The History of Veterinary Radiology[1]

GERRY B. SCHNELLE, V.M.D.[2]

INTRODUCTION

It seems appropriate that at this first meeting of veterinary radiologists of the western world there should be an attempt to record the beginnings and the progress of this specialty. It has been difficult to be truly worldly because of the comparative recent emergence of radiology in our profession as more than a tool for locating foreign bodies. The writer apologizes for omissions due to our inability to thoroughly search the European veterinary literature.

HISTORY

Articles on veterinary radiology by Troester, in Berlin; Hobday and Johnson, in England; and by Lemoine, in France; appeared in print in 1896, just one year after Karl Wilhelm Roentgen's discovery of the x-ray. Radiographs taken at this time should be classed as a novelty, albeit a dangerous one, since it took a 20-minute exposure to penetrate a man's arm. In 1896 the first x-ray periodical appeared. It was published in England and called *The Archives of Skiaography*. The first issue showed a "motion picture" taken with the fluoroscope which depicted movement of the bones of a frog's leg. In 1897 Doctor Morton, in New York, obtained a radiograph of a man's entire, fully-clothed body with an exposure time of only 30 minutes! It was soon recognized that the x-ray had selective, destructive action on certain cells and there was great interest in its potential curative action in both cancer and in bacterial disease.

At the first and second Roentgen Congresses held in Berlin in 1905 and 1906, Professor R. Eberlin, Director of the Surgical Clinic of the Royal Veterinary Academy in Berlin, presented papers on veterinary x-ray therapy. He was also prominent at the Fifth and Seventh Roentgen Congresses and at the latter meeting in 1911 he cautioned about the destructive effects of the x-ray. During the first several decades after Roentgen's discovery the greatest emphasis in veterinary medicine seemed to have been on x-radiation therapy. At this time there was not sufficient power derived from the available apparatus to make diagnostic radiography in large animals a very helpful procedure. Judging from the photographs of veterinary radiographic attempts during this period, it seems likely that more harm was done to the radiographer's assistant than there was good done to the patient. Even as late as 1953 when a veterinary lecturer from central Europe (during the International Veterinary Congress in Stockholm) was questioned about slides showing his assistant's hands in the direct beam, he replied to the effect that assistants were replaceable!

In 1927 a grant from the Rockefeller Institute in the United States provided funds for equipment and establishment of the Roentgen Institute of the Vienna Veterinary High School. Professor Alois Pommer was associated with The Institute from its inception and became its director in 1938. His emphasis seems to have been on x-ray therapy.

In 1938 an x-ray therapeutic apparatus was installed at the University of Pennsyl-

[1] This paper was presented at The First International Conference of Veterinary Radiologists, Dublin, Ireland, September 6, 7, and 8, 1968.

[2] Doctor Schnelle is Director of the Nantucket (Massachusetts) Animal Clinic and Hospital and Clinician Emeritus of the Angell Memorial Animal Hospital in Boston.

vania and Dr. Mack A. Emmerson, who had been trained in Professor Pommer's clinic, was in charge. In the U. S. other installations of therapeutic x-radiation apparatus appeared shortly after this in other veterinary colleges and in at least two humane society hospitals. It is this historian's opinion that the emphasis upon radiation therapy during the first several decades contributed to its slow progress in the diagnostic area. Certainly diagnostic radiography in veterinary practice was far behind its counterpart in human medicine even so late as the 1930's.

In the decades from 1930 to 1950 specialization in small animals developed rapidly. Until this time small animal practice had been sort of a bastard-orphan of a profession which was reluctantly watching the horse disappear from both the city and the farm. Most veterinary colleges, perhaps all of them, were both agriculturally oriented and financed and could neither get money for advancement in their small animal clinics nor could they get enthusiasm from a faculty hierarchy that was heavily weighted toward farm animals. The practitioner in the small animal field and some of the humane society veterinarians in the cities must be given much credit for setting the stage for tremendous forward strides in surgery, use of the clinical laboratory, and in radiology. The natural alliance of the small animal practitioner with the physician and the sentiment-profit nature of his practice led the small animal veterinarian to real progress in diagnostic radiography. Naturally, the size of his patient was important since it is only comparatively recently that short exposure penetration of the large animal has been possible.

Actually, it was not until the approach of World War II that small animal medicine aroused much interest from either veterinary officialdom or from veterinary college management. In the United States the American Animal Hospital Association grew rapidly out of a need for cultivation and protection of the special interests of the small animal specialist. This had a direct bearing upon the development of diagnostic radiology since it was rare that a meeting of this association did not have a presentation on the subject and the level of the discussions became higher rapidly. After the explosion of the atomic bomb, radiation became a household word and tax money began to pour into research in many fields. Since animals are used in so much of the research, it was inevitable that veterinarians would be important in this area.

Research utilizing dogs and cats, directly benefitting these animals, had seemed strangely minimal in the United States, but both Sweden, in a tax supported university, and England, through foundation support largely, seemed to take a broader outlook on the "there is but one medicine" thesis. In the atomic era in the United States unheard of funds began to pour into veterinary clinical research. More than $1,000,000 was granted for the study of canine heart disease at the University of Pennsylvania and more than half a million dollars annually granted to support a veterinarian-headed department of radiation and radiation biology at Colorado State University. Prior to both of these the Atomic Energy's National Laboratory's enormous radiation efforts at Oak Ridge, Tenn., employed and trained many veterinarians in radiology, but their efforts cannot be said to have been oriented toward clinical veterinary radiology.

The development of clinical radiology was largely destined to follow a different pattern than in human medicine. The physician who desired to specialize in radiology would seek a residency in one of the large hospitals where clinical radiology was highly developed, while our future, and now present, teachers of veterinary radiology, would go to a research center whose prime interest was radiation research. There are exceptions, of course, in which individual veterinarians would associate themselves with physician radiologists and learn from them. Officially, the first effort at this clinical orientation came at the University of Pennsylvania

Graduate School of Medicine when they accepted veterinarians as full-time residents in clinical radiology (anesthesiology and pathology also) and trained the veterinarian along with the physician in a hospital-medical school program.

Radiographic Equipment

Photographs of veterinary radiographers in the period from 1896, even until the 1920's, show the hand fluoroscope to be the most common piece of ancillary equipment. In the United States the first x-ray apparatus designed and built for veterinary use was made by a Boston based company around 1930. The company officials were well aware of the veterinarian's lack of training in the field and lack of darkroom facilities, and designed the apparatus with a built-in fluoroscope to eliminate that deadly instrument, the hand fluoroscope. Unfortunately, they did not entirely reckon with the combination of the veterinarian's lack of knowledge on radiation and the nature of his practice which led him to set fractures and explore for foreign bodies with his hands in the direct beam. The usual absence of darkroom facilities helped to prevent the veterinary radiographer from proper dark adaptation of his eyes before use of the fluoroscope. The inevitable result was a considerable number of veterinarians with radiation damage to their hands.

A lead shielded table with leaded wings which "box" the patient and control much of the scatter radiation was designed and used at the Angell Memorial Animal Hospital at least 25 years ago. This represented a compromise with complete shielding from radiation achieved in radiography of human adults when the technician retreats into a leaded booth. Veterinary practice is more like pediatrics in which some person must help to control the patient. If anesthesia or deep tranquilization were to be used on all animal patients for radiography, it certainly would have a limiting effect upon the usefulness of the x-ray.

Publications

The first text on veterinary radiology was Dr. Paul Henkel's *Veterinary Radiology*, published by Paul Parey in Berlin in 1926. There were six chapters with 226 pages and 91 illustrations. Roentgen physics, technic, normal anatomy, and both diagnosis and therapy were covered. The quality of the illustrations was generally good, although the range of diagnoses was not very great. Barium enema and upper gastrointestinal (normal) visualization were depicted. This book was excellent and it is regretable that it was not translated, at least into English, since it could have been of greater help to this beginning specialty in veterinary medicine.

In 1937 *The North American Veterinarian*, in Chicago, started a series of bimonthly articles on diagnostic radiology in small animals. This writer was the author and the material was based upon radiography and diagnosis at the Angell Memorial Hospital in Boston. Small animal medicine was still quite juvenile at that time and the author not only had the large clinic of that hospital to draw upon but also the real advantage of being within the Harvard Medical School and hospital complex and having almost unlimited consultation with physicians in all specialties. A number of diagnoses that were new to veterinary medicine were reported. Among these were congenital hip dysplasia, Legg-Perthes disease, intervertebral disk disease, and tumors of the canine nares. These articles continued until 1947.

In 1939, Major Hamilton Kirk's *Index of Diagnosis* (Clinical and Radiological) was published by Bailliere, Tindal, and Cox in London and Williams and Wilkins in Baltimore with Schnelle as a collaborator. Sixty-nine pages (of 540) were devoted to radiographic diagnosis with the reproduction of 57 radiographs.

In 1945 Schnelle's first book *Radiology in Canine Practice* was published by *The North American Veterinarian*. There were 336 pages with 245 illustrations, most of them radiographic reproductions. Many were

illustrations that had been used in the journal articles. In 1950 this text was rewritten and enlarged both in page size and number of pages and included a section on radiotherapy by Dr. Myron Thom. There were 305 illustrations and the text was entitled *Radiology in Small Animal Practice*, since feline practice had become a larger part of its contents. Both books had a foreword by Dr. Merrill C. Sosman who was then Professor of Roentgenology at the Harvard Medical School and radiologist at the Peter Bent Brigham Hospital and who had contributed generously to the author's knowledge on radiology. The texts attempted to go beyond radiology and into diagnosis so as to make them more useful to the practitioner. At that time there was still a paucity of books on small animal medicine.

Since 1960 texts on veterinary radiology have been published both in Europe and the United States with marked improvement in their quality and scope. Review of them, however, scarcely belongs in this historical survey.

THE JOURNAL OF THE AMERICAN VETERINARY RADIOLOGY SOCIETY came into being formally in 1962. Prior to this time and due almost entirely to the efforts of Dr. and Mrs. Julius J. Fishler of Elkhart, Ind., the papers presented at the annual meeting of The Society were mimeographed and bound and sent to all the members of the group. In 1962 the annual meeting papers were printed on high quality gloss paper and the JAVRS achieved "journal" status. In 1963 the editorial office moved to the University of Pennsylvania in Philadelphia and Dr. W. H. Rhodes became the editor. The Journal then commenced reproducing articles on veterinary radiology that were solicited for publication. It also contained numerous abstracts of world-wide origin. Volume 8 (1967) contains 10 original articles and 42 abstracts concerned with veterinary radiology.

Undoubtedly one of the reasons for the emergence of a journal devoted entirely to veterinary radiology was the unwillingness of existing journals to reproduce radiographs of adequate size and quality to have them be intelligible to their readers. One notable exception to this has been the *Veterinary Record* which frequently used insert sheets of high gloss paper on which radiographs were reproduced.

Organizations

The American Veterinary Radiology Society was formed in 1953 by a group of veterinarians who had a particular interest in this specialty. Its membership is open to any veterinarian who is sufficiently interested to join and to pay the small annual dues. It should not be considered an organization of specialists. The AVRS fostered the practice of holding assemblies on radiology in conjunction with regularly scheduled meetings of veterinarians and has contributed greatly to the education of practitioners in the art and science of radiology. As noted elsewhere, this group was and is responsible for publication of a specialty journal. The history of this group supports the contention that practitioners in the small animal field supplied the energy and initiative for much of the development in veterinary radiology, although teachers of the specialty lent their support to the AVRS.

An organization known as The Educators in Veterinary Radiologic Science was formed in 1956 in the United States and its membership was limited to those who teach in the field. Its purpose was mainly to improve and standardize the teaching of radiology in the veterinary colleges. It also attempted to educate the administrators of the colleges in understanding the place achieved by the specialty. At this time there was considerable difference in the organization of departmental teaching of radiology in various veterinary colleges. It might be under the head of clinics, of surgery, or even of medicine but not, as in human medicine, as a department itself. Out of the EVRS came the charter members of the American Board of Veterinary Radiology.

In 1962 the American Board of Veterinary Radiology was granted temporary recognition by the Council on Education of the American Veterinary Medical Association and currently is a fully recognized specialty board with 21 diplomates and one emeritus member. This Board sets rigid standards for applicants for examination and gives annual examinations for candidates. As a specialty, radiology now has equal status with three other groups: pathology, public health, and laboratory animal medicine. Three more specialties have probationary approval. They are microbiologists, surgeons, and toxicologists.

Protection Against Radiation Damage

Although it was recognized quite early that x-rays were destructive, their carcinogenic properties were not discovered for some decades. Veterinary users of the x-ray seem to have escaped the fate of other early Roentgenologists who became martyrs to their specialty and paid with their lives. It is possible that some of the veterinary assistants, particularly those who assisted the therapy experimenters, did pay the highest penalty but I cannot find it so recorded. When diagnostic radiography spread into the expanding field of small animal medicine the lack of full awareness of the dangers of radiation damage soon became apparent. By the 1950's x-ray burns on the fingers of veterinarians were so widespread that the American Animal Hospital Association collected a series of twenty or more slides of damage to the skin, or even amputation of fingers, and sent them around to veterinary meetings for graphic illustration of radiation dangers. They apparently had good effect, for one rarely sees a radiograph now which shows human fingers holding the patient.

One of the aftermaths of the explosion of the atomic bomb in the United States was the creation of the Atomic Energy Commission and great interest in protection of the public from radiation damage from all sources, including the x-ray apparatus. In the United States, and probably in other countries, this expanded into veterinary practice on both a national and a state level. In 1964 a committee (Subcommittee 17) of seven veterinarians and a physicist was formed under the auspices of the U. S. National Council on Radiation Protection and Measurements, to draw up an appropriate set of rules for the installation and operation of x-ray apparatus by veterinarians.

This report (NCRP 35) is not yet in its final printing, but the latest revision of 39 pages gives structural details of approved x-ray installation, responsibilities of the operator and, altogether, has ten sections covering all phases of radiography including the sealed sources of radiation. Many states in the U. S. have legal regulations for the protection of the public against exposure during veterinary radiography but at this writing the Federal regulations are in the stage of saying that the veterinarian "shall," meaning "must," adhere to certain rules. It can be assumed that if a veterinarian does not comply with the rules he might be subject to suit by a client or employee who was harmed by radiation as a result of the noncompliance.

The subcommittee report discourages both x-radiation therapy and fluoroscopy except in institutions in which fully trained veterinary radiologists would supervise and where the apparatus would be properly installed and fully shielded.

SUMMARY

Articles on veterinary radiology appeared in Germany, France, and England one year after Roentgen's discovery of the x-ray in 1895. Except for Henkel's *Veterinary Radiology* (1926), there was little in the veterinary literature until 1937 that was really progressive in the specialty. The "radiation explosion" after World War II set the stage for rapid development of the science of radiology in veterinary medicine. Much credit for its progress must be given to the small animal specialist.

Nantucket Animal Clinic and Hospital
Boston, Massachusetts

ZUSAMMENFASSUNG

Ein Jahr nach Röntgens Entdeckung der Röntgenstrahlen im Jahre 1895, erschienen in Deutschland, Frankreich und England Arbeiten über Veterinär-Radiologie. Mit der Ausnahme von Henkels Veterinär-Radiologie im Jahre 1926, erschien nur wenig Fortschrittliches auf diesem Gebiet bis zum Jahre 1937. Die "Bestrahlungs-Explosion" nach dem zweiten Weltkrieg ermöglichte eine rasche Entwicklung der Röntgenologie in der Tiermedizin. Diese Vorwärtsentwicklung ist vor allem den Kleintierspezialisten zu verdanken.

RÉSUMÉ

Articles sur la radiologie vétérinaire sont parus en Allemagne, France et Angleterre un an après le découverte des rayons X par Röntgen en 1895. A l'exception de la "Radiologie vétérinaire" (1926) de Henkel, il y a eu peu de quoi progréssif dans la littérature vétérinaire avant 1937. "L'-explosion de radiation" après la deuxième guerre mondiale a preparé le terrain pour le développement rapid de la science de radiologie dans la médicine vétérinaire. On doit faire crédit pour cela aux spécialistes des petits animaux.