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ІСТОРІЯ РОЗВИТКУ РЕНТГЕНОЛОГІЇ
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HISTORY OF RENGENOLOGY DEVELOPMENT
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Бидучак Анжела, Грицюк Марьяна, Чорненькая Жанетта, Доманчук Татьяна. История развития рентгенологии. Рентгеновское излучение, невидимое излучение, способное проникать, хотя и в разной степени, во все вещества. Представляет собой электромагнитное излучение с длиной волны порядка 10-8 см. **Цель исследования.** Описать исторические этапы формирования рентгенологии, как науки. **Методология исследования.** В статье использованы описательный, библиосемантический и историко-сравнительный методы. **Выводы.** В целом, анализ значимости вклада ученых-медиков в развитие рентгенологии, как науки, позволяет заключить, что их научно-практическая деятельность и сейчас обеспечивает высокий уровень, и широкие перспективы в реализации своего практического и творческого потенциала в современной медицине.

***Ключевые слова:** история медицины, рентгенология, Х-лучи, рентгенодиагностика.*

Introduction. The end of the 19th century is known for the largest discovery of roentgenology, without which it is impossible to imagine modern medicine, it was born thanks to the discovery of penetrating radiation by the German physicist V.K. This industry, like no other, has made an invaluable contribution to the development of medical diagnostics.

Aim of investigation. Describe the historical stages of the formation of radiology as a science.

Research methodology. The article uses descriptive, bibliosemantic and historical comparative methods.

Setting the main material. The science of radiology got its name in honor of Wilhelm Conrad Rentgen, a professor at the University of Würzburg, who discovered X-rays on November 8, 1895. The discovery itself X-rays made unexpectedly: late in the evening, leaving the laboratory, the scientist turned off the light in the room and noticed a greenish glow, fluorescence in the dark emanating from the screen, covered with crystals of platinum-synergistic barium. As it turned out, the crystals reacted to the impact of an electrovacuum (crux) tube located nearby, which at that moment was under high voltage. When the current was turned off, the screen glow stopped, and when it was turned on again, it resumed. The tube was wrapped in black opaque paper, so X-rays suggested that when an electric current passes through it, it emits some invisible rays that can penetrate through opaque media and excite barium crystals. These unknown rays are called X-rays by X-rays[1].

After 50 days, the scientist submitted a 17-page manuscript containing a description of the rays discovered by him to the chairperson of the Würzburg Physical-Medical Society[2]. This day, December 28, 1895, went down in history as the official opening date of X-rays. Together with the manuscript, the scientist also presented the first radiograph, taken earlier, on December 22, on which the hand of his wife Bertha Roentgen was captured. After the woman saw the X-ray of her hand, she, without understanding the subtleties of physics, was so impressed that she exclaimed: "I saw my death"[3].

On the evening of January 23, Dr. Roentgen gave a lecture to the filled audience of the Würzburg Physical-Medical Society. After a discussion about the experiments, Roentgen invited the chairperson of the society Albert von Kölliker, a famous anatomist, to take a picture of his hand with the help of new X-rays. When the finished image was demonstrated to the audience, it broke out into deafening ovations. Dr. von Kölliker, impressed by the discovery, suggested that the new rays be called X-rays - the audience greeted his proposal with applause[4].

The discovery of X-rays caused a wide resonance among scientists from all over the world, including Russian scientists. At the beginning of January 1896 the X-ray brochure was published. Within a few weeks, it was translated into Russian, English, French and Italian, and by the end of January A.S. Popov produced the first X-ray machine in our country, with which Russian scientists repeated the X-ray experiment, making the first X-ray in Russia. The photograph of the photograph taken was posted in the Russian translation of the Roentgen brochure published in St. Petersburg under the name "New kind of rays" in the same month[5].

Wilhelm Roentgen continued to study his discovery, and by May 1897, he finally formulated all the basic properties of X-rays, having published two more articles that

[1] Lisitsyn Yu.P. "Istoriya meditsiny" [History of medicine], Moskva, GEOTAR−MED, 2004, 400p. [in Russian].
[2] Lindenbraten L. D., Korolyuk I. P. Meditsinskaya radiologiya i rentgenologiya [Medical radiology and roentgenology.], Moskva, 1993, 554 p. [in Russian].
[3] Mul'tanovskiy M. P. Istoriya meditsiny [History of Medicine], Studies. for students med. in-tov, Moskva, 1981, 348 p. [in Russian].
[4] Churilov L. P. Ocherki istorii meditsiny [Essays on the history of medicine], Moskva, SpecLit, 2015, 448 p. [in Russian].
[5] Rusanov K. V. "X-luchi v Ukraine: pervyje shagi" [The X-rays in Ukraine: the first steps], *Novosti meditsiny i farmatsii* [Medicine and Pharmacy News], 2007, N 21−22, P. 230−231 [in Russian].

are scientific[6]. The most valuable practical property of X-rays, which has found wide application in science and medicine, has been its ability to penetrate non-transparent bodies. In 1901, Wilhelm Roentgen was awarded for his discovery of the first Nobel Prize in physics. Subsequently, the science that studies the effect of X-rays on the body is called radiology[7].

The first x-ray, which captures the hand of the scientist's wife, Bertha Roentgen, and her wedding ring.

The year of birth of veterinary radiology can be considered 1896, when S. S. Lisovsky first used X-rays to show a dog. In 1899, M. A. Maltsev, in addition to scanning, also took pictures of the head, neck and limbs of a dog, the tarsus and put of a horse, as well as the pastern of the cow; for fixing animals during the study, the scientist used anesthesia[8]. Three years later, an X-ray unit was assembled in the laboratory of the Kharkov Veterinary Institute, which diagnosed bone fractures and sprains, determined foreign bodies, and carried out studies of the fruits of small domestic animals[9].

However, these studies were sporadic; they were conducted on primitive apparatuses assembled on their own. Only by 1924, production of X-ray machines was started in the workshops of the former USSR, and thanks to G. V. Domracheva and A.I. Vishnyakov from Kazan and Leningrad Veterinary Institutes This type of research has been widely used in veterinary medicine[10].

Subsequently, workshops for the production of X-ray machines turned into X-ray plants, which by 1931 began to produce devices suitable for studying not only small animals, but also large ones, due to which in 1932 the first x-ray rooms[11].

Radiograph of the hand of the anatomist Albert von Kölliker, made on January 23, 1896. V.K. An x-ray during his public lecture at a meeting of the Physico-Medical Society[12].

From that moment on, in the former USSR, intensive development of veterinary radiology began, many Soviet veterinary radiologists made a significant contribution to which[13]. Among the most significant discoveries are the following:

In 1931, A. I. Vishnyakov wrote the first book on the X-ray diagnosis of animal diseases, “Basics of Veterinary Radiology”.

In 1935 the book of prof. A. Century Sinev “Clinical diagnosis of internal diseases of domestic animals”.

In 1939, the book by A. Yu. Tarasevich, The Limps of Farm Animals, appeared.

In 1940, the volume textbook “Veterinary Radiology” by A. I. Vishnyakov was published, which describes the principles of X-ray physics, X-ray techniques, and also provides extensive and systematic X-ray diagnostic material for various animal diseases and X-ray therapy.

A. A. Weller published articles on the use of X-ray research in military conditions. Weller also studied the possibility of diagnosing diseases of the limbs, withers and intestines in horses.

G. G. Vokken has published a number of works on the age and comparative x-ray anatomy of animals, X-ray osteology, anthropology, and angiology[14].

Veterinary radiologists of Russia and the former USSR made a great contribution to veterinary science on issues such as determining mineral metabolism in farm animals and birds, diagnosis of respiratory diseases of large and small animals, diagnosis of diseases of the digestive organs, comparative x-ray anatomical studies in agricultural animals, determining the location and depth of foreign bodies.

In connection with the emergence now of even more sophisticated X-ray apparatuses, the possibility of studying animals has increased significantly. Digital radiography is actively developing, which, due to the multiple improvement in image quality, is gradually replacing classical, analog radiography .

In 1971, a prototype of an X-ray CT scanner was installed in London. The engineer Godfrey Hounsfield created it. Scientists, having overcome serious technical difficulties, in 1975 created an X-ray computed tomography scanner to study the whole body. For the creation of the computed tomography method, Godfrey Hounsfield and Alan Cormack in 1979 were awarded the Nobel Prize in Medicine.

The foundations of another tomographic technique - magnetic resonance imaging (MRI) – laid the work of two Nobel laureates – physicists F. Bloch and E. Parcell (1952), who discovered the effect of nuclear magnetic resonance (NMR).

Modern methods of x-ray studies are classified primarily by the type of hardware visualization of x-ray projection images. That is, the main types of X-ray diagnostics are differentiated by the fact that each is based on the use of one of several existing types of X-ray detectors: an X-ray film, a fluorescent screen, an electron-optical x-ray converter, a digital detector, etc.

The method of x-ray diffraction is the obtaining of fixed images of an object in the spectrum of x-ray radiation on a material sensitive to it (x-ray film, digital detector) by the principle of inverse negative. The advantage of the method is low radiation exposure, high image quality with clear detail.

The disadvantage of radiography is the inability to observe dynamic processes and a long processing period (in the case of film radiography). To study dynamic processes, there is a method of frame-by-frame image fixation - X-ray cinematography. Used to study the processes of digestion, swallowing, respiration, blood circulation dynamics: X-ray phase cardiography, X-ray pneumography.

The method of fluoroscopy is the acquisition of an x-ray image on a fluorescent (luminescent) screen according to the principle of direct negative. It allows you to study dynamic processes in real time, to optimize the position of the patient in relation to the x-ray beam during the study. Radioscopy allows you to evaluate both the structure of the organ and its functional

[6] Rozenshtraukh L. S. Rentgenodiagnostika zabolevaniy organov dykhaniya [Radiodiagnosis of respiratory diseases.], Moskva, 1987, 640 p. [in Russian].
[7] Uil'yam E. Osnovy diagnosticheskoy radiologii, 3-ye izdaniye [Fundamentals of diagnostic radiology, 3rd Edition], 2007, 1335 p. [in English].
[8] Lindenbraten L. D., Korolyuk I. P. Meditsinskaya radiologiya i rentgenologiya [Medical radiology and roentgenology.], Moskva, 1993, 554 p. [in Russian].
[9] Churilov, L. P. Ocherki istorii meditsiny [Essays on the history of medicine], op. cit.
[10] Verkhatskiy S. A. Istoriya meditsiny [History of Medicine], Kyjiv, 1983, 382 p. [in Ukrainian].
[11] Mul'tanovskiy M.P. Istoriya meditsiny [History of Medicine], op. cit.
[12] Rusanov K. V. “X−luchi v Ukraine: pervyye shagi” [The X−rays in Ukraine: the first steps], op. cit., P. 230-231.
[13] Zabludovskiy P.Ye. Puti razvitiya obshchestvennoy meditsiny [Ways of development of public medicine], Moskva, 1970, 82 p. [in Russian].
[14] Petrov B. D. Ocherki istorii otechestvennoy meditsiny [Essays on the history of domestic medicine], Moskva, 1962, 303 p. [in Russian].

state: contractility or extensibility, displacement, filling with contrast medium and its passage. The multi-projection method allows you to quickly and accurately identify the localization of existing changes.

A significant drawback of fluoroscopy is the large radiation load on the patient and the examining doctor, as well as the need for the procedure in a dark room.

Tele-roentgenoscopy is a study using the conversion of an X-ray image into a television signal using an electron-optical converter or amplifier. A positive x-ray image is displayed on a television monitor. The advantage of the technique is that it substantially eliminates the disadvantages of conventional fluofluoroscopy: the radiation load on the patient and staff is redureduced, image quality can be controlled (contrast, brightness, high resolution, the ability to increase the image), the procedure is carried out in a bright room.

The method of fluorography is based on photographing a full-sized shadow X-ray image from a fluorescence screen onto photographic film. Depending on the film format, analog fluorography is small, medium and large frame (100x100 mm). Used for mass preventive studies, mainly of the chest organs. In modern medicine, more informative large-frame fluorography or digital fluorography is used.

X-ray contrast diagnosis is based on the use of artificial contrast by introducing radiopaque substances into the body. The latter are divided into x-ray positive and x-ray negative. X-ray positive substances basically contain heavy metals - iodine or barium, therefore they absorb radiation more than soft tissues. X-ray negative substances are gases: oxygen, nitrous oxide, air. They absorb x-rays less than soft tissues, thereby creating a contrast to the organ under examination.

Artificial contrasting is used in gastroenterology, cardiology and angiology, pulmonology, in urology and gynecology, and in the study of bone structures.

Conclusion. The main advantages of X-ray examination are the availability of the method and its simplicity. Indeed, in the modern world there are many institutions where you can do an X-ray. This predominantly does not require any special training, cheapness and the availability of images, which can be consulted with several doctors in different institutions.

Бідучак А.С., Грицюк М.І., Чорненька Ж.А., Доманчук Т.І. Історія розвитку рентгенології. Історія рентгенології починається з того часу, як професор Вюрцбурзького університету Вільгельм Конрад Рентген 8 листопада 1895 року випадково для себе відкрив рентгенівське випромінювання. Відкриття рентгенівських променів викликало сенсацію в усьому світі. Сучасній людині дуже важко собі уявити все те, що говорилось стосовно відкриття рентгенівських променів на початку нашого століття. Рентгенівські трубки отримали широке розповсюдження та почали активно використовувати в багатьох країнах. Завдяки їм з'явилися нові напрями науки і техніки – рентгенологія, рентгенодіагностика, рентгенометрія та ін. **Мета дослідження.** Описати історичні етапи формування рентгенології, як науки. **Методологія дослідження.** У статті використано описовий, бібліосемантіческій та історико-порівняльний методи. **Висновки.** На сьогодні, практично немає такої галузі медицини, де б не використовувалися рентгенівські промені для виявлення різноманітних захворювань на різних стадіях. Без рентгенологічних досліджень неможлива сучасна діагностика деяких захворювань. Особливо це стосується злоякісних пухлин. Забій чи перелом, біль в голові, проблеми у внутрішньому вусі – в усьому цьому допоможе рентгенолог. Вдосконалення апаратури та застосовування комбінованої терапії дає можливість більш ефективно та правильно лікувати хворих людей в майбутньому.

Ключові слова: *історія медицини, рентгенологія, Х-промені, рентгенодіагностика.*

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