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History of Contemporary Medicine

Development of Radiology in Iran

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Abstract

Historically, stratification in medical profession has followed certain patterns pertinent to the nature of the work and the organ of interest. Evolution of radiology was, however, different insofar as it followed an accidental discovery toward the end of the 19th century. The physical properties of the discovered rays were to set the initial direction for future expansion of the discipline.

Keywords: Radiology ● Iran

The detrimental ionizing properties of the X-rays to be discovered later, were soon deployed to combat cancer and ultimately led to the establishment of another new discipline—radiotherapy—that was basically different from the initially observed image formation.

In the early days of radiology, the hidden image on the radiographic plate had to be first chemically developed. This was however, not only confined to the field of imaging but many other diagnostic procedures of that time such as electrocardiography used also the radiographic plate as the final technical output and thus, became somehow allied to the radiologist's expertise. This was also true for the field of "electrotherapy," a therapeutic modality which was widely used and included diathermy; the newly-evolved discipline was called electro-radiology in the francophone literature. Gradually, with the improvement of X-ray technology, image formation crystallized into the most salient and relevant signature of the specialty and any image forming procedure was considered the exclusive turf of radiology, albeit with many counterclaims.

The technical advancements of the West were recapitulated in most developing countries including Iran.

It is not documented when the first medical radiology apparatus was operational in Iran (then known as Persia to the rest of the world). We know that military medicine was very interested and played a pivotal role in dissemination of the medical use of X-rays. Ottoman Empire, the western neighbor and arch rival of Persia had made extensive use of X-rays in the Turco-Greek war of 1897, shortly after its discovery. In Persia, however, medical use of the newly- discovered rays presumably took place much later; There is mention of an electrical apparatus capable of displaying the interior of human body in the memoirs of Malijak the second, the Court's favorite attendant, dating to 1906. The instrument had been allegedly procured for him as a recreational object from Europe during the last lavish journey of the fourth monarch of Qajar dynasty.

One of the first pioneers in the construction of X-ray machine in Iran was Professor Mahmud Hessabi (1903 – 1992), a French-trained scientist and engineer with interest in X-ray physics. According to his memoirs, he tried to put together the first experimental machine in 1929 in the laboratory of the premises of the "Higher College for Teachers".

In this endeavor he received technical advice and assistance from his previous teachers at the University of Sorbonne and *Ecole Polytechnique* of Paris.

According to his allegation, Professor Hessabi used to spend long hours at the only poorly equipped mechanics shop existing in Tehran of that period for winding of the necessary high voltage coils.

After gaining enough experience in rigging up his experimental machine, he decided to construct an X-ray machine which could be utilized for clinical purposes.

While performing technical work on his clinical X-ray machine in the basement of the Sina Hospital, one of the major hospitals of that time,

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Figure 1. Dr. Mohammad Hessabi (1899 – 1990), the first specialty trained radiologist in Iran.

the sparks firing between the manually-wound coils spanned dozens of inches and created such a loud noise that not many people from the hospital dared to enter the eerie workshop.

Meanwhile, Professor Hessabi sent his brother, Dr. Mohammad Hessabi, to Paris to acquire knowledge and experience in the new field of clinical radiology. Upon his return, he was named the first Department chairman of Radiology at the University of Tehran, of which the medical faculty was making long strides towards modernization under the superb guidance of Professor Charles Oberling of France (Figure 1).

Figure 2. One of the first roentgenograms probably produced at Dr. Adl's private office. The keys at the top right corner of the picture served as a gauge in the process of developing.

Concurrently, the first foreign manufactured X-ray machine—a 250-mA unit made in Siemens Company—was installed at the private clinic of Dr. Habib Adl in the South of Tehran (Figure 2). Dr. Adl operated the machine and interpreted the films himself. Unfortunately, he practiced poor radiation protection, and ultimately developed leukemia.

Around the same time, another diagnostic machine was allegedly imported and installed in the Military Hospital of Urmia, a city in the far northwestern part of the country.

Clinical radiology was pioneered by Drs Ahmad Farhad, Mansour Guidfar and Abbas Maleki who developed the first radiology department at the main teaching hospital of Tehran University.

Dr. Farhad was born in Tehran in 1903 and finished his primary school in the then existing Qajar schools before entering the only modern high school—the *Darolfonun* or Polytechnics School. Thereafter, he went to Germany and studied medicine at the Universities of Berlin and Heidelberg. After graduation and obtaining the *Bestallung*—the German medical license—he started a three-year course in radiology at the University of Frankfurt/Main where he received specialty degree in radiology. He returned home in 1933 and was assigned Professor and Head of the newly-established Department of Radiology. Later, Dr. Farhad entered guest professorships at the German and American Universities in 1945 – 1947 and published his carefully collected clinical and scientific materials from Iran, in prestigious German journals (Figure 3).

The importance of radiology physics as an indispensable adjunct to the science of radiology was

Figure 3. Dr. Ahmad Farhad (1901 – 1981)

Figure 4. Dr. Fereidoun Manuchehrian (1910 – 1970) radiologist and medical physicist)

given due priority and the first academic radiologists were so well versed in physics that they were also simultaneously appointed as Directors of Medical Physics Departments.

Dr. Farhad and Dr. Manuchehrian, served as exemplary figures in underscoring the importance of basic sciences in the practice of radiology. Dr. Fereidoun Manuchehrian followed a similar career as his predecessor, Dr. Farhad, although after his high school training at the Darolfonun, he chose to study medicine in France instead.

With his solid background in physics , he delved into the study of enhanced pharmacological elimination of ionic contrast material with short electromagnetic waves and that, spawned later his pursuit of a full-fledged course in radiology. On returning to the homeland, he was assigned Associate Professor of Medical Physics at the University of Tehran. Bound to a previous affiliation with the military, he was also entrusted with the supervision of the Radiology Division of the Military Hospitals in

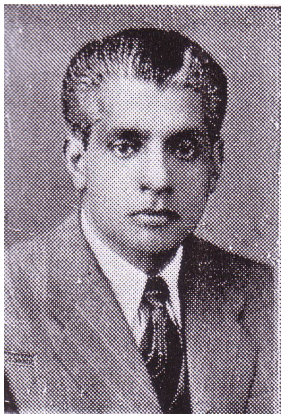

Figure 5. Dr. Pezeshkmehr, a pioneer in clinical radiology.

Figure 6. Dr. Abolghassem Bahrami laid the foundations of modern radiology in Isfahan.

the capital city of Tehran. Dr. Manuchehrian has compiled a two-volume treatise on medical physics in Persian (Figure 4).

Dr. Abbas Maleki was a recognized and highly knowledgeable academic radiologist who chaired the diagnostic radiology Department of the Cancer Institute of Tehran and ran also a successful private practice.

Dr. Yussef Fazlealizadeh was another dedicated teacher at the Radiology Department of Tehran University who rendered outstanding services to the education of Radiology in the newly established residency program.

Dr. Pezeshkmehr was a French trained Faculty Member stationed at the Sina Hospital while running a private office at the same time (Figure 5).

Another pioneer of radiology was Dr. Abolghassem Bahrami born in 1910 (Figure 6). Following his high school education, he set off for France and studied medicine and radiology for nine years. Afterwards he was assigned Chairman of Radiology and Radiation Physics at the University of Isfahan. He was later joined by Dr. Nematollah Keramatian who was instrumental in the development and advancement of that Department.

Dr. Bonakdarpour was the first US-trained Iranian radiology specialist to join the combined radiology-radiotherapy department at the Tehran University Faculty of Medicine in 1958 and served there until 1963.

The major breakthrough in the development of radiology was the launching of the residency program in 1970 which took place simultaneously

in Tehran and five major provincial universities of the country. Along with those measures, radiology as a teaching subject was also incorporated nationwide in the core curriculum of the medical schools.

Residency program, as a formal training in radiology, was started as a 3-year training course at the approved centers that would lead to national certification, pending on successful passing of the written and oral Board Examination handled by carefully selected examiners.

The residency program was expanded to four years starting in 2004 and fellowship courses were approved for major training centers with due emphasis on interventional radiology.

Guided by the Iranian Society of Radiology, teaching of radiology was boosted by inter-university courses and exchange of scholars.

While students and residents were urged to use educational sources in the English language, efforts were also made to provide them with up-to-date radiology texts in the Persian language: this goal was efficiently pursued at the Tabriz Department of Radiology under the supervision of Dr. Saeed Rad who compiled several treatises on radiology of the abdomen. Likewise, Dr. Karim Vessal from Shiraz together with Dr. Reza Habibian published the first Persian-language textbook on nuclear medicine in 1976.

Nuclear medicine in Iran, like elsewhere in the world, developed first within the radiology departments on account of the ionizing radiation present in the discipline. Due to the preponderance of physiology and clinical chemistry involved in the field, it has diverged from radiology in many world centers. The more anatomy-oriented part, however, has remained integrated with as nuclear radiology.

In Iran, the first nuclear medicine facilities were installed at the Nemazi Hospital of Shiraz as a section of the Department of Radiology and later in the Shariati Hospital of Tehran as a section of the Department of endocrinology.

Among the noteworthy promoters of nuclear radiology in Iran were Drs Zabih Arnawaz and Parviz Kaboli trained in France and USA, respectively.

Dr. Abbas Alavi an internationally distinguished scholar in molecular imaging and positron emission tomography, while not engaged in any official governmental contract, has been regularly visiting the country, and has given most valuable lectures for all those interested in his wide spanning research topics. Dr. Alavi holds one of the highest research scores in the world and is the recipient of several high ranking international awards including Hevesy award in nuclear medicine.[1]

In recognition to his long services in education and research in nuclear medicine, he was granted honorary medical degree of the Shiraz University of Medical Sciences and also honorary membership of the Iranian Academy of Medical Sciences, both in 2005 (Figure 7).

The major event of the 1970s in the medical world was an explosive growth and proliferation of new imaging modalities which was the reason why "radiology" was gradually replaced by the more inclusive term of "Medical Imaging Sciences". Keeping abreast with new developmental trends in the rapidly growing field of radiology necessitated access to costly machines which had to be purchased at a time when an economy crunch was imposed on the country by the Iran-Iraq war. Hard currency had to be paid for the constantly evolving algorithms or new patents which appeared along the improvement of the new products. Ironically, the word algorithm is the Latinized version of the name of the great Iranian scientist Al-Khwarazmi. It is a common English term denoting execution of successive mathematical steps to reach a

Figure 7. Dr. Alavi (first from left) receiving honorary Medical Degree from the Shiraz University of Medical Sciences, 2005.

Figure 8. Banquet held to the honor of Professor Manuel Viamonte from Miami (⇩) and Secretary of the Society Dr. Fateh (⇩) at the Annual Meeting in 1977.

desired result. However, with a closer scrutiny, it becomes apparent that one amazing coincidence is at work. The story is as follows; in the classic Roentgenology the physical rules governing image formation are simple geometric optics. With the advent of the new imaging modalities, the underlying physical principles extended beyond simple projection and the science of signal- as well as image-processing dominated the field. As is the case with computed tomography (CT), the image is created in accordance to a mathematical principle called Radon transformation, which was Radon's genial utilization of the so-called "projection profiles." These projections ultimately generate a system of simultaneous linear equations which, in turn is a multi-variable form of Al-Khwarazmi's algebraic equation described and formulated ten centuries ago. In a thought experiment, if Al-Khwarazmi were provided with the data from a CT scanner, he would come up with a crude but correct image, albeit after a long period of calculation[1,2]

The unprecedented bulk of teaching responsibilities required serious scholarly endeavors which were appropriately met by a host of Iranian specialists recruited from all over the world. However, one individual who rendered his most sincere service to the development of quality and modern education in radiology was the late Dr. Rooholamini who selflessly and tirelessly devoted most of his time to the training of radiologists in this country. His exemplary dedication to promoting of radiology in Iran was multi-faceted and spanned across nearly all relevant topics of the field.

Dr. Seyed Majid Rooholomini completed his residency training at Yale University with Dr. Richard Greenspan and then entered a fellowship of cardiovascular radiology with Dr. Herbert Abrams.[3,4]

Dr. Rooholamini together with his old-time friend Issa Yaghmai founded the Iranian Society of Radiology and over years invited a large number of illustrious radiologists to attend annual meetings (Figure 8).

His passion to render evermore service to his homeland was the main impetus to contribute to the establishing of North American Iranian Radiologic Society to provide educational and scientific assistance to colleagues back home. Another US-trained radiologist to further efficiently the cause of academic radiology in Iran

Figure 9. Ms. Shahla Hadjianpour, The first British trained technologist who headed the first Technology School of the Shiraz University.

Figure 10. Dr. Seyed Majid Rooholamini (1938 – 2007).

was Dr. Piran Aliabadi who served at Shiraz University of Medical Sciences for 12 years. As a close assistant of Professor Abrams at Harvard, he was a superb teacher and dexterous in selective angiography.

Training courses for radiology technologists began shortly after initiation of residency program and was initially scheduled as a 2-year program soon to be expanded to four years. The first British trained radiology technician, Ms. Hadjianpour started her services in 1965 at the Medical School in Shiraz and was later assigned head of the Technologists School there (Figure 10).

Establishment of scientific societies was a great boon for the development of radiology since it created a coordinated liaison among the medical disciplines under supervision of governmental authorities for improvement of the quality of service, education as well as research activities. One of the effective strategies of the Iranian Society of Radiology was to organize educational courses by Iranian and foreign authorities to meet the explosive growth of knowledge in radiology. These demands were efficiently met through the endeavors of Drs Hassan Fateh, Majid Rooholamini and Issa Yaghmai as an enterprise which has steadily flourished ever since its inception. The relatively young specialty of radiology in Iran could obviously contribute little to the science of radiology at large. However, right from the beginning, the radiology research was encouraged and directed toward description and analysis of the radiologic aspects of endemic diseases,[5–12] which was both valuable to the epidemiology of the disease and not infrequently met with a positive reception from foreign journals as tropical or geographic radiology research material, and different from the predominantly mainstream research topics of their own. To further enhance the spirit of research among the young colleagues, the Iranian Society of Radiology initiated publication of the first journal in 1998 which is striving the path of recognition ever since and has managed to secure an appropriate place in the international scientific forum.

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