Review

History of X-Rays in Dentistry

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Abstract

The discovery of x-rays can be perceived as the culmination of work of many years, beginning as early as 1821. Roentgen started his work on x-rays during the summer of 1894, when he repeated all of Lenard’s published work (on cathode rays and inverse square law), familiarizing himself with the equipment. Following several experiments, Roentgen discovered x-rays on November 8, 1895. Roentgen’s discovery opened up an exciting field for doctors. It was now possible to use this new form of radiation in the study of the human body. Broken bones, for example, could now be looked at by using the rays to see straight through flesh. The news of this amazing breakthrough caused a major stir in the medical and scientific communities.

Keywords:

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Roentgen and the x-rays

Following autumn of 1895 due to his obligations of the rectorship, Professor Wilhelm Conrad Roentgen could only devote his evening hours to the study of cathode rays. It was on a Friday evening that he darkened his laboratory to obscure the fluorescence produced by Hittorf-Crookes tube. He covered the tube with black cardboard and applied power to the electrodes with a Ruhmkoff induction coil. To his surprise he observed a faint glow on a table some distance from the tube. The source of glimmering was another fluorescent screen covered with barium platinocyanide. As a result of his experience with cathode rays, Roentgen realized that the distance between the Hittorf-Crookes tube and the glowing screen was well beyond the distance (6 to 8 cm) that cathode rays from the Lenard tube could be detected. He realized that he was observing a new form of energy. He determined that the new energy (x rays due to the unknown nature), in addition to traveling much farther in air than cathode rays, was able to penetrate dense materials to varying degrees. Combining the knowledge that certain materials would absorb the beam of x rays when placed in its path, Roentgen demonstrated that an image of dense object could be captured on the photographic plate. Roentgen proceeded to make the first radiograph of the human body; he placed his wife’s hand on a photographic plate and exposed it to the unknown ray for 15 minutes. On developing the plate, the outline of bones in her hand could be seen (Figure 1). On December 28,1895, just 40 days after the initial observation of x rays, Roentgen submitted a paper, “On A New Kind Of Rays, A Preliminary Communication,” to the Wurzburg Physical Medical Society for publication in its journal. It was published just 4 days later, apparently without any revision. He continued the examination of x rays and 3 months later, on March 9,1896, published his second paper, “On A New Kind Of Rays, Continued” in the same journal of the Wurzburg Society. Again, on March 10, almost a year after the second paper was published the third scientific report, “Further Observations on A New Kind of Ray”, was published in the journal of the Prussian Academy of Sciences in Berlin.

So complete and detailed were his studies and descriptions of the nature of x-rays that over the next 15 years only the facts that x rays could be polarized and defracted were to be added to the information these three reports provided. However these latter two facts demonstrated that x rays are in fact electromagnetic radiation. Roentgen was awarded many honors and distinctions: An honorory M.D. degree from the Maximilian University in Wurzburg, The Rhumford Gold Medal of the Royal
Society (British), The Iron Cross from Hindenburg. Wilhelm Conrad Roentgen was awarded the first Nobel Prize for Physics in 1901. 28 years after his discovery Roentgen died of cancer at the age of 78 years.\textsuperscript{1} Roentgen’s discovery was to open up an exciting field for doctors. It was now possible to use this new form of radiation in the study of the human body. Broken bones, for example, could now be looked at by using the rays to see straight through flesh. The news of this amazing breakthrough caused a major stir in the medical and scientific communities. The news had soon travelled around the world. Doctors soon picked up on the beneficial uses of the x-ray photography and were quick in using them to diagnose health complaints. In Germany, a museum was set-up in the name of it’s discoverer - Roentgen (Figure 2).\textsuperscript{1}

**Discovery of new radio-activities**

Shortly after the discovery of X-rays, another form of penetrating rays was discovered. In 1896, French scientist Henri Becquerel discovered natural radioactivity. Many scientists of the period were working with cathode rays, and other scientists were gathering evidence on the theory that the atom could be subdivided. Some of the new research showed that certain types of atoms disintegrate by themselves. It was Henri Becquerel who discovered this phenomenon while investigating the properties of fluorescent minerals. Becquerel was researching the principles of fluorescence, wherein certain minerals glow (fluoresce) when exposed to sunlight. He utilized photographic plates to record this fluorescence. Becquerel continued to test samples of uranium compounds and determined that the source of radiation was the element uranium. Becquerel’s discovery was, unlike that of the Xrays, virtually unnoticed by laymen and scientists alike. Relatively few scientists were interested in Becquerel’s findings. It was not until the discovery of radium by the Curies two years later that interest in radioactivity became widespread.\textsuperscript{2}

While working in France at the time of Becquerel’s discovery, Polish scientist Marie Curie became very interested in his work. She suspected that a uranium ore known as pitchblende contained other radioactive elements. Marie and her husband, the French scientist Pierre Curie, started looking for these other elements. In 1898, the Curies discovered another radioactive element in pitchblende, and named it *Polonium* in honour of Marie Curie’s native homeland. Later that year the Curies discovered another radioactive element which they named *Radium*, or shining element. Both polonium and radium were more radioactive than uranium. Since these discoveries, many other radioactive
elements have been discovered or produced.\textsuperscript{2,3}

\textbf{Roentgen and the dentistry}

Even dentists very quickly recognized the diagnostic advantage for their own special medical field. Especially in dental surgery, significant progress was achieved through the new possibilities of a radiological examination. 14 days later the publication of Roentgen, Dr. Otto Walkhoff in Braunschweig made the first picture of the teeth. Walkhoff received the first intraoral X-ray after an exposure time of some 25 minutes. In addition to the torture of the long exposure time one also had to accept other inconveniences such as the loss of hair, for instance.\textsuperscript{3}

Louis Richard Chauvin and Félix Allard introduced their own technic and the practical application X-rays. Frank Harrison in England; William James Morton Junior were the first users of the X-rays, in the United States. He published the first dental skiagrams in USA the first article in the Dental Cosmos of April 24, 1896. From this emergent point of the electrons, the X-rays spread out in every directions. In 1897, the Franch Professeur Béclère set up first laboratory of radiology in his department of the Tenon Hospital.\textsuperscript{4}

Dr. C. Edmund Kells, a dentist practicing in the deep South, became a pioneer in the profession of Dentistry and Medicine with his numerous inventions and publications. Kells was also one of the first dentists to hire a female dental assistant and the one of first to expose a dental radiograph in the United States (Figure 3).\textsuperscript{5}

Rollins developed a number of pioneering instruments for dentistry an improved on others already in existence. He invented a rheostat with hundreds of steps for the purpose of causing anesthesia by electricity, and made mention of a rheostat that he invented which was continuously variable, depending on the effect of light on the electrical conductivity of selenium. In the consecutive accidents with the use of X-rays, Dr. Rollins affirms that the deleterious agent relates primarily to the Roentgen radiations. X-rays entertainment sessions are daily given at that time in private living rooms in USA and in Europe.\textsuperscript{6}

\textbf{References}


**Figure 1:** First radiograph made by Roentgen

**Figure 2:** Roentgen Museum in Germany

**Figure 3:** Dr. Kells at his laboratory

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