

## A RADIUM APPLICATOR FOR THE LARYNX.

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The hidden location of the larynx, its mobility, extreme sensitiveness, the cough and retching reflexes unite to make effectively prolonged and accurate intralaryngeal applications of radium most difficult. Nevertheless, after making and changing several instruments for the purpose, I feel that I have at last made a type that satisfactorily holds the radium in surface contact in the exact part of the larynx where it is desired to place it and for sufficiently prolonged periods. This instrument, my intralaryngeal radium applicator, supplements the radium needles of Dr. Frank Edward Simpson which are designed to be thrust into the tissues by a needle introducer devised by me and described by me in the Transactions of the American Laryngological Association for 1918. The needles contain radium or radium emanation and are intended especially for the raying of malignant growths by "cross-firing" from several needles lying from 8 to 12 hours in the substance of the growth. In an article\* on cancer of the prostate by Dr. Robert Herbst in the Journal of the American Medical Association, May 31, page 1610, 1919, both the Simpson needles and my introducer are pictured and described without credit to either Dr. Simpson or myself, so that to protect our priority I find it necessary to mention the matter here. For malignant growths of the larynx and vicinity needling is the best method, but there are many intralaryngeal conditions where needling is unsuitable and where surface applications are indicated, such as chronic hypertrophic laryngitis, papilloma of the larynx, amyloid infiltration of the larynx, laryngeal tuberculosis, pachydermia of the larynx, many similar affections and to supplement needling treatment for malignant growths. It is for these states that my intralaryngeal radium applicator has been devised. It is made as follows:

A length of heavy copper wire, No. 16, 38 inches long, is bent upon its middle until the two lengths so created lie parallel and in contact. The radium container (Fig. 1 and 2) of standard make, made by the Radium Chemical Company, Pittsburg, possesses an eye at one end. This eye is now threaded upon and slipped along the wire to the mid bend of the wire. The eye end of the container

\*Dr. Gordon B. New, The Laryngoscope, June, 1919.

is then soldered in the bend so that the container forms a straight line with the two parallel lengths of wire. These lengths are then soldered together along their whole length to form a long, flat rod of copper. This rod is reinforced upon its flat sides (Fig. 2, a) by two ribbons of soft sheet brass, 1-32 of an inch thick and 5-32 of an inch (4 millimeters) wide, soldered on with soft solder. The combined brass, copper and solder rod so formed is evenly squared with a file so that it has a rectangular cross-section (Fig. 2, a) and when thus completed is an inelastic, stiff but easily bent rod of soft metal that will keep any angle given it with the pliers. At the end of this rod is the radium container fastened beyond the possibility of coming off and dropping into the trachea by the heavy copper wire passing through its eye. This security would not exist if the container were merely soldered or even brazed to the end of a simple copper rod.

The forehead clamp shown in Fig 1 is now placed upon the patient's forehead and is firmly fixed to his head by means of the broad heavy headband of elastic webbing, to which the clamp is sewed. The rod is now bent by pliers into a shape resembling that shown in Fig. 2 but with such modifications as the patient's dimensions indicate, in order to approximately form the applicator. This is then seized by the wooden thumb-plate (Fig. 2 b) and the radium container is introduced into the previously anesthetized larynx into the desired position, using mirror laryngoscopy. While the radium container is held by the operator in place in the larynx an assistant ascertains whether the upper part of the rod or stem of the applicator will at the same time lie in the jaws of the clamp. If the stem will not do this, the instrument is withdrawn and the bends of the stem are changed with the pliers until the stem will rest in the clamp when the radium container is in the right position in the larynx. The clamp is then firmly closed upon the stem and the mirror is used to see whether the container stays in place in the larynx or springs out of position, or, as sometimes happens, jumps out of the larynx into one or the other fossa piriformis. This is most apt to occur if the patient swallow or retch or if the container has not been passed deeply enough into the laryngeal interior. In some cases, especially where the base of the tongue needs treatment in the hyoid region, the fossa piriformis is the proper place for the applicator.

While the container is in the larynx the patient must not move his head more than a little, for motions of the head, especially rota-

tion, will of course move the container in the larynx with the head, and so may cause coughing and retching. Another source of displacement of the container in the larynx and one that may lift it out of it, is strong upward movements of the tongue made in retching or from nervousness, as the dorsum of the tongue may push the oral bend of the applicator stem far upward. To avoid this

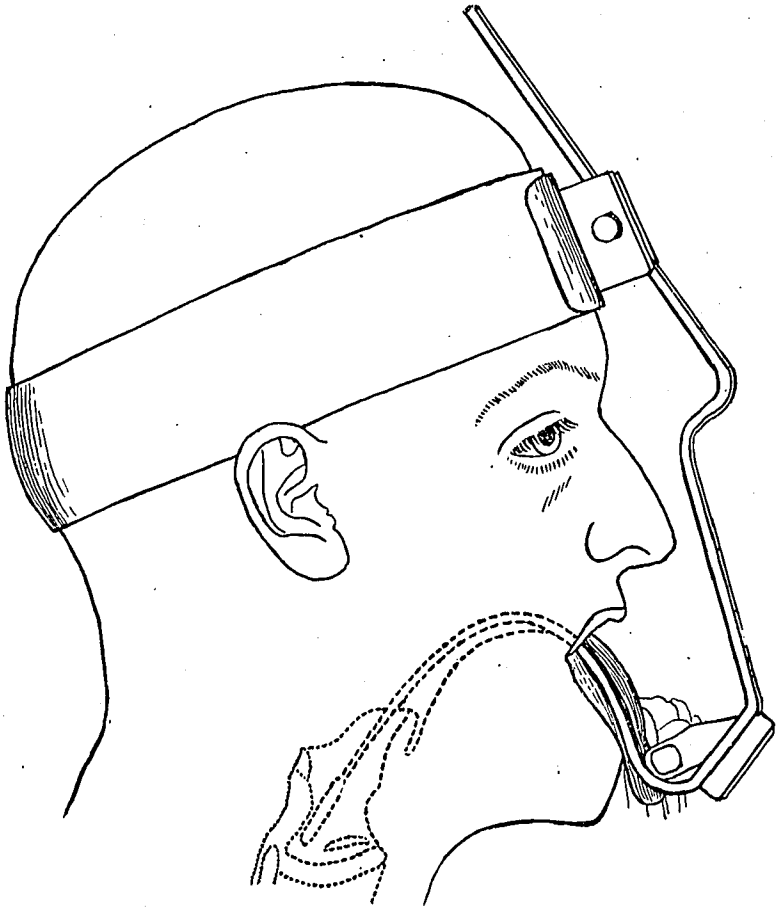


Figure 1. The radium applicator in place in the larynx.

the patient shown in the sketch from life in Fig. 1, kept his tongue pulled out during the treatment which lasted over an hour at each sitting. Since making this drawing, I have altered the oral bend of the stem (Fig. 2) so as to keep it as far away from the tongue as possible, following the roof of the mouth to the posterior pharyngeal wall. Repeated treatments make the larynx very tolerant and

longer and longer radium applications may be made with less and less local anesthesia. During the first treatments there may be a copious flow of saliva so viscid that it may need to be removed with an electric pump, as the usual dental saliva ejector is too weak to take up the thick spittle produced.

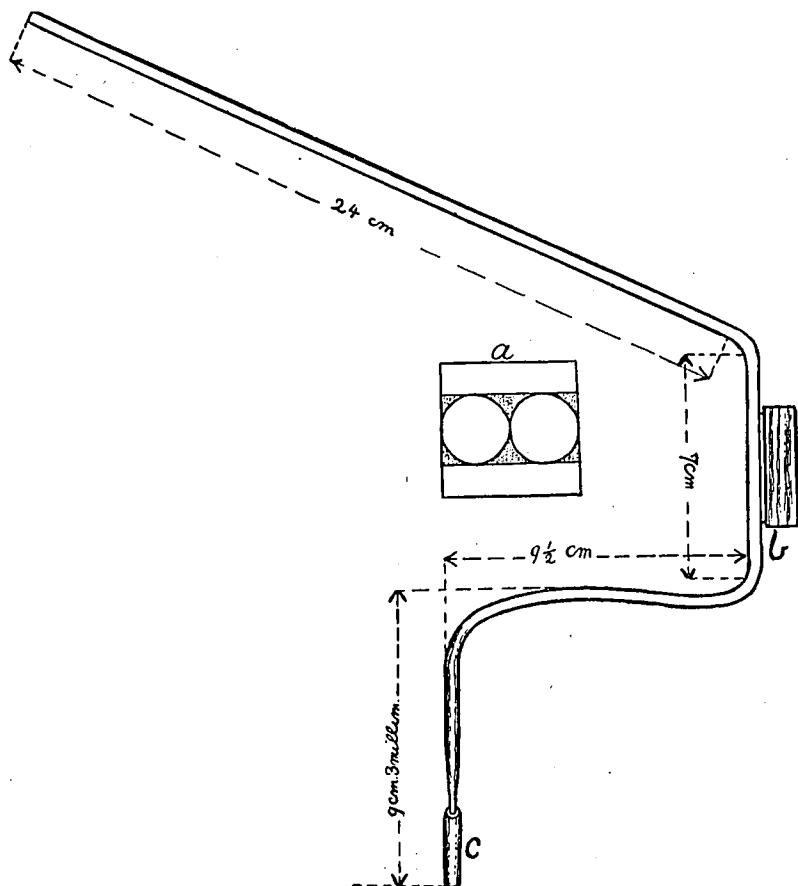


Figure 2. The radium applicator with standard bends to be altered to fit individual patients; (a) enlarged cross section of the stem of the applicator showing the parallel wires and the brass ribbons soldered together. Natural size diameter, 5-32 of an inch or 4 millimeters; (b) wooden thumb piece for holding applicator in its introduction; (c) the radium container.

For the local anesthesia I use a ten per cent cocaine spray reinforced by the application of a mud of pure flake cocaine with a laryngeal applicator to the place where the container is to rest. During the treatment an occasional spray from the cocaine atomizer may be needed to keep the reflexes from waking up, and in order

to reduce the amount of cocaine used it is supplemented with the insufflation of anesthesia powders at intervals.

While in the case of treatments to the surface of the body the use of small amounts of radium may be compensated by increasing the time of its application, the matter is different in the larynx where, to minimize irritation, lessen the amount of cocaine needed and shorten the fatigue of the rigid position for the often weak patient it is desirable to cut short the time of the treatment as much as possible by using as large a dose of radium as is available. The maximum amount of radium in effectively screening capsules that would fit into the standard radium container is 25 milligrammes, 15 milligrammes being the usual screen content. To be able to employ more radium than that, up to 50 milligrammes, protected properly by sufficient screening against radium "burns," would necessitate the making of an especial screen of platinum, for the usual screen for 50 milligrammes would form far too bulky a mass for the laryngeal interior, and would create irritation and some obstruction. For these reasons I have not used metallic radium for the intralaryngeal treatments but have employed radium emanation, that is, the gas given off by radium and its salts, obtaining the emanation from the radium laboratory of Dr. Frank Edward Simpson. To make emanation in sufficient amounts practically, it is necessary to have a gramme of radium or more. The radium is kept in a safe while the emanation arising from it is pumped by an elaborate apparatus, a so-called mercury pump, into narrowing glass tubes that terminate in a capillary tube as thick as a fine cambric needle. This tube is sectioned by heat and sealed by it into lengths about three-fourths of an inch long. Nevertheless one of these lengths may be made to contain up to 400 millicuries, as their strength is measured, a millicurie being equivalent to a milligramme of radium. The dose of each capillary tube length is measured as to its strength and the tube is then inclosed in an enameled silver screen to go inside the outer screen or container described. The average dose used by me was about 50 millicuries, but, had there been need, a hundred or more could have been forced into one tube for an especial patient. The average time used for a single treatment was from one-half of an hour to one hour. Using these effective doses results were obtained in twenty minutes that could only have been partly had from an hour's treatment with 15 milligrammes of radium. In addition, as shown by Finzi, the effect of a large dose of radium given at one time is

greater than the effect of the same dose subdivided into a number of treatments.

Nevertheless, those having the non-malignant affections of the larynx to treat with radium should not be deterred by the lack of emanation if a dose of radium suitable to enter the container is the only thing available. A prolonged course of treatments would, however, be necessary, with a much delayed result.

Dr. Simpson is having slightly larger especial containers made that will hold two of the silver screens that hold the emanation tubes instead of only one as is the case with the standard containers. This will double the effectiveness of the raying, so that even ten-minute treatments will be enough in some cases. In malignant growths, though at least one needling is indicated, additional raying with the laryngeal applicator will tend to prevent relapses and extensions in the surroundings of the tumor and so prolong and reinforce the effect of the radium needling.

The production of the radium applicator is too recent to permit a series of case reports nor are they necessary, as it is merely a means of prolonged and accurate application of radium or its emanation. I will mention one case here as an example of what may be accomplished. A man, aged 65, with a carcinoma of the left aryteno-epiglottic fold with beginning deep infiltration of the hyoid region from behind, refused radium needling so that the radium applicator alone could be used. When first seen the patient could not swallow solid food and took liquids only with effort. He had severe radiating pain in the throat that kept him awake at night, had lost his sense of taste and was very weak from lack of food and sleep. He was given six hours of raying with the applicator, the individual sittings being at long intervals and lasting only one half of an hour each on account of his weakness. The treatments spread over two months and now he can swallow normally, his sense of taste has returned and the tumor is so reduced in size that it looks merely like a somewhat swollen aryteno-epiglottic fold. As shrinking of the tumor gradually exposed the previously hidden left vocal cord to view, the cord was at first seen to be immobile, but now is as freely movable as the right cord and the laryngeal interior at the level of the glottis looks normal. The patient is still under treatment.

Those wishing duplicates of my applicator may have them made to order by applying to F. A. Hardy and Co., 10 South Wabash Avenue, Chicago.

*Addendum.*—Since writing the above I have made a radium applicator of the form described but using a copper tube 3-16 of an inch, outside diameter and 1-8 inch caliber instead of the composite rod described, the idea being to use the applicator itself as a suction tube to keep the larynx free from secretion for those patients whose copious flow of saliva overflows into the laryngopharynx causing strangling and retching. The lower end of the tube opens just above the radium container and the rubber tube that connects this tubular applicator with the vacuum bottle of the suction pump is attached to the upper end of the tube. After being hammered flat the copper wire that holds the container is soldered to the sides of the copper tube in a groove cut longitudinally in both sides of the tube. The copper wire so attached extends as far as the handle of the applicator only. This instrument gave a patient, who was constantly retching as the result of saliva collecting in his throat, such perfect ease that the treatment could be conducted without the least interruption and with great relief to him. The copper tube is sufficiently bendable to permit such adjustments as are needed. To keep the mouth free from saliva a common dental saliva ejector with suction from the water supply was also employed simultaneously with the electric pump attached to the tubular applicator.

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## A CASE OF TRAUMATIC SALIVARY FISTULA

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Cases of traumatic salivary fistula, as a complication of the mastoid operation, are sufficiently unusual to warrant the reporting of the same. The difficulties attending the cure of this condition in cases not dependant upon obstruction of the salivary duct are many.

J. S., aged 7 years, had an acute mastoid operation performed four years ago, following an attack of measles. The post auricular wound was healed but discharge continued from the middle ear. Two years later it became necessary to perform a secondary mas-