

THE EARLY HISTORY OF RADIOTHERAPY

This report concerns the development of radiation therapy from 1896 till 1906, i.e. in the years immediately after the discovery of X-rays by Wilhelm Conrad Roentgen (1845-1923) in 1895, and the discovery of radium by Marie Curie-Sklodowska (1867-1934) and Pierre Curie (1859-1906) in 1898.

The Early Beginnings of Roentgen Therapy

The first steps in the use of Roentgen rays for therapy were done in the year after publication of the paper « Ueber eine neue Art von Strahlen » by W.C. Roentgen in 1895 (1,2).

Biological effects of X-rays were soon observed. O. Leppin describes in 1896 radiation injury of his hand (7). Leopold Freund (1868-1943) in 1896 used Roentgen rays for the epilation of a naevus pilosus with tragic results. A deep ulcer persisted after radiation (1,2). The first successful radiation treatment was achieved in 1897. Eduard Schiff (1849-1913) cured a patient with lupus erythematosus (Fig. 1) (8,9,10). In Sweden Tage A.U. Sjöegren (1859-1939), and Thor Stenbeck (1864-1914) successfully treated a skin tumor in 1899 (11,12,13).

Roentgen rays were soon used for treatment of different diseases.

The Early Beginnings of Radium Therapy

Another trend in the use of radiation for the treatment of the disease was the application of radium.

Antoine Henri Becquerel (1852-1908) observed the biological effects of radium. He had carried a glass tube containing radium salts in his vest pocket, and « radium burn » of the skin underlying the pocket resulted.

The French physician Henri A. Danlos (1814-1912) was the first to use radium for the treatment of patients at Hôpital Saint-Louis in Paris.

In 1903 Margaret A. Cleaves (1848-1917) in New York applied radium intracavitary for the treatment of carcinoma of the cervix.

Robert Abbé (1851-1928), a New York surgeon, in 1905 implanted radium directly into a tumor.

Louis F. Wickham (1861-1913), Paul Degrais (1784-) and Henri Dominci (1867-1926) established in 1906 the « Laboratoire biologique du radium » in Paris

which became the most important institution for radium therapy (14). In this institution excellent results in radium therapy were achieved (Fig. 2, 3, 4).

The successes of the radium and Roentgen therapy were overshadowed however from many failures, especially severe radiation burn. At that time there was no possibility to measure the radiation dosis applied in the treatment. Therefore three main problems had to be solved for the further development of the Roentgen and radium therapy : 1. measurement (dosimetry) of applied radiation, 2. use of filters in order to eliminate soft rays which are absorbed in the skin and cause severe reactions, and 3. construction of tubus in order to cone the rays.

The Early Beginnings of Dosimetry

The fundamental work in constructing and using the instruments needed for the measurement of the radiation dosis was done by Guido Holzkecht (1872-1931) of Vienna, Raymond J.A. Sabouraud (1864-1938), Henri Noiré (1878-1937) of Paris, and Robert Kienboeck (1871-1954). Guido Holzkecht in 1902 constructed the radio-chronometer or penetrometer (3, 4). He used the discoloration of irradiated alkaline salts as a measure of the amount of radiation.

R.J.A. Sabouraud and H. Noiré in 1904 used the radiometer which allowed to estimate the dose of radiation from the color change of pastilles of compressed barium platinocyanide placed on the patient's skin during the irradiation.

In 1906 R. Kienboeck constructed the quantimeter using strips of silver bromide paper exposed to the radiation on the skin of the patient (5,6). After irradiation the paper strips were processed and their darkening compared with a standard.

Improvements in Radiotherapy

On the turn of the century and in the first years of this century X-ray tubes and equipment were significantly improved. The use of filters, i.e. metallic plates placed between the X-ray tube and the skin of the patient, eliminated the soft rays which are absorbed in the skin and subcutaneous tissue causing severe skin « burns ».

In order to avoid dispersion of X-rays Heinrich E. Albers-Schoenberg (1865-1921) constructed tubus. The conization of X-rays allowed a more localized radiation of pathological lesions.

The radiation dosis measurements, the use of filters and conization of X-rays led to the better tolerance of radiation and to the more successful treatment of patients.

Summary

The early beginnings (from 1896 till 1906) of Röntgen and radium therapy and the achievements of pioneer radiotherapists are described. The role of the measurement of radiation (dosimetry), the use of filters and tubus for the better tolerance of radiation and more successful treatment are emphasized.

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