

Classics in brachytherapy: Margaret Cleaves introduces gynecologic brachytherapy

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ABSTRACT

Intracavitary treatment of gynecologic cancers has been the anchor of brachytherapy, and perhaps the greatest success of radiotherapy, for over a century. The woman who first performed the procedure was neither a surgeon nor radiologist, but an electrotherapist who began her career as an alienist. She pursued a prolific academic career despite being disabled by a disease that is no longer recognized. The fascinating life of Margaret Cleaves, the initiator of gynecologic brachytherapy, is recounted. © 2007 American Brachytherapy Society. All rights reserved.

Keywords:

History of medicine; Margaret Cleaves; Brachytherapy; Radium; Cancer of the uterine cervix; Electrotherapy; Phototherapy

Brachytherapy's century-long history has been uneven; periods of enthusiasm have been interspersed with intervals of doubt, skepticism, and even antagonism. Its primacy in the treatment of cervical cancer, however, has been acknowledged for 90 years, and may justifiably be considered to have sustained the practice of brachytherapy (and radiotherapy) through difficult times. The first report of intracavitary radium for gynecologic malignancy (and possibly the first report of any clinical radium application in the United States) was published in October of 1903, barely 5 years after radium's discovery.

RADIUM: WITH A PRELIMINARY NOTE ON RADIUM RAYS IN THE TREATMENT OF CANCER (1).

By Margaret A. Cleaves, M.D.
New York

Not only the scientific world, but the lay as well, listens with bated breath to the marvelous tales of radium; tales which, especially when accompanied by the demonstrations of the apparently magical phenomena of this new element, seem more befitting fairy lore than abstruse scientific fact; and one can but wonder whether radium may not prove a veritable Aladdin's lamp to medical science as well as to physics.

“All nature is vibrating, from the lowest musical note to the highest pitch of the chemical rays,” and in radium the highest form of etheric vibration is to be found.

The electrotherapist with his high-frequency discharges from vacuum tubes, his ultraviolet rays, his cathode and x-ray must, of necessity, have not only a scientific but a practical interest as well in radioactivity.

After this breathless introduction, Cleaves (1848–1917) discussed current theories concerning the nature of radioactivity, and reviewed the literature pertaining to the physiologic effects of radium rays and the few reports of therapeutic applications.

She then related her clinical experience (two cases treated on September 15 and 16, 1903) using a tube of radium, borrowed only a week earlier from Dr. Charles Baskerville, professor of chemistry at the University of North Carolina. The glass vial contained 1 g of radium bromide, but its reported “radioactivity of 7000” indicates that it was highly impure (2), containing but a few milligrams of the element. The first case was a man with a painful sarcoma of the inner cheek. The tumor had failed to respond to 12 X-ray “exposures,” applied both externally and with an intracavitary tube designed by Eugene Caldwell (3, 4). The patient enjoyed dramatic pain relief, however, after two radium applications (external and intra-oral), totaling 27 min. The second patient had an advanced squamous cell carcinoma of the cervix, extending almost to the introitus, and

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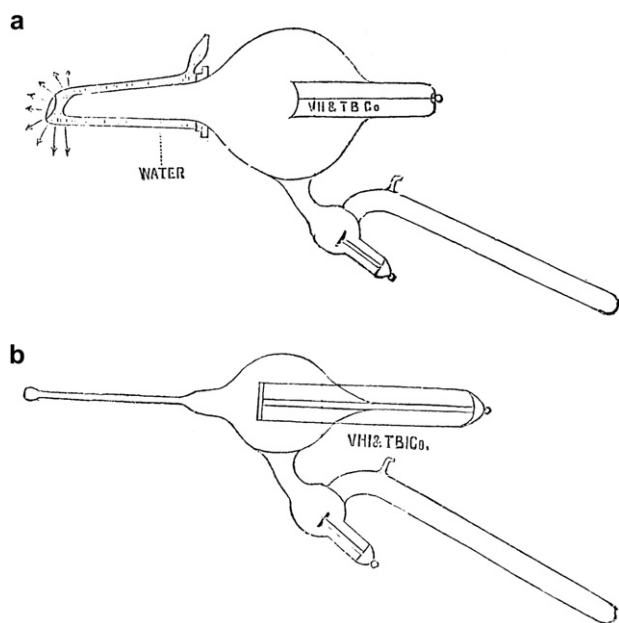


Fig. 1. X-ray tubes used by Cleaves, designed specifically for intracavitary application (3). The target of the cathode rays (where the X-rays were emitted) was in a glass appendage that was inserted into the treated cavity. (a) The concave recess at the tip of the tube's appendage fit over the cervix. Cooling water circulated through the sheath to prevent tissue burns. (b) This tube's narrow appendage was to be inserted into the urethra; urine performed the "cooling" function.

invasive of the bladder and rectum. Cleaves had initially treated her with ultraviolet light and intracavitary X-rays, a regimen that she had first described the previous year (5) (Fig. 1). The patient seemed to have benefited from 3 months of this regime, but "... believing that the radium rays would penetrate more deeply than the x-ray, the radium was used." The vial was applied to the fornices for 10 min, and for 5 min the following day. Cleaves immediately regretted the second application, because examination on the third day revealed an intense reaction, suggesting overdose (after a total application of approximately 1 mghr!). But several days later there was "no bleeding, no odor, no discharge, no ulceration, and vaginal and cervical mucous membrane normal in appearance." At this point, Cleaves departed for Atlantic City to present her findings at the annual meeting of the American Electro-Therapeutic Association (AETA). Based on these two cases, without followup, Cleaves concluded that radium had an important role in cancer therapy, but that greater activities or longer exposures were not indicated! Not surprisingly, longer followup compelled her to conclude that the clinical responses were "evanescent" (6).

Margaret Abigail Cleaves: an enigma

Margaret Cleaves (Fig. 2) was born in rural Iowa in 1848, the third of seven children, of whom only the daughters survived to adulthood. Her father was a physician whose medical training consisted of apprenticeship under



Fig. 2. Young Margaret Abigail Cleaves (7).

a series of preceptors (7). He was a respected member of his community, and was twice elected to the state legislature. Margaret was especially close to her father, and occasionally accompanied him on his medical rounds. His early death (when she was 13 years) was a financial and emotional stress for the family. Margaret began teaching at age 15 years to finance her education at the Normal School at the State University of Iowa (now the University of Iowa). In 1870, she matriculated into the first class of the University's Medical Department. The Iowa legislature mandated that admission to medical school be "open, upon equal terms, to students of both sexes, without regard to color; and to each will be afforded equal opportunities, and the same facilities for acquiring a complete and thorough medical education" (8). Indeed, women comprised a quarter of the first class, and over the next decade the number of female physicians in Iowa rose from 8 to 73. Cleaves was awarded a medical degree in 1873, after 2 years of lectures and a year of preceptorship. Twelve years later she would be appointed to the Medical Department's examining committee, perhaps the first woman to serve in that capacity in the United States.

Her first professional appointment was as "second assistant physician" at the State Hospital for the Insane at Mount Pleasant. She departed after 3 years of service to pursue private practice, but was appointed a trustee of the institution. She was Iowa's delegate to the annual meeting of the National Conference of Charities in 1879, presenting a paper, "The Medical and Moral Care of Female Patients in Hospitals for the Insane" (9). It proposed that the services of female physicians were essential to the effective and humane care of female asylum patients. Current

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