other forms of radiant energy in the diagnosis and treatment of disease.

Radiograph: A picture (visible photographic record) on film produced by the passage of x-rays through an object or body. In practice, often called an x-ray; this is not correct. X-ray is a term that refers to a beam of energy.

Dental radiograph: A photographic image produced on film by the passage of x-rays through teeth and related structures.

Radiography: The art and science of making radiographs by the exposure of film to x-rays.

Dental radiography: The making of radiographs of the teeth and adjacent structures by the exposure of film to x-rays.

Dental radiographer: Any person who positions, "7 exposes, and processes dental x-ray film.

HISTORY OF DENTAL X –RAY EQUIPMENT

In 1913, William D. Coolidge, an electrical engineer developed the first hot cathode x –ray tube, a high vacuum tube that contained a tungsten filament. Coolidge's x –ray tube became the prototype for all modern x – ray tubes and revolutionized the generation of x – ray.

In 1923, a miniature version of the x – ray machine and in placed inside the head of an x –ray machine and immersed in oil; this served as the precursor for all modern dental x –ray machines and was manufactured by the Victor x – ray corporation of Chicago. Later in 1933, a new machine with improved features was introduced by General Electric. From that time on, the dental x –ray machine changed very little until a variable kilo voltage machine was introduced in 1957, Later, in 1966,a recessed long beam tube head was introduced.

INTRODUCTION TO DENTAL X – RAY MACHINES

The dental radiographer must be familiar with dental x-ray equipment and dental x-ray film holders and deuces. The purpose of this lecture is to introduce the dental radiographer to a variety of intraoral and

extraoral dental x-ray machines, to detail the component parts of such machines, and to describe the more common dental x-ray film holders and devices.

DENTAL X-RAY MACHINES

A variety of intraoral and extraoral dental x-ray machines are available for diagnostic purposes. Dental x-ray equipment varies in both design and operation.

The dental radiographer must have a clear understanding of the operating procedures for the specific equipment that is used in the dental office, otherwise, improper exposure of patients and dental personnel may occur.

Performance Standards

Before 1974, no federal standards existed for the manufacture of dental x-ray machines. All dental x-ray machines manufactured after 1974 must meet specific federal guidelines regulating diagnostic equipment performance standards. The federal government regulates the manufacture and installation of dental x-ray equipment. State and local governments regulate how dental x-ray equipment is used and dictate codes that pertain to the use of x-radiation. Depending on state and local radiation safety codes, dental equipment must be inspected and monitored periodically. A fee is typically charged for such an inspection.

Types of Machines

Dental x-ray machines may be used to expose intraoral films (films placed *inside* the mouth) or extraoral films (films placed *outside* the mouth). Some machines are used only for intraoral films, whereas others are limited to extraoral films. A variety of dental x-ray machines are available from a number of different manufacturers. Examples of dental x-ray units used for intraoral films. Examples of dental x-ray units used for extraoral films.

Component Parts

The typical intraoral dental x-ray machine features three component parts: the tubehead, the extension arm, and the control panel.

TUBEHEAD

The **tubehead**, or tube housing, contains the x-ray tube that produces dental x-rays. Extending from the tubehead opening is the position-indicating device, or PID. The PID, sometimes referred to as the cone, may be circular or rectangular in shape and restricts the size of the x-ray beam.

EXTENSION ARM

The extension arm suspends the x-ray tubehead, houses the electrical wires, and allows for movement and positioning of the tubehead.

CONTROL PANEL

The **control panel** allows the dental radiographer to regulate the x-ray beam. The control panel is plugged into an electrical outlet and appears as a console or cabinet. A control panel may be mounted on a floor pedestal, a wall support, or a remote wall location outside the dental operator. A single control panel may be used to operate more than one x-ray unit located in adjacent rooms. The control panel consists of (1) an on-off switch and indicator light, (2) an exposure button and indicator light, and (3) control devices (time, kilovoltage peak, and milliamperage selectors)

ON-OFF SWITCH

The **on-off switch** must be placed in the "on" position to operate the dental x-ray equipment. An **indicator light** is illuminated when the equipment is turned on.

EXPOSURE BUTTON

The exposure button activates the machine to produce x-rays. The dental radiographer must firmly depress the exposure button until the preset exposure time is completed. As a visible sign that x-rays are being produced, an exposure light on the control panel is illuminated during x-ray exposure. In addition, a beep sounds during x-ray exposure as an audible signal that x-rays are being produced. The exposure light turns off and the beep stops when the x-ray exposure is completed.

CONTROL DEVICES

The **control devices** that regulate the x-ray beam include the timer and the kilovoltage peak and milliamperage selectors. The timer determines the length of exposure time in seconds or impulses. The kilovoltage peak and milliamperage selectors permit the dental radiographer to adjust and set the correct kilovoltage peak and milliamperage. Some dental x-ray units do

DENTAL X-RAY FILM HOLDERS AND BEAM ALIGNMENT DEVICES

A **film holder** is a device used to hold and align intraoral dental x-ray films in the mouth. Film holders eliminate the need for the patient to stabilize the film. With certain intraoral techniques (e.g., paralleling technique), the use of a film-holding device is required.

A beam alignment device is an instrument used to help the dental radiographer position the PID in relation to the tooth and film. For use in conjunction with a beam alignment device, a collimating device, or metal plate with an opening, can be used to restrict the size of the beam.

Intraoral film holders are commercially available from a number of manufacturers. The simplest film holder is a disposable styrofoam bite-block with a backing plate and a slot for film retention; examples include the XCP Bite-Block or Stable Bite-Block manufactured by the Rinn Corporation. Sturdy molded plastic devices that can be sterilized are also available. An example of such a device is the EEZEE-Grip, formerly the Snap-A-Ray, also manufactured by the Rinn Corporation. The EEZEE-Grip is a double ended instrument that holds the film between two serrated plastic grips that can be locked in place.