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	PAGE
A Technique for Measuring the Quality and Quantity of the X-Ray, with a Discussion Regarding the Value of the Pastilles of Platino- Cyanide of Barium - - -	49
<i>By George M. Mac Kee, M. D., New York, and John Remer, A. M., M. D., New York</i>	
Technique in Radiotherapy with Especial Reference to Deep Therapy as Practiced at Freiberg by Kronig and Gauss - - -	59
<i>By Arthur F. Holding, M. D.</i>	
The Use of Roentgen Rays in the Treatment of Gynaecological Con- ditions - - -	65
<i>By George E. Pfahler, M. D., Philadelphia, Pa.</i>	
The Present States of the X-Ray Therapy of Enlarged Ghymus - - -	74
<i>By Sidney Lange, M. D.</i>	
A Device for Using a Constant Stream of Water in a Water Coiled Tube - - -	81
<i>By George E. Pfahler, M. D., Philadelphia, Pa.</i>	
Fracture of the Skull with Air in the Ventricles - - -	83
<i>By Dr. W. H. Stewart, New York, N. Y.</i>	
Editorial - - - - -	90
Minutes of the Fourteenth Annual Meeting - - - - -	92
Abstracts - - - - -	99

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Editor, P. M. Hickey, M. D., Detroit
Associate Editor, F. C. Zapffe, M. D., Chicago

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No. 2

A TECHNIQUE FOR MEASURING THE QUALITY AND QUANTITY OF THE X-RAY, WITH A DISCUSSION REGARDING THE VALUE OF THE PASTILLES OF PLATINO-CYANIDE OF BARIUM*

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In the time and space at our disposal we cannot enter into a discussion relative to the various methods and instruments employed in the direct measurement of the X-ray for therapeutic purposes. We will, therefore, confine ourselves very largely to a description of a technique that we have found sufficiently reliable for practical purposes.

The estimation of the X-ray dose divides itself into the determination of quality and quantity.

QUALITY

Since the advent of the Holzknecht radiometer, the estimation of quality has given us more concern than the determination of quantity. The knowledge of quality is a very important factor in radiotherapy, for without it, the accurate estimation of quantity is impossible. For this purpose we have

found nothing superior to a combination of Benoist radiochromometer, Bauer qualimeter and the milliamperemeter.

The first step is to "dose" the tube for quality. This is done in the following manner: In the first place, a definite amount of current as a "constant" is decided upon. Let us say that this is one milliampere. A new, "hard" tube is now excited and allowed to run until the "starting resistance" is overcome and it has reached the stage of "running resistance." The rheostat or other "current control" is now adjusted so that the milliamperemeter gives a reading of one. The reading of the qualimeter is now noted and a radiographic record made of the Benoist instrument. Let us assume that the observation yields the following: milliampere, 1; qualimeter, 9; Benoist, 10. The actuation of the tube is continued until it becomes hot and another reading of the

*Read at the Fourteenth Annual Meeting of the American Roentgen Ray Society

three instruments recorded. In fact, frequent readings should be made during the experimental treatment. If, during the exposure, the qualimeter reading becomes less and the milliamperage higher, it must be ascertained what relation exists between these readings and the Benoist scale. These observations should be repeated over a period of several days to see if the tube is trustworthy before it is used for radiotherapeutic purposes. It is not necessary to "dose" a tube at the beginning of every treatment, although it is advisable to adjust the "constants" and obtain a fluoroscopic reading of the radiochromometer. In this manner and with a little practice only a moment is required to obtain a reasonably accurate reading before or during the treatment and if the tube, fluoroscope and operator are suitably protected, there is no danger to the last.

It seems hardly necessary to say that these three instruments—radiochromometer, qualimeter and milliamperemeter—may be employed in connection with all of the various types of exciting apparatus. The relative value of the readings, however, will be altered. That is to say, the tube must be "dosed" for quality whenever the quality or quantity of current is changed. This not only applies to a change, for instance, from coil to interrupterless transformer, but, also, whenever a different type of interrupter is employed or, in fact, whenever any "working-constant" is altered. A great source of trouble with coils is the inverse current. Not that its elimination is such a source of anxiety, but rather the resistance in the valve tube. If for instance, a tube is "dosed" with a valve tube of low resistance in the circuit and, later, this resistance materially increases, it may alter the relation between the readings of the three instruments already mentioned.

The reading of the radiochromometer is associated with certain difficulties with which you are all familiar. But we would

like to call attention to a few pertinent facts. This instrument, of course, records only the maximum penetration. In making a radiograph of the radiochromometer an over-exposure or an under-exposure may alter the reading, so it is advisable to give the correct time; in fact, it is advantageous to make several exposures of different lengths. The distance from the tube may make a difference and, although we have found this of greater theoretical than of practical importance, yet it is probably better to make the exposure at the regular "working distance." The radiochromometer, like all the so-called instruments of precision, does not fulfill theoretical requirements, but we have found it suitable for practical purposes. Finally, it may be said that other penetrometers, such as the Walter or Benoist-Walter, may be utilized. This is simply a matter of personal preference.

In regard to the qualimeter, we have not as yet detected any important eccentricities. A little experience with this instrument is, however, essential for the proper interpretation of its readings. It does no more than the parallel spark-gap, excepting that one has a scale of figures to be guided by. We have found it to be a very useful instrument. There are other qualimeters on the market, but we have had no experience with them. Suffice it to say that with the three instruments under discussion, it is possible to estimate the quality of ray employed with sufficient accuracy for practical purposes.

This brings us to a consideration of the X-ray tube. For many years it was difficult to obtain tubes that would maintain a constant vacuum for a sufficiently long period of time. Improved regulators, better methods of exhausting and the use of air and water for cooling purposes, have overcome this difficulty to a large extent. It is now possible to obtain tubes that will emit "hard" rays during one or two or even several epilating doses. We will state, here,

although more will be said on this subject, that we always employ "hard" rays for radiotherapeutic purposes.

We can now take up the question of the estimation of the quantity of ray employed.

QUANTITY

After considerable experimental and practical work with many of the various methods of quantitative estimation, we have selected the Holzknacht radiometer (not the chromoradiometer) for routine use. A very good description of this instrument will be found in an article by Stein (*Med. Rec.*, May 20, 1911). While space will not allow of a detailed description of the radiometer, there are some features to which we desire to call attention. The index consists of a suitably tinted celluloid band. The colors run from zero to 8 H units. The "measuring" or "reacting" pieces are pastilles of platino-cyanide of barium. The estimation is made by placing a half pastille under the colored celluloid band. Another half pastille is exposed to the X-ray, covered with colorless celluloid and placed in contact with the "index" half pastille, but outside of the colored band. The whole pastille is now moved down the scale until the two halves match in tint and a reading is made. The advantage of this scheme over other types of radiometers that depend upon the double cyanide of barium, should be obvious. The objection to the Sabouraud-Noiré instrument is that there is no graduated color scale. Tints A and B are painted in water-color on cardboard and they lack the peculiar gloss of the pastille. The Hampson radiometer (*Archiv. Roentg. Ray*, Aug., 1911), possesses a graduated or fractional color scale prepared by tinting cardboard with water-color. Here, too, there is an absence of the gloss that is necessary for an accurate comparison. Again, there is a piece of black cardboard between the two half pastilles which seriously interferes with accurate and prompt com-

parisons. Another objection to these instruments is that it is not always possible to obtain pastilles that will match the Sabouraud tint A or the Hampson zero.

These objections are largely, if not completely, overcome by the Holzknacht radiometer. Here, the zero tint is one-half of the pastille employed for measuring the quantitative dose.

DOSAGE

Holzknacht units are now employed rather universally and they have, of course, certain values which must be thoroughly understood. These values are as follows: 1 unit is $\frac{1}{3}$ the quantity of ray required to produce a slight erythema of the skin of the face of an adult. The following doses may be applied to obtain the maximum effect without visible reaction: middle-aged adults—face, 2 H; head and joints, 3 H, body 3.5 to 4 H; children—1 H, 2 H, and 3 H, respectively; aged individuals—3 H, 4 H, and 5 H, respectively. One H unit corresponds to 2 X units of Kienböck's scale and 5 H matches the tint B of Sabouraud and Noiré's original radiometer. The H units are accurate only when a "medium" ray is employed—No. 5 Walter-Benoist or Benoist No. 6. This is an important point to remember, as the following will illustrate: It has been stated that 5 H equals tint B. This is true so far as color is concerned, but not necessarily as to biological effect, because Sabouraud and Noiré employed "hard" rays. In other words, tint B or 5 H will produce a temporary alopecia if "hard" rays are used, while an erythema and even a permanent alopecia may result if the same amount of "soft" or "medium" rays is administered. It is seen, therefore, that the biological effect of the H units will vary in accordance with the quality of ray. As an additional example the following may be cited: 6 H, B 5 or 6, will produce a severe reaction. Now, everything else being equal, the same amount of B 9 or 10 ray will produce very little reaction or none

at all. It will require about 9 or 10 H of a B 9 or 10 ray to produce the same result as obtained with H 6, B 5 or 6.

PERSONAL EQUATION

It must be understood that the results mentioned in the last paragraph have been obtained by the technique as described in this article. We are not prepared to state just how much influence personal equation may have. That it is an important factor must be admitted, but we believe that with careful attention to technique it will cease to be a disturbing element. With the technique herein described there are two essential requisites, namely, the accurate estimation of both the quality and quantity of ray. Personal equation must, therefore, be in relation to one or both of these factors. And inasmuch as the determination of quantity depends upon the detection of slight color changes in the pastille, while the estimation of quality is determined by noting changes in density in the photographic plate, it would seem that the question of personal equation is more or less one of ability of the eye to recognize these modifications in color and density. This subject will be discussed more fully under the heading of color blindness. Of course judgment, conservatism and common sense are necessary in determining the amount of ray to be administered in a given instance. Faulty technique, lack of judgment, carelessness, recklessness, faulty color vision, incomplete records, etc., are all factors that combine to produce the so-called personal equation and human fallibility.

That personal equation can be negated to a large extent is shown by the fact that we have worked independently, with both the coil and transformer, and it is astonishing how closely our results agree. On the other hand, there are some published reports that do not correspond with ours and which we are unable to explain. For instance, Pirie (*Arch. Roentg. Ray*, April, 1911) states that he has applied 4 epilating

doses of a B 3 or 4 ray to epitheliomata. As a result of one such treatment the lesions completely involuted; the degree of reaction produced was not mentioned. This dose represents about 20 H units of a "soft" ray, which, with our technique, would produce a third-degree radiodermatitis. With our technique we can obtain a well-marked first-degree reaction with 4 H, B 6, or 8 H, B 9 or 10. We would not dare to administer over 20 or 30 H of a B 9 or 10 ray even when filtered through 3 millimeters of aluminum. And yet, when one of us visited Pirie, it was found that his technique did not differ materially from ours so far as dosage is concerned.* In other words, he gave an epilating dose consisting of 5 H with a "hard" ray. We cannot explain these discrepancies. It does, however, accentuate the fact that every individual must develop his own technique.

CHOICE OF "HARD," "MEDIUM" AND "SOFT" RAYS

Space will not permit of a discussion of the relative values of rays of different qualities, nor of the selection of varying qualities for different conditions. Formerly, like almost everyone else, we favored the use of "soft" or "medium" rays in the treatment of superficial conditions, but now, as a result of experience in practice as well as of experimental work we have developed a marked preference for "hard" rays in nearly all cases. The explanation of the superiority of "hard" rays may be found in the fact that penetration is essential, even in affections of the epidermis, in order to pass through areas of hyperkeratosis or parakeratosis, etc. Again, even a "hard" tube possibly emits all the "soft" rays that are necessary to affect the most superficial tissues.

There is, in addition, a very important point to be considered in connection with the use of "hard" rays, namely, *latitude*. A

*In the discussion of this paper, Pirie stated that he gave these large doses for the destructive effect and that a severe radiodermatitis always resulted.

pastille will, seemingly, be influenced more by "hard" than by "soft" rays* and, also, the "soft" rays affect the superficial tissues more profoundly than do the "hard" rays. In other words, and to be practical, when "soft" rays are employed, the estimation of the dose must be more accurate than is necessary in the case of "hard" rays.

As a routine we employ a B 9 or 10 ray. The quality is never allowed to fall below B 7, even if it is necessary to employ several tubes during a treatment. There is enough latitude to allow of a gradual fall from B 10 to B 8 or even, perhaps, B 7, but, of course, it is preferable to maintain a constant quality. The dose employed in a given case depends upon so many factors, such as location, age, disease, result desired, etc., that it is extremely difficult to formulate a dose standard. It is well to begin with small doses—fractional-dose method—aiming to give a maximum dose during a period of 3 or 4 weeks. The dose-table already given will suffice for this purpose. After the necessary experience has been obtained, massive doses can be given. A period of at least 4 weeks must elapse between massive doses. If there has been a sharp reaction it is preferable to wait 6 or even 8 weeks before repeating the dose. Irritating or stimulating chemicals must never be applied for from 1 to 2 weeks previous to, nor from 5 to 6 weeks subsequent to a massive or intensive X-ray treatment. Large doses should never be administered to the lesions of mycosis fungoides without testing the toleration, for not only are the lesions of this disease very sensitive to the X-ray, but a rapid resorption of disease products may produce alarming and dangerous systemic symptoms.

Well-measured, massive or intensive doses give superior results in affections such as epithelioma and tinea tonsurans, but the method of administering an erythematous dose in 3 or 4 sittings over a period of 3 or 4 weeks will produce admirable re-

*This is an accepted but a debatable fact. We are inclined to believe that "soft" rays have a more profound effect on the pastilles than do the "hard" rays.

sults in most of the dermatological disorders that are amenable to radiotherapy and it is unquestionably the best method to begin with. This communication, however, is not for the purpose of advocating either fractional or intensive doses, but an attempt to outline a technique for the direct measurement of the dose, whether it be large or small.

FILTRATION

The Holzknecht radiometer and the pastilles may be used to estimate the dose of a filtered ray—the only difference being that a different construction or interpretation must be given the scale of units. For instance, 1 unit of a filtered ray will produce a different effect than the same amount of an unfiltered ray. The value of, or the biological effect of 1 unit will vary to a certain extent with the thickness of the filter and the character of the material of which it is composed. For deep effects we employ 3 millimeters of aluminum and a B 10 ray or even a "harder" ray if it is obtainable. We place the pastille on the skin, the aluminum directly over it and place the anode at a distance of 6½ inches. The dose will range from 8 to 20 H, depending upon the disease, the location, the age of the individual, the effect desired, etc.

IDIOSYNCRASY

This is an extensively discussed subject and one upon which hardly any two radiotherapists will agree. Largely for the sake of convenience, we consider idiosyncrasy as a characteristic hypersensitiveness for which no explanation can be offered. This hypersensitiveness should be generalized and constant and independent of health or disease. Every other unexpected reaction we ascribe either to an unavoidable error in technique, or to hypersusceptibility. Examples of the latter are common: blonds are, perhaps, a little more susceptible than are brunettes; females a little more than males. Children respond more readily

than do adults; aged individuals least of all. The face is the most sensitive part of the body; the body and scalp the least. The lesions of mycosis fungoides are sometimes exceedingly hypersensitive. The skin over a goitre is at times somewhat hypersensitive. Eczema, psoriasis and a few other diseases may fail to tolerate full doses. Local irritants, such as iodine, chrysarobin, tar, mercury, etc., will produce hypersusceptibility. If idiosyncrasy and hypersusceptibility are held to be synonymous then the former most surely does exist. In any event, beyond the instances just mentioned, idiosyncrasy must be very uncommon. For the most part reports of cases of idiosyncrasy emanate from men who employ the indirect methods of measurement and when they have acquired experience and skill with the direct measurements, or with a combination of the direct and indirect methods, they cease to encounter examples of true idiosyncrasy. A glance at the literature of the past will convince one of this fact. Think of the thousands of cases of ringworm of the scalp treated in England and France without a single instance of idiosyncrasy. There have been untoward results, but these have been proved to have been caused by hypersensitivity produced by irritants or to a discoverable but unavoidable error.

In concluding this subject we desire to say, that even if the terms idiosyncrasy and hypersusceptibility are separated, we do not and cannot deny that true idiosyncrasy to the X-ray does exist. The most we are willing to say is that it must be uncommon.

"SKIN DISTANCE" AND "PASTILLE DISTANCE"

It is customary to place the pastille exactly half way between the anode and the skin. The reason for this is that the pastille, being closer to the anode, will assume a deeper color when in this position than when placed upon the skin and, therefore,

supposedly greater latitude is obtained in estimating the change in tint. Paradoxical as it may seem, the deep orange shades are harder to match than the paler colors. Not only are the green, yellow and lighter orange tints easier to match, but they do not fade so rapidly when they are exposed to light and moisture. Contrary to what has been published, the color acquired by an exposed pastille will fade almost as rapidly under the influence of strong artificial light as by the action of daylight and the deeper orange tints will attenuate far more rapidly than will the paler colors. These are some of the reasons why we prefer the full "skin distance" for the pastille. There are, also, other very important reasons: the numerals on the scale of units of the Holzkecht instrument are not equally spaced. The distance between zero and 1 is $\frac{6}{8}$ of an inch; that between 1 and 2 is $\frac{5}{8}$ of an inch; between 2 and 3, $\frac{5}{8}$; between 3 and 4, $\frac{4}{8}$; between 4 and 5, $\frac{3}{8}$; between 5 and 6, $\frac{2}{8}$; and between 6 and 7, $\frac{1}{8}$ of an inch. It can be seen, therefore, that one has considerably more latitude in comparing the lighter than in estimating the darker tints.

To overcome this last difficulty, it has been suggested that when 2 units are to be administered, two pastilles be used, each being colored from zero to 1. If this is done $2\frac{1}{2}$ instead of 2 units will be given, because we have found that from 1 to 2 equals from zero to $1\frac{1}{4}$.* This can be explained in another manner: A pastille starting at zero is allowed to acquire a color equal to 1 unit. Another pastille is now started at zero and the exposure arrested when the first pastille registers 2 units. The second pastille will now read $1\frac{1}{4}$ units. When, therefore, 2, 3, 4 or 5 units are to be applied to one lesion, only one pastille should be used. That is to say, the only way in which 5 units can be accurately measured is by having one pastille start at

*We have not, as yet, been able to definitely ascertain whether this defect is in the pastille or in the colored celluloid band. It is possible that the pastille, as it becomes colored, gradually loses its sensitiveness.

zero and continue to 5 H at one sitting. If, however, it is desired to apply 1 unit to one lesion and a similar quantity to another area, it is advisable to employ a fresh pastille for each exposure. This is, obviously, a point to be considered in giving fractional doses. In this connection, however, it must be realized that a dose sufficiently large to produce an erythema when applied at one sitting, will not produce this reaction when divided into several treatments at weekly intervals.

Now to return to the "skin distance" and why it is to be preferred to the placing of the pastille at "half distance." The pastille must be placed at least one inch from the wall of the tube to avoid the deleterious influence of heat. Now, if the tube has a radius of $3\frac{1}{2}$ inches, it would be impossible, with the pastille at "half distance" to bring the anode closer than 8 inches from the skin. On the other hand, when the "skin distance" is used, the anode can be placed as near as $4\frac{1}{2}$ inches, which will materially shorten the exposure and prevent overheating of the tube.

With the "half distance" position, it is not infrequently necessary to change tubes during a treatment and when this is done it is, of course, essential that the relative distances between anode, pastille and skin are not altered. This difficulty is not encountered with the "skin distance." Again, with the "half distance" the area to be treated must be firmly fixed, for, if it should move toward the tube, the dose would be underestimated. With the pastille on the skin it makes no difference if the part does move, so long as the pastille remains in the path of the direct rays.

With the pastille on the skin does the distance of the anode from the skin make any difference? Theoretically it should, because, with the anode at 5 inches one might suppose that more ray of low penetration would be absorbed than with the anode at a distance of 10 inches. On the other hand, it might be suggested that at 10

inches more hard rays would be arrested by the skin than at 5 inches. Without entering further into a discussion of this subject, we will say that it apparently makes very little if any practical difference how far or how near the anode is to the skin so long as the pastille is not less than one inch from the wall of the tube. There is, however, one obvious exception to this statement, namely, that there will be a difference in the size of the surface covered by the exposure. Although not necessary, it is advisable and we advise and employ a fixed "working distance" and for this purpose $6\frac{1}{2}$ inches appears to answer all requirements.

With the pastille on the skin, regardless of the distance of the anode, the H units must be multiplied by four to conform with the law of inverse proportion to the square of the distance. That is to say, if 1 unit is administered in this manner, it will equal 4 units by the "half distance" method.*

We now employ the "skin distance" exclusively and believe it to be more accurate and more economical in point of time and effort.

PRESERVATION OF PASTILLES

The fresh pastille is of a brilliant green color. It is advisable to have a standard of comparison for fresh pastilles. Such an index may be made by tinting cardboard with water-color and covering this with a coating of gum-arabic for the purpose of preservation and to produce a shiny, brilliant surface. If a new consignment fails to match the index, the pastilles should be rejected. As a matter of fact, it is seldom that a new lot of pastilles accurately matches the index and although this makes a marked difference with some radiometers, it is of no great moment when the Holzkecht instrument is employed unless, indeed, the color is very faulty. As a matter of fact, and after considerable experience, we can say that it is possible to employ

*The doses mentioned in this communication are estimated with the pastille at "half distance"; that is, they have been multiplied by four.

used or unused pastilles that register as high as 1 unit, but it is decidedly advisable to adhere to pastilles of normal color.

Pastilles should be "en route" from the manufacturer for as short a time as possible and they are to be placed in a well-ventilated humidor as soon as received. The humidor should be made of glass and kept in a cool room that is illuminated by daylight. A pastille that has been exposed to the ray can be returned to about $\frac{1}{2}$ H by exposure to moisture and daylight. Excessive heat (above 110° F.) will color the chemical and the original color of a tablet so treated cannot be restored—in fact it cannot be reduced at all. For this reason a pastille should never be exposed to sunlight.

CHOICE OF PASTILLES

All radiometers are supplied with a set of pastilles. For use with the Holzknecht instrument half pastilles, suitably mounted and presumably of German make, are furnished. We have experimented with German, English and French pastilles and have found them equally reliable. The English pastilles can be obtained more quickly, but it is necessary to cut and mount them for use with the Holzknecht radiometer and this is some trouble.

METHOD OF USING THE HOLZKNECHT RADIOMETER

The "index pastille" is removed from the humidor and placed in its proper position on the instrument. A fresh half pastille is then also placed in its proper position. The two half pastilles should match accurately at zero. The "reacting" half pastille is then covered with a thin piece of black paper for the purpose of protecting it against heat, moisture and dust. It is then placed upon the skin directly under the anode. When treating convex surfaces care should be taken to prevent any portion of the skin from being nearer the anode

than is the pastille. The pastille is then fixed to the skin by court-plaster and the part to be treated immobilized. A little experimenting is necessary in order to determine how soon and how often the pastille should be examined. It is advisable not to examine too often, nor should the examination be too long, for fear of the color fading. The first examination should be at the end of a minute or two and may be very short. The careful comparison is made at or near the termination of the dose. It is advisable to experiment a little before treatments are undertaken, in order to educate and train the eye, and for the purpose of estimating the time required for the various color changes. For this reason it is preferable to employ all the indirect methods of quantitative estimation and employ the pastilles for a control or a "check." We believe that pastilles should be employed for every treatment, instead of depending upon any method of "dosing" the tube for quantity.

When the exposed pastille is ready for examination it is again placed in the radiometer. The instrument is held against a black background in a dimly lighted room. The light from a shaded, 16-candle-power electric incandescent bulb or other source of artificial light is allowed to illuminate the instrument and the sliding arm moved up and down until a register of colors is obtained, and a reading made in H units. It is advisable to employ always the same source of light and always at the same angle of incidence. Daylight should never be used for this purpose.

Of service in this comparison, is a piece of black paper so cut as to exclude from vision everything but the two half pastilles. This same idea may be advantageously utilized in studying the Benoist instrument.

It should be borne in mind that the colored celluloid bands may vary a little in tint. We have compared several radiometers and have found them to be the same, but the possibility of variations and defects must be kept in mind. It is possible, too, that the

color in or on the celluloid may fade. We have compared old and new radiometers and have failed to detect variations, but, nevertheless, it is well to appreciate the possibility. Care must be taken to see that the celluloid band is in its proper position on the instrument.

RELIABILITY OF THE PASTILLES

We have conducted a variety of experiments to test the reliability of the pastilles and what is written under this heading may be of interest to those who desire to use them. The observations have been made many times and carefully controlled. To save space it will suffice to give conclusions rather than enter into a detailed description of the experiments.

We have never detected any variations in the reaction of the pastilles. For instance, if 3 normal-colored pastilles are exposed to the extent of 1 unit, at one time, they will all register the same. If 3 old pastilles are employed for this purpose, each one registering $\frac{1}{2}$ unit at the start, they will all measure 2 units when this point has been reached. The main reason why we advise against the use of previously exposed pastilles is because of the loss of latitude. For instance, it is easier to obtain an exact registration of the color at zero than at any other portion of the scale. In other words, a certain amount of error is likely to be made in matching colors after leaving zero and the possibility of error is increased as the deeper orange shades are reached. Now, if an error is made both at the beginning and at the termination of the exposure, it may be more than the latitude of safety will allow. Another reason is the defect in the scale, or in the pastilles, which has been described in another section of this communication.

It is a well-known fact that heat and dryness will enhance, while moisture will retard the coloring of a pastille.

In our experience, with the precautions already enumerated, neither the heat of the

tube nor New York's warmest weather (95° F) will seriously interfere with the correct action of the pastille during a treatment. Indeed, if heat from either of these sources were to enhance the coloring of the pastille during a treatment, the only result would be an overestimation of the dose—an error on the side of safety. It has been claimed that heat and dryness not only add to the color of a pastille, but that they also lessen the sensitiveness of the chemical to the X-ray. This is true of excessive or long-continued heat and dryness, but we have found that these factors are of very little practical importance so far as the actual treatment is concerned. It must be remembered, however, that excessive heat in New York is associated with a high degree of humidity, and that the high temperatures of some countries, where the humidity is low, may really be an important factor. We do not believe that this fact need cause alarm, so long as the possibility of such an effect is appreciated.

Excessive humidity is likely to prove to be a more disturbing factor than heat and dryness. This, too, we have found to be of little practical importance, but certain precautions must be taken. In the first place, we have found that while moisture will very rapidly reduce the deep orange tints, the effect is not nearly so marked in the case of the paler colors. Nevertheless, it is advisable, on very moist days, to make the treatment of reasonably short duration, or, if it is a long one, to make allowance for loss of color. A more important point is, in the case of an unavoidable interruption in the treatment, to read the pastille at once and then make another reading when the exposure is about to be continued. A little experimental work will soon give one the necessary knowledge regarding the effect of heat, moisture, etc., on the pastilles. These factors should not cause an error in the dose, at least not enough to overcome the latitude of safety.

COLOR BLINDNESS; EYE DEFECTS; EYE EDUCATION

The ability to detect slight color changes and to quickly and easily match tints, varies considerably in different individuals. Some eyes are endowed with this ability, while others must be trained or educated by practice. For this reason, experience with the pastilles is necessary before they are employed for practical purposes. For this reason, also, the dose must not be started by one individual and finished by another. That ordinary color blindness is an important factor in this work has not been proved. If for instance, one operator considers that a pastille in the Holzknecht radiometer matches at zero, while another believes it to register $\frac{1}{4}$ unit, and the first individual will color the pastille to match 1 unit, the second will read the dose at $1\frac{1}{4}$ units. In other words, the dose will be the same in both instances. In most cases of marked color blindness the individual can detect a slight change in tint, but will be unable to name the true color. For example: a person might say that the original pastille is red instead of green, that the first change in color is a brownish-red instead of a yellowish-green, but he detects the change in tint and it is quite possible that the relative value of the color change is the same as with the normal eye. Unexposed pastilles, while appearing green to the eye, are, according to Corbett (*Brit. Journ. Dermat.*, Aug. 1913), who has experimented with the Lovibond tintometer, a mixture of yellow and blue. Under

exposure to the X-ray the blue gradually disappears and there is only the yellow. Red then appears in increasing proportion, causing the tint to become deeper in tone. The proportion of yellow remains constant throughout. Color blindness may be in relation to any one or all of these colors, but this will not necessarily be a disadvantage if the individual can detect a change in tint as quickly as can the normal eye. It is possible, of course, that eyes exist that are unable to detect variations in tint. An individual possessing eyes with this defect, cannot, of course, employ the pastille method of measurement. It is probable that the ordinary eye defects can be overcome by training and education. In any event we are not very conversant with the subject of color blindness, and it might be well for every radiologist to have his eyes examined before undertaking this work.

In conclusion, the experiments of Corbett's with the tintometer are extremely interesting and valuable, and it is not improbable that as a result of these observations, an instrument will be devised for the estimation of quantity that will be more accurate than the Holzknecht radiometer.

We desire to express our gratitude to Dr. John A. Fordyce for his kindness in placing unlimited clinical material at our disposal; and also to the entire staff of the Dermatological Department of the College of Physicians and Surgeons for their kindly interest and help.

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TECHNIQUE IN RADIOTHERAPY WITH ESPECIAL REFERENCE TO DEEP THERAPY AS PRACTICED AT FREIBURG BY KRONIG AND GAUSS

By ARTHUR F. HOLDING, M. D.

It may surprise even Roentgenologists to know that a review of the medical literature from 1896 to 1909 shows that during that time 3,134 cases of malignant conditions alone had been treated by the X-Ray and reported.¹ This does not include cases of non-malignant skin diseases. Most of these cases were reported as either cured or improved. How many indifferent, bad or good results of X-Ray therapy there are that have not been published, nobody knows.

A review of the literature² presents the following significant results obtained by the use of Roentgen Rays in some gynecological conditions, and particularly in cases of myoma, metrorrhagia, and menorrhagia.

MYOMA

Number of cases treated	794
Number of cases still under treatment.	60
Number of cases which continued treatment	27
Number of cases lost track of.....	40
	—127
Number of cases treated in which results are known.....	667
Number of cases cured	376 or 56.2%
Number of cases improved	208 or 31.1%
Number of cases unimproved	74 or 11.1%
Number of cases relapsed	7 or 1.0%
Number of cases dead	2 or 0.29%
Number of cases which developed an X-ray erythema	52 or 7.8%

METRITIS, ENDOMETRITIS, MENORRHAGIA OR MENOPAUSE

Number of cases treated	353
Number of cases still under treatment.	39
Number of cases which discontinued treatment	33
Number of cases lost track of.....	10
	— 82
Number of cases in which results are known	271

Number of cases healed	127 or 46.8%
Number of cases improved	111 or 41.0%
Number of cases unimproved	28 or 10.3%
Number of cases relapsed	4 or 1.5%
Number of cases dead	1 or 0.4%
Number of cases which developed an X-ray erythema	11 or 4.1%

A study of the indications and contraindications³, as deduced from the literature on the subject, shows that

- (1) Roentgen treatment is indicated in
 - (a) all cases of myoma in elderly patients, particularly if the size of the tumor is stationary
 - if there is no bleeding
 - if the tumor does not cause kidney or heart blockade
 - if the tumor does not crowd the pelvis.
 - (b) cases of myoma, if the patient is deeply anaemic, diabetic, nephritic, bronchitic, arteriosclerotic, or possessed of a bad heart or large thyroid.
- (2) Roentgen treatment is contraindicated in
 - (a) large, rapidly growing tumors
 - (b) all submucous polypoid growths
 - (c) adenomyomata
 - (d) infected or degenerating cases, or those suspected of malignancy
 - (e) cases of women below 40 yrs. with free bleeding and rapid development of the tumor.

Based on the premises established by the large number of cases reported, it is but a logical conclusion that Roentgen therapy is established in scientific medical procedure, and cannot be ignored nor discredited by real scientific leaders of the medical world.

It is noticeable that the number of good results obtained varies directly with the attention given to technique.

One of the most important advances in the technique of scientific radio-therapy was the measurement of the erythema dose,

which was soon followed by the administration of a massive dose, usually at a single sitting. The next improvement in technique was aimed at the generation of an increased number of hard, penetrating rays, delivered so as to get a maximum effect on deep tissues and a minimum effect on the skin. The most notable developments of this later step in technique has been perfected in the Gynecological Clinic of the University of Freiburg, by Kronig and Gauss, in connection with the treatment of myomata and allied gynecological conditions.

Beginning in 1906 Gauss started treating selected gynecological cases with the Roentgen Rays giving three treatments per week, with a medium hard tube, at 15 cm. focus skin distance, filtering through a Kolpeuryter, using 2-3 m. a. of current through the tube, each treatment lasting five minutes. Subsequently, the rays were filtered according to the method of Perthes, and an attempt was made to utilize the homogeneous rays of Dessauer.

Twenty-five cases were treated by the Albers-Schoenberg technique, consisting of a full pastille dose given in three sittings, using a tube reading 6-8 Walter; focus skin distance, 38 cm.; each sitting lasting about six minutes; 3-5 m. a. passing through the tube; each series of treatments being followed by an interval of fourteen days before a second series of treatments was begun. The skin over the area treated was compressed and the X-Rays were filtered through a layer of aluminum or tin.

Results were obtained by these methods, but the patient's treatments extended over 3 to 5 months. In order to shorten this period of treatment extensive experiments were carried out to utilize the greatest number of deep penetrating rays, without bad effect on the skin. It was found that by using filters of aluminum 3 m. m. thick, with a layer of leather or a layer of sensitized paper, with tubes reading Walter 6-8, a given area of skin could be given twice

the usual erythema dose without danger. By treating only a small area of the skin at a time and "cross-firing" the rays so that the rays were directed toward the seat of the pathological process and only allowing a given area of skin to be rayed "once in a series" 150 to 230 erythema doses have been administered to a single case without any ill effect on the skin and with decided therapeutic effect on the tumor.

A series of treatment lasts not less than three hours. To illustrate the program of treatment, I give a synopsis of two cases selected from the last 10 cases reported in the monograph by Kronig, Gauss and Lembke.⁴

Case 196—(which received the maximum dosage in the series) Diagnosis, Myoma of the uterus, tumor extending above the umbilicus.

	Days
Series 1—366 Kienbock units (X) administered in two successive days.....	2
Interval	18
Series 2—549 X, administered in one day....	1
Interval	20
Series 3—331 X, administered in two days...	2
Interval	20
Series 4—322 X, administered in two days...	2
Interval	18
Series 5—321 X, administered in two days...	2
Interval	22
Series 6—392 X, administered in one day....	—

Total, 2281 X

Period of time under treatment.....107

Case 197—Diagnosis, Myoma extending within three fingerbreadths of the umbilicus.

	Days
Series 1—330 X, administered in three successive days	3
Interval	18
Series 2—368 X, administered in one day....	1
Interval	28
Series 3—234 X, administered in two days...	2
Interval	17
Series 4—146 X, administered in one day....	1
Interval	18
Series 5—152 X	1

Total, 1230 X

Period of time under treatment..... 89

The arrangement of the patient in relation to the tube and the areas of the skin treated are illustrated in Figs. 1 and 2. When using a 220 volt current, 10 to 15 X can be administered to a given area of skin in 6 to 7 minutes; when using 110 volt cur-

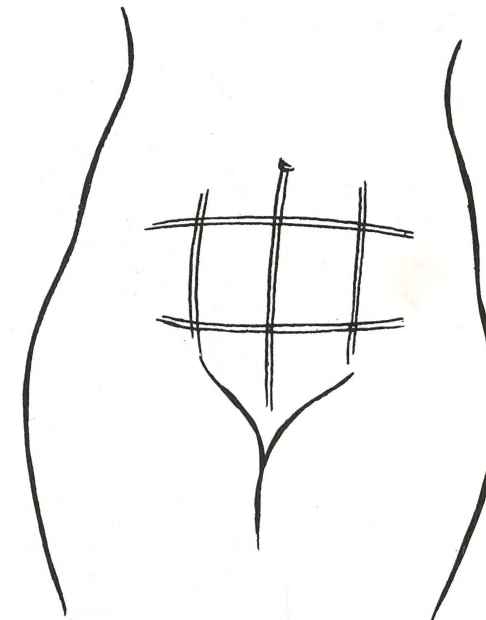


FIG 1.

rent, in 7 to 8 minutes; so that if treatment is administered over 21 skin areas, the total time consumed, allowing for no interruptions or delays, will last 3½ hours.

In order to be able to administer such protracted treatments as well as to take advantage of the fact that there are a greater number of deep penetrating rays when the tube first lights up, a device for rhythmically interrupting the current to the tube is used (the *rhythmeur*). A double bulbed, water-cooled tube with constantly circulating water is used. An air insulated induction coil which has in addition to the usual outfit, condensers and a *rhythmeur*, is also recommended.

The advantages claimed for the Freiburg technique are:

- 1—Results obtained in the shortest possible time.
- 2—Utilization of a greatly increased amount of X-rays.
- 3—Without danger to the skin.

Kronig and Gauss have reported favorable results in carcinomas of the face, breast, rectum and uterus. Ashoff, Kronig and Gauss⁵ have reported a series of twenty-five abdominal cases, which an exploratory

laparotomy proved to be inoperable carcinomata of the abdominal or pelvic organs. Histological sections were obtained, and limited areas of the lesions were rigorously treated. At necropsy sections were taken from these rayed areas, and they showed marked degeneration or absence of the carcinoma elements and their replacement by connective tissue.

Bumm and Voights⁶ have reported thirteen cases of carcinoma of the cervix and four cases of carcinoma of the vulva and vagina that were treated by Roentgen deep therapy, in combination with mesothorium. These cases were all inoperable and were so favorably influenced by the treatment that they became operable with good results. The cases received from 62 to 10,000 X of Roentgen rays, and from 6,200 to 25,540 mg. hrs. of mesothorium, treatments lasting from 19 to 84 days. A noticeable tendency in the series of cases reported to increase the mesothorium treatments and diminish the amount of X-Rays used is significant.

While there will undoubtedly be more or less dispute, not only as to whether X-Rays shall become the method of preference for the treatment of selected gynecological cases as well as to whether the three to five hour treatments of the Freiburg technique have sufficient advantages over the simpler methods which have given good results in the hands of such men as Albers-Schoenberg, Pfahler, Stern and many others, we are certainly indebted to Kronig and Gauss for having called our attention to several important details or adjuvants to Roentgen therapeutic technique.

The utilization of the Freiburg technique for inoperable malignant conditions is, perhaps, more important at the present period of the development of Roentgen technique than its use in gynecological conditions. Certainly it will meet with an immediate and cordial welcome in this field, where it is sorely needed. Its reception in the gynecological field will largely be de-

terminated by the attitude of gynecologists toward it. The duration of the treatments would seem to be needlessly tedious. They could be greatly shortened by increasing the size of the areas of the skin treated at one time, and although this would not result in such a grand total of figures at the end of the treatment, I venture to predict that the results would be quite as good. However, results are the only arguments admissible.

The fractional, UNMEASURED X-Ray treatment technique should be unsparingly condemned. While we are glad to hear of the advancement in the X-Ray technique, we feel that the widespread treatment of disease throughout the world, applied by men who do not measure their X-Rays and are not careful in regard to their therapeutic technique, especially when such men are stimulated by the brilliant results and enormous dosages published by Kronig and Gauss, can only result in a new era of X-Ray disasters and will tend to further discredit the Roentgen method of therapy. The only way to avoid this, and to safeguard our patients as well as our specialty, is to insist that the technique must be carefully followed out and that no area of skin shall be given more than an erythe-

ma unfiltered, and not more than $1\frac{1}{2}$ times the erythema dose with the rays filtered through at least 3 m. m. of aluminum. It would also be wise to dehematise the skin by compression during the treatment.

In conclusion, let me emphasize that the slogan of success in Roentgen therapy is the same as that of surgery or any other specialty—TECHNIQUE.

REFERENCES

- 1—Bachem, M.—"Die Therapeutische Verwendbarkeit der Roentgenstrahlen," Fort. a. d. Geb. den Roentgenstrahlen. Bd. XIV, Heft 1, Seite 30.
 - 2—Mohr, Ludwig—"Statistische Bearbeitung der von Roentgenstrahlen behandelten Gynäkologischen Erkrankungen," Fort. a. d. Geb. den Roentgenstrahlen. Bd. XX, Heft 2, Seite 105.
 - 3—Dickinson, Robt. L.—"The X-ray in Gynecology," Surgery, Gynecology and Obstetrics, Nov., 1912, pp. 602-605.
 - 4—Kronig, Gauss and Lembke—"Roentgen Tiefen-therapie," pub. by Urban & Schwartzberg, Berlin, Wien. 1912.
 - 5—Ashoff, Kronig and Gauss—"Zur Frage der Beeinflussbarkeit tiefliegender Krebse durch Kraftstrahlen," Munch. Med. Woch., 1913, No. 7, Seite 337.
 - 6—Bumm and Voights—"Zur Technik der Karzinom-bestrahlung," Münch. Med. Woch., 1913, No. 31, Seite 1697.
- 103 Park Ave., New York City.

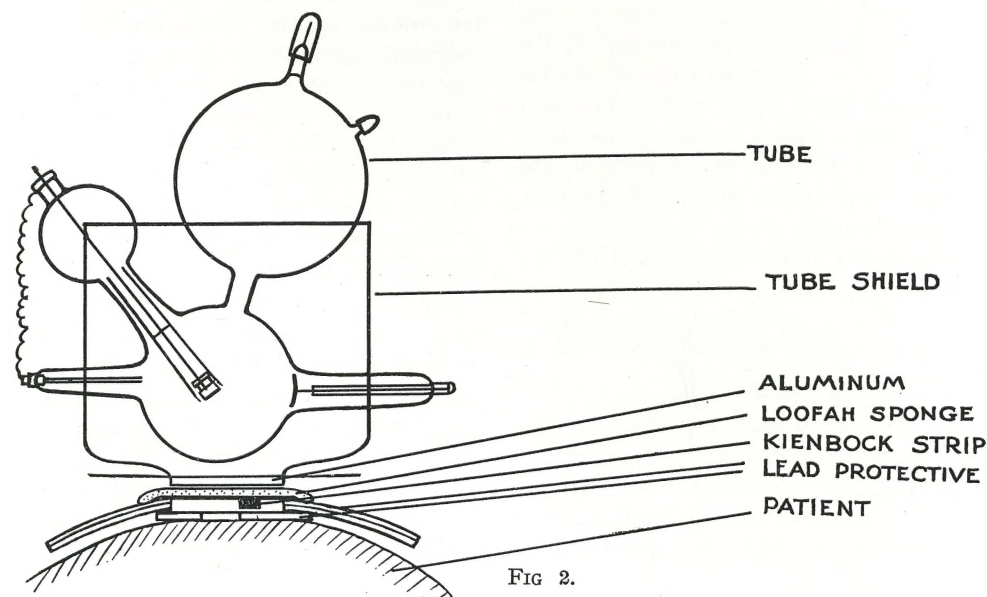


FIG. 2.

DISCUSSION

DR. ROLLIN H. STEVENS, Detroit: Mr. President: I am very glad indeed to hear these papers on therapeutics presented at this time, because I think we have been just a little bit behind our European friends in therapeutic technic. They have been developing this technic for six or seven years past, and we are only just beginning to appreciate it in this country.

I have been particularly interested in the matter of technic from the dermatologic standpoint. I have not taken up the deep therapy as yet, although I am somewhat familiar with the technic followed. There are a number of points in Dr. MacKee's paper which I would like to emphasize. I agree with everything he said, but there are some points about which we ought to be very careful. One is, adopting the uniform distance at which we give our treatments, and methods of keeping that distance constant during a treatment. We ought to have some kind of an apparatus which would shut out the rays and govern exactly the field we are going to treat, and which would at the same time measure the distance. It is a very easy matter to have the patient get some part under treatment a little closer to the tube than some other part, unless there is something between the apparatus and the skin which will keep the tube distance constant. Therefore, I think we ought to have some such apparatus, say in the shape of a cone, which would maintain the tube distance. I have been unable to find anything of that kind in the American market, and the apparatus made abroad seems to be rather clumsy. In fact, the whole apparatus used in giving massive doses is rather clumsy. It is difficult to read the pastille at the right time, keep it in the proper position half way between the anode and the skin, and protect it from the influence of ordinary light. I have used for this purpose some of the glass cones made by the Scheidel-Western Company, having them cut in two and fitted into a

metallic collar which is attached to the base of the glass shield. Filters of varying thickness can be placed in the collar, and through a slit the pastille can be inserted below the filters at the proper distance from the anticathode and the skin. The cones being of glass do not conduct the current and rest directly on the skin, thus keeping constant the distance. It seems to me that we need some apparatus developed along that line which would be very much more convenient to use than anything we have at the present time.

I would like to emphasize the importance of testing the penetration tube frequently. Of course, if we use a water-cooled tube, we will not have so much difficulty as with the ordinary tube. Dr. MacKee dwelt on the importance of penetration of the tube. I use a tube of about seven or eight Benoist. The pastilles I have not always found reliable. I have had several dozen of the Holzknecht-Saboraaud pastilles which would hardly respond to the rays. I also have had a number of the Bordier pastilles which I experimentally rayed for an hour or more without making any change in their color. Therefore, I recommend testing out the pastilles when you get them, to make sure that they are all right.

I think the personal equation enters very much into the treatment. It is utterly impossible with our present apparatus and methods to be watching the pastilles every minute and not interrupt the treatment. Eye defects also make a great difference, and there are many persons who are unable to match colors well enough to use the pastilles with safety.

DR. J. W. HUNTER, Norfolk, Va.: Is any special light used in examining the pastilles? I understand that candle-light is a very good one.

DR. GEORGE E. PFAHLER, Philadelphia: I want to speak on only one point. This discussion should have taken place five or six

years ago instead of to-day. The reason it was not held at that time is that American roentgenologists do not place the confidence in the pastilles which they deserve. This is probably the result of ignorance in the use of the pastilles. I tried them when they first came out and I discarded them because they were unreliable, but the reason they were unreliable is that I did not know how to take care of them. The change in the feeling of the Society to-day is to be credited to Dr. Pirie, who a year ago told us how to take care of the pastilles by keeping them in a moist chamber. When the pastilles dry out, they are unreliable. By keeping them moist in the manner he described they remain in good condition.

DR. A. HOWARD PIRIE, Montreal: Dr. MacKee referred to the fact that I gave four pastille doses at once, and that I get no reaction. That is not the case. I have given six pastille doses on one area at one sitting, and I have seen ten doses given at one sitting, but with the intention of producing destruction, and not with the idea of not getting a reaction. The case in which

I gave four doses was one of a small epithelioma projecting above the skin surface, which I wanted to destroy, and I succeeded in doing so.

DR. EDWARD C. TITUS, New York City: In giving erythema doses we sometimes would like to prevent too severe a reaction. An observation made at Finger's clinic is rather interesting. He found in his investigations that both the violet and the Roentgen ray produced destruction of skin in over-sensitive cases, which is annoying. He advised using a four per cent. esculin ointment with a glycerine base during treatment, and found that in those cases it would prevent skin reaction.

DR. SIDNEY LANGE, Cincinnati: In regard to giving several times the erythema dose, we forget that the upper layer of cells only gets the full dose. The deeper layers of skin do not. Therefore if we want to destroy the upper layers of cells we must give several times the erythema dose, in order to deliver the full dose to the lower layer of cells.

THE USE OF ROENTGEN RAYS IN THE TREATMENT OF GYNAECOLOGICAL CONDITIONS

By GEORGE E. PFAHLER, M. D., Philadelphia, Pa.

The use of the Roentgen Rays in the treatment of gynaecological conditions is no longer a novelty. While it is the last field that has been invaded by the Roentgen therapist, the amount of work done has been so extensive, the number of cases treated so great, the technique so well established, that today it probably holds first place in the field of Roentgen therapy. Both Gynaecologists and Roentgenologists in America have been slow in appreciating the value of this method of treatment. Considerably over 1,000 cases have been carefully recorded in medical literature; at least two books have been written upon the subject; and at the last International Congress of Medicine, a whole session of the combined sections on radiology and gynaecology was devoted to this subject. No greater testimony to the efficiency of this method of treatment could possibly be given, and it is only fair to say that the Roentgenologists were no more enthusiastic in their testimony as to the efficiency of this method of treatment than were the gynaecologists.

On two previous occasions upon this subject (1—"Roentgen Therapy and Gynaecology," New York Medical Journal, June 25th, 1910; 2—"The Treatment of Uterine Hemorrhage by Means of the Roentgen Rays," American Journal of Obstetrics and Diseases of Women and Children, Vol. LXVII, No. 5, 1913), I described the theory of the action of the X-Rays in gynaecology; the indications and contraindications for the treatment and have given a review of twenty-four cases treated. I have treated twenty-eight patients in all. I will not review the case histories in this report, but will try to devote the time to the consideration of the more technical phase of this subject.

THEORY OF THE ACTION OF THE X-RAYS IN GYNAECOLOGY: It has been proven by experiments upon animals and human beings (Albers-Schoenberg⁴, Phillippe⁵, Halberstaedter⁶, Heimicke⁷, that the ovaries and testicles are the most sensitive of all the tissues of the body to the action of the Roentgen Rays and that these can be seriously affected without producing visible effect upon the overlying skin. It is likely that the results referred to in this paper are chiefly due to this special action of the rays upon the ovaries: and secondarily to their direct effect upon uterine fibromata when present.

It is claimed that the menstrual flow depends upon the activities of the ovaries. If the activities of the ovaries send out a stimulus to prepare the mucous membrane of the uterus for the reception of the ovum, and the degree of this stimulation governs the menstrual flow, then the depression of this function will decrease the menstrual flow and finally lead to its obliteration. This same lack of congestion and nutriment probably leads to an atrophy of the fibroids. By decreasing the hemorrhage, at least such pains as are due to the expulsion of the clots, will be relieved, and by decreasing the functions of the ovaries there is probably a decrease in the irritability of the nervous mechanism of the ovaries, thus bringing about, consequently, a relief in the dysmenorrhea of neurotic subjects. The rays have undoubtedly a direct effect upon the tumor tissue, as well.

Saretzky⁸, in a series of experiments upon sixty-two rabbits, found the ovarian tissue to be especially sensitive to the rays and of the ovarian tissue the ripe and ripening follicles were first affected. Only the weakest dose showed no effect. Progress-

sively increasing doses affected, in proportion to the quantity of treatment, first the ripe and ripening follicles, then the pre-follicular cells, and finally the interstitial tissue.

At certain stages he found that a beginning atrophy of the follicles undergoes a regeneration, the ovarian tissue develops anew, and the ovaries entirely regain their functions. If the treatment is persisted in, however, a complete atrophy takes place. He found that if only one ovary was treated, the other ovary and the entire genital tract retained their normal functions and the animal was capable of reproduction.

Based upon these theories and experiments, we easily find the explanation of the fact that as we approach the menopause the quantity of treatment needed to produce sterility and an artificial menopause is very much less than is needed in younger patients in whom the functions of the ovaries are very much more active, and the resistance greater. The resistance of the ovaries in younger people is sometimes remarkable, and on this account the Roentgen Ray treatment is not the method of choice in patients under forty years of age. One patient, age thirty-four, whom I treated over the spleen and abdomen for chronic cyanotic polycythemia, and who received a great deal of treatment over the pelvic region during two and a half years, became pregnant and gave birth to a healthy child, who is now three years old.

In another patient, age 34, who had given birth to two children, and who had suffered from a fibroid for the last three years with the characteristic symptoms belonging to this affection, recovered after the use of 52-X. At the end of a year no tumor could be palpated, and in this case the menses only stopped for two months. At the end of four years she was still having normal menstrual periods and was perfectly well. This is mentioned to show the regenerative powers of the ovaries in young people.

In addition to the action of the Roentgen Rays upon the ovarium tissue, which I believe is the most important function, there is good reason to believe that these rays have an atrophic effect upon the tumor tissue itself, in the case of fibroids. An argument favoring this action is the disappearance of fibroids in women who are treated after the menopause, and I am told that at present in the Frieberg clinic the rays are directed more particularly against the tumor.

INDICATIONS AND CONTRA-INDICATIONS: The great majority of gynecological cases that have been treated by the Roentgen Rays have consisted of fibroids. For indications and contra-indications in this group of cases I cannot do better than quote the opinion of Prof. Menge⁹ and Dr. Eymer⁹, who made a careful study of 164 patients treated with Roentgen Rays in the gynecological clinic of the University of Heidelberg between January, 1909, and the early part of 1912. They give the following indications for Roentgenotherapy in fibroids: "(1) All cases of myoma in older women in whom there is already a well-advanced anemia, which may be the cause of an anemic heart. (2) All elderly and young women with myoma, in whom there is marked organic heart disease, diabetes mellitus, chronic nephritis, marked lung disease, and goiter with cardiac symptoms."

In general the older the patient, and the more nearly she has approached menopause, the more prompt and more satisfactory will be the results. With regard to age, the patients over forty give best results. Under forty Roentgenotherapy is not the method of choice.

The type of tumor will influence the result very much. The intramural or interstitial variety give the best results. The subserous, pedunculated and submucous variety do not give good results and should be operated upon. In the subserous, or submucous varieties, excision might be performed, to

be followed by Roentgenotherapy to prevent a recurrence or further development of fibroids.

Fibroids that have undergone malignant degeneration, or that have become gangrenous should not be treated.

ROENTGENOTHERAPY IS ALSO INDICATED IN METROPATHIC HEMORRHAGE.—Under this heading Eymer and Menge include: (1) Cases of *bleeding* connected with disease of the uterus in which there is no tumor or none recognizable, cases of so-called "metritis"; (2) Cases of hemorrhagic endometritis, and (3) the climateric hemorrhages, which are not malignant in origin.

Roentgenotherapy has also accomplished good results in some cases of hemorrhage connected with *inflammatory disease of the adnexae* (Menge) and is indicated in those cases in which operation is contraindicated for some reason or other.

RESULTS:—The decrease or cessation of the *hemorrhage* is the first result to be expected. This effect is the more prompt the older the patient or the more nearly the menopause has been approached. Generally there is a decrease or cessation of the flow within a month or two after the first two series of applications of the rays, or after one or two full doses of the rays (10 to 20 X) have been given. For the production of complete and permanent amenorrhea, from one to six series of applications, or from 10 X to 60 X are needed, and this usually requires from three to six months. Usually, the period following the first series of treatments is shorter in duration, or the flow is more watery. In one case, No. IX, the bleeding, which had been constant, stopped permanently after the first three applications of the rays (about 9 X). Occasionally the first period after the beginning of treatment is accompanied by more bleeding than before. This is more likely to occur in connection with submucous fibromata, or in cases of severe anemia. Therefore in very anemic women it is advisable to take all precautions and put the patient to

bed after the first series of treatments. If the menses have not ceased after the sixth series, with proper technic, the case is not suitable for this treatment.

With the establishment of permanent amenorrhea, or an artificial menopause, the patient is likely to have the same group of symptoms which occur with a normal menopause. They are more likely to occur if the menopause has been produced rapidly. In my cases only five patients complained of such symptoms as flashes of heat, a full headache and restlessness.

The case referred to above shows that a woman of thirty-four may have a temporary amenorrhea, disappearance of the fibroid, and re-establishment of the menses with recovery of perfect health.

With the cessation of hemorrhage the general health improves, the patient regains color and strength, appetite and sleep improve and the hemoglobin and red corpuscles increase to nearly normal.

The *tumor* is usually last to show any effect; occasionally it decreases in size before the bleeding ceases. Generally there is decided reduction in the size of the tumors at the time of cessation of treatment. For instance, if the tumor extends to the umbilicus at the beginning of treatment, at the end it may be the size of an orange. The tumor continues to decrease in size long after the cessation of treatment.

In one case the tumor originally extended to the umbilicus; at the end of two years it was the size of an orange, and at the end of five years had disappeared.

In another case the tumor originally extended to the umbilicus; at the end of two years it was very much reduced, and at the end of four years could not be found. In twelve of my sixteen patients, 75 per cent, who have ceased treatment, the tumor has disappeared. With the decrease in the size of the tumor, the pressure symptoms disappear.

The question of subsequent malignant degeneration of the fibroid after X-Ray

treatment, has been raised by friends in conversation. There is no case on record in which this has taken place. When one considers that under ordinary conditions with no treatment, 1 or 2 per cent. undergo malignant change, this fact forms another argument in favor of the Roentgen treatment.

The Relief of Pain will depend in great part upon its cause. If it is caused by pressure of a large fibroid, the pain will, of course, not be greatly relieved until there is sufficient reduction in the size of the tumor to release the pressure. If pain is due to hyper-sensitive ovaries, or ovarium excitability, it will be relieved comparatively early because the earliest effect of the rays is shown on the ovaries. Such conditions sometimes exist in dysmenorrhea. The relief of other pressure symptoms, such as constipation, swelling of the lower extremities, irritability of the bladder, etc., will, of course, await the reduction of the size of the tumor, and since this is actually the latest effect to be seen, it may persist for several months after beginning treatment.

METROPATHIA HEMORRHAGIE: Of this group, the climacteric hemorrhages of non-malignant origin have been treated with brilliant results. Generally less treatment is needed than in cases of fibroid, and at times only a few applications of the rays are necessary to bring about a complete menopause. Again the older the patient the more prompt will be the result. It is usually advisable to carry treatment slightly beyond the production of amenorrhea, so as to make it permanent.

Cases of hemorrhagic metritis and endometritis (Menge) are treated in the same manner. In this group it is not always necessary to produce a complete amenorrhea. The production of temporary oligomenorrhea, with relief of all symptoms, may be sufficient, and this can be followed by the establishment of normal menstruation after the regeneration of the ovaries.

HEMORRHAGES IN INFLAMMATORY DISEASES OF THE ADNEXA: In this class I have had no experience, and most authorities have avoided the treatment of such cases. However, since the reports of such careful observers as Eymers and Menge¹⁰ upon their results in this group, the Roentgenotherapy is justified when other palliative treatment has failed, or when operation is contraindicated.

They treated ten patients who had inflammatory disease of the adnexa, who suffered from menorrhagia of long duration, in which other conservative methods were unsatisfactory, and with whom they obtained good results from Roentgenotherapy. (Five of these patients with disease of the adnexæ of gonorrheic origin but with no tumors.) All patients were free from fever at the time of beginning treatment. They were given from ninety-eight to 175 milliamperes-minutes exposure.

One patient, aged forty, with double puerperal tumor, after 118 milliamperes-minutes (eighteen applications) developed amenorrhea. After the first application she had a severe hemorrhage. Later the pains, tumors, leukorrhea and bleeding ceased. In five other cases oligomenorrhea developed. In one case amenorrhea had lasted eighteen months. In three cases temporary amenorrhea was produced. In all there was diminished menstrual flow; in all the leukorrhea diminished, and at times disappeared, but not permanently. The tumors became smaller or disappeared. The subjective symptoms were satisfactory. They believe the results to be due to the rays, since the symptoms were stationary for a long time with other methods of treatment.

TECHNIC

In general, the object of the treatment is to depress, or obliterate, the functions of the ovaries, thus producing an amenorrhea or oligomenorrhea; and to cause an atrophy of fibroids if present, both by the action of

the rays upon the ovaries, and by direct action upon the tumors. This should be accomplished without damage to the skin, the bowels or the lymphatic glands, with a fair degree of certainty, and within a reasonably short time. Therefore the greatest attention must be given to technic. To learn this technic, one must learn the principles of Roentgenography, as well as Roentgenotherapy. It is not easily learned, or more men would know it.

The exciting instrument should give a uniform current of high voltage. For this I prefer the high-speed static machine (forty plates), but an inductor or a transformer may be used.

The tube should be one that will keep a constant high vacuum of 7 to 8 Benoist. If this is allowed to get soft, the rays will be absorbed in the superficial tissues, resulting in a burn, and the deep effect upon the ovaries will not be obtained. I prefer a water-cooled tube with a constant stream of cold water.

The *distance* of the target of the tube from the skin of the patient is 8 inches.

The *field of application* of the rays is over the ovaries and including the fibroid if one is present. The rays should be confined to the area treated as much as possible. If a rapid result is desired, large doses must be given, and since less than a full dose should be given over any area of skin within a month, the field of application must be subdivided in such a manner that by cross firing, an increased dose will reach the ovaries without burning the skin.

It is this sub-division of the skin area which has permitted the enormous doses referred to, especially by Gauss and Lembcke, and usually spoken of as the Freiburg technic, in which they aim to give all the treatment necessary at one time. This is the other extreme of the swinging of the pendulum, as compared with the often repeated, very small doses which were first used by myself and others. It has, however, landed

the more conservative man into the middle road technique, which consists in giving full doses through a number of fields at one time rather than often repeated small doses through the entire lower abdomen, scattered over a long period.

The objections which I see to the Freiburg technic are the wasting of an enormous amount of energy; the fatiguing of an ill woman by a very prolonged treatment; and more important, a very decided increased danger of a burn, which is liable to be produced by an overlapping of the lines of radiation. In spite of these objections we recognize that they have accomplished wonderful results, and with the exception of a few cases we have not heard of bad results.

My own technic consists in dividing the anterior, lower abdominal region into three areas—a central and two lateral; a fourth area is at the posterior, pelvic outlet, or perineal region. At present I give a patient a full dose of Rays through each of two of these areas, in one day, and a full dose through each of the other two on the succeeding day. I believe this to be the best technic consistent with the greatest degree of safety and economy of energy. I find that the patients become fatigued from lying still at the end of two full doses, otherwise the patient might be treated through the four areas just as well, on the same day.

The frequency of applications will vary with the circumstances connected with the patient, and with the skill of the operator. If a patient comes from a distance and must leave her home, it is desirable to get results as rapidly as possible. To give large doses in a short time, requires greater skill on the part of the Roentgenologist. I generally make these series of treatments through the four areas above described, in two successive days. When circumstances demand it, they can all be given on one day, or may be divided into intervals of two or three times a week. (This will permit the administration of 40-X in each series.)

After a full dose has been given over any area of skin, this area should not be treated again within three weeks.

The *favorable time* for the treatment is immediately after a menstrual period. When one has a choice in the matter, the treatment should at least be given ten days before the beginning of the succeeding menstrual period. If the bleeding is continuous, the treatment should be given just after the time that would correspond to a period. One may give a full dose (10 X) through any area of skin in a series of treatments, but this full dose should never be exceeded.

The *duration* of the total treatment will vary with the individual. Generally from one to six such series of treatments are needed in each area of skin (40 to 240 X); therefore the treatment will extend over a period of from one to six months—more often from five to six months. If large doses are given by the cross-fire method, with great skill, the duration of treatment can be reduced to about three months. The duration of each individual application will vary with the technic of the operator and his apparatus. This will vary from five to twenty minutes.

The *skin dose*, or total quantity of rays applied to the surface should be carefully measured so as to avoid burns. This can be done by the Kienböck quantimeter, or by the Sabouraud and Noire discs, or Holz-knecht's modifactor of the later instrument (Holzknecht radiometer). The units 10 X (Kienböck) or 5 H. (Holzknecht) correspond to an erythema dose.

Filters should be used to cut off the rays that are mostly absorbed by the skin. For this purpose the leather filter, first recommended by myself (Transactions of the American Roentgen Ray Society, Sept. 28, 29, 30, 1905), has served well. This consists of a layer of sole leather placed just above the diaphragm of the tube stand. Recently I have added to this a layer of 2

millimeters of aluminum, and sometimes 3. The skin dose must, of course, be measured beneath the filters.

Skin effects in the hands of the skilful operators have been of no consequence. In a number of patients treated, an erythema developed and in some others the skin became pigmented, or tanned. These effects disappear leaving the skin undamaged. In a few cases a dermatitis of the first degree has been produced. In these later cases telangiectases develop in the skin about a year later. If the treatment is ignorantly or carelessly given, a severe burn may of course be produced. The treatment should never be carried beyond the production of a slight erythema.

ADVANTAGES AND DISADVANTAGES OF THE TREATMENT: The *advantages* are: (1) It is painless; (2) it avoids the shock of an operation; (3) it preserves to a certain extent, we believe, the internal secretion which is lost in a complete oöphorectomy; (4) it does not interrupt the usual habits; (5) confinement in a hospital is avoided; (6) in the hands of a skilful operator it is without risk; (7) the menopause is brought on gradually, when necessary; (8) the amount of treatment can be graded to the needs of the patient.

The *disadvantages* are: (1) The prolonged course of treatment that is usually necessary. This can probably be shortened by improvement in technic. If it can be reduced to two or three months, it will probably be equal to the time required for operation and convalescence therefrom. (2) There is danger to the overlying tissues, if the rays are not properly applied. By careful attention to the technic and exact measurement of the skin dose, this can be eliminated. (3) It has been claimed to be more expensive than operation. In a sense this is true. However, if one considers that by this treatment the expense of board and hospital care is eliminated, both in the case of charity

and private patients, and in both instances they can go about their usual duties, I believe we must conclude that it is not more expensive.

REFERENCES

- 4—Albers-Schonberg. Ueber eine bisher undekante Wirkung der Röntgenstrahlen auf den Organismus der Tiere. *Münchener med. Wochenschr.*, 1903, No. 43.
- 5—Phillips. Die Röntgenbestrahlung des Hoden des Mannes. *Fortschritte a. d. Geb. d. Röntgenstrahlen*, vol. VIII, p. 114.
- 6—Haberstaedter. Die Einwirkung der Röntgenstrahlen auf Ovarien. *Berliner klin. Wochenschr.*, 1905, No. 1.

- 7—Heinicke. Ueber die Einwirkung der X-Strahlen auf Tierische Organe. *Münch. Med. Wochenschrift*, 1903, No. 48; 1904, No. 18.
- 8—Saretzky. Durch Röntgenbestrahlung der Ovarie hervorgerufene Amenorrhoe. Referat der Geburtshülfflich-Gynäkologischen Gesellschaft in St. Petersburg, Nov. 20, 1903; Nov. 20, 1908, in *Fortschritte a. d. Geb. d. Röntgenstrahlen*, vol. VIII, p. 42.
- 9—Eymer u. Menge. Röntgentherapie in der Gynäkologie. *Monatsschrift f. Geburtshilfe und Gynäkologie*, 1902, XXXV, p. 268-302.
- 10—Eymer and Menge. *Monatsschrift f. Geburtshilfe u. Gynäkologie*, 1912, XXXV, p. 268, 302.

DISCUSSION

DR. EDWARD H. SKINNER, Kansas City, Mo.: The array of literature upon this subject is alarming. There seems to be little doubt of the value of the Roentgen ray in (1) post-climacteric bleeding; (2) small intramural fibroids with bleeding and near the menopause; (3) metropathia, near the menopause, and (4) pruritus. The percentage of cures by radiotherapy in such cases is gratifyingly high.

The warnings against dependence upon radiotherapy are likewise well established, and may be enumerated as follows: (1) Degeneration of fibroid or myoma. (2) Patient under forty years of age. (3) Papillary fibroid or infectious endometritis. (4) Pressure symptoms. (5) Hemoglobin under fifty per cent. (6) and most important, the necessity of securing courageous intensive radiotherapy in sufficient doses at the hands of a capable radiologist. The technic of intensive deep therapy is difficult and trying upon both the radiologist and his apparatus. It cannot be compared to the radiotherapy of superficial lesions. Deep therapy cannot be given in small doses over a long period. It must be intensive, quick, to the spot and efficient. It must be a carefully measured dosage, a correctly focused tube, and a protective technic and a selected operator. The greatest danger to the future of deep therapy is the attempt of the ill-prepared man

to duplicate the work of those favored by good apparatus and wide experience.

Both as a warning and as a corollary, I desire to bring to your attention a parallel in medical history in the electrical line. In 1877, Apostoli brought forth an electrical method of reducing uterine fibroids and treating other gynecologic conditions wherein the negative pole of the galvanic current was displayed within the uterine cavity and the positive pole upon a skin electrode. He reported wonderful success. Rapidly this treatment was tried in all parts of the world, and success after success reported. Caret, in 1884, made a collection of all cases recorded and reported. I hold in my hand one of the copies of this monograph, bearing the autograph of Apostoli. Upon pages 246-248, and following, we find the general conclusions as to the efficacy of Apostoli's technique, which are, briefly: (1) Intervention for non-hemorrhagic fibromas should be intermenstrual. (2) If there is hemorrhage, the treatment should be frequent and prompt. (3) The treatment produces a rapid regression of fibroids, but not a total disappearance; it restores the patient, suppressing the metrorrhagia.

We know that the Apostoli treatment became quite generally used, only to fall into disrepute. Will intensive radiotherapy likewise rise and fall? Unless all cases are

thoroughly diagnosed and the treatment courageously, vigorously, intelligently and conscientiously applied, we cannot hope to achieve the permanent success that intensive radiotherapy deserves.

DR. A. HOWARD PIRIE, Montreal: This method interests me, so much so that I made a special visit to Freiburg in order to see Gauss and Lembke at work. They had four sets of apparatus for producing Roentgen rays, each at work for ten hours a day. These sets of apparatus run for the purpose of treating fibroids. A nurse is in attendance on each apparatus. She is very skilled in the measurement of the ray and is on duty all day. Most of those treated are private patients.

Dr. Pfahler mentioned the possibility of a burn on the skin in connection with the Freiburg treatment, but they are extremely careful to avoid that. No part of the skin receives more than ten X at any treatment. One sitting consists of about six hours' treatment. In abdominal work they map out the abdomen with a blue pencil into areas which are not to receive any Roentgen rays at all. They divide the abdomen into areas by double cross lines and double horizontal lines. Certain parts of the skin are thus protected. The target of the tube is brought within fifteen centimeters' distance of the skin. Each exposure is applied so that you get an intensive cross fire. They use the hardest tube and the Kienboeck method of measuring the dose. They use two interrupters, an ordinary mercury interrupter and a rhythmic interrupter, so that six milliamperes go through a water-cooled tube. Each tube is expected to give six erythema doses before allowing it to rest. The dose takes ten minutes, so that they can treat six areas in an hour, but with the time of changing it is not quite so fast. But, suppose five areas are treated in an hour, thus 300 X going into the patient, that means six hours' treatment. That is not all done at one sitting, but it can be accomplished in one day.

DR. ADOLPH HARTUNG, Chicago: I have treated a number of these cases and can confirm the good results obtained by Dr. Pfahler. Some of my cases have been treated under unique conditions. Dr. Wiener, with whom I have worked, bases the treatment on the assumption that some of these fibroids are of tuberculous origin, and in some of them he does get a marked tuberculin reaction. He has treated a number of these cases with tuberculin only, and has gotten some of these fibroids to decrease in size and the hemorrhage to disappear in part. He has sent me a number of cases for Roentgen therapy, and some have been treated with the Roentgen ray as well as with tuberculin. The results in these cases were better than those obtained when either method alone was used. He, of course, ascribes part of the action to the tuberculin injection, but I believe that the increased action of the Roentgen ray in these cases is due to the increased sensibilization of the tumor itself, caused by the tuberculin, providing, of course, that it is of tuberculous origin. Some of the cases will tend to bear out this assumption. For instance, we get in some of the cases a marked decrease in the tumor mass without any apparent action on the ovaries. There is no decrease in the metrorrhagia present at the menstrual period, but there was a very marked decrease in the size of the tumor. It is worth while noting at this time, and possibly some of the other men may carry out some experiments along these same lines, whether there actually is something in this method of treatment.

DR. EDWARD C. TITUS, New York City: It might be of interest to the members to know that the first recorded case of fibroid treated by the Roentgen ray was by a citizen of this country. That fact has been established by correspondence and data at hand. In counting up the number of my cases, which amount to forty or forty-five in the last seven years, I find all the patients are well today and enjoying good health—that is, a symptomatic cure was produced. In a number of cases the tumors have disappear-

ed entirely, and in others the mass is very small and gives no trouble. The symptoms have disappeared. An observation I have made and not alluded to in the paper is that in some cases within twenty-four hours after treatment there will be an intense reaction, followed by vomiting, diarrhea and high temperature, indicating that something has been thrown into the circulation which acts as a poison, some material which has been liberated from the tumor by the action of the ray. It is interesting to note how many men are taking up this method of treatment. There are many more employing it than we are aware of, and I have been in a position to hear the results that have been obtained, and I am glad to say that there is a degree of uniformity that bids fair to lead to a thorough adoption of this method. My own experience has been very satisfactory. I am very glad to add my testimony to the splendid exposition of this subject by Dr. Pfahler.

DR. PFAHLER (closing the discussion): All the discussion has been on one side. I am glad to see that the results obtained from this method of treatment are so uniformly good. There is no line of therapy that has been so uniformly successful and satisfactory to me, or one that has elicited so much gratitude from the patient. I made no attempt to review the history or the literature on this subject. If I had simply given references and names of the men who have worked in this field and written on this subject, the list would have been longer than the paper.

Dr. Skinner spoke of using two pastilles, the Saboraaud and Noir pastilles, one under the tube and the other over the skin. We

have to bear in mind that these pastilles are designed and created to be used midway between the anode and the skin, and that the dose measured, that is, the B-tint, should, if used as a measure of skin dosage, be obtained at that point. If you use it above that point or below it, you must make allowances for the change in dosage. You must calculate your results accordingly. If you do not do this, you will probably get a burn because you are giving more than the erythema dose.

Dr. Hartung referred to the decrease in the size of the tumor mass and the reduction in the bleeding, but leaves the impression that that is probably due to the tuberculin. That observation has been made in many cases in which no tuberculin was used, and I would hesitate to draw the conclusion that the tuberculin had that effect, at least it has not been proven to have that effect.

Dr. Titus referred to constitutional symptoms that develop shortly after the first exposure. I have never observed that.

We must not forget that in giving the first treatment to the patient the patient is receiving a very new experience, and she usually has in her mind all the possible dangers she has read about in the newspapers. Her nervous condition can bring about an increased pulse rate, a nervous diarrhea, vomiting and even a headache. We must be careful in drawing the conclusion that these symptoms are due to the absorption of toxins liberated from the tumor by the Roentgen ray.

It is rather unusual to produce degeneration of the tumor within twenty-four hours.

THE PRESENT STATUS OF THE X-RAY THERAPY OF ENLARGED THYMUS

By SIDNEY LANGE, M. D.

It is now three years since the attention of this society was called to the influence of the X-Ray upon the thymus gland.¹ At that time the application of the X-Ray to disease of the thymus was somewhat experimental, the rationale of which was not universally accepted. In the brief interval of three years the question has been discussed and decisively settled, the publications upon the subject forming a most interesting contribution to medical literature. The service which Roentgen therapy of the thymus may render to medicine and surgery is a far reaching one, since this line of treatment may not only save the lives of many children but may lessen operative risks in older individuals as well.

The physiology and pathology of the thymus is still not definitely worked out, although many theories based upon animal experimentation have been advanced. It has been known, however, since 1829, when Kopp first described a disturbance of respiration due to persistent or enlarged thymus, that the thymus may cause distressing symptoms. Kopp described the "thymic asthma" and believed that it was due to actual mechanical pressure upon the trachea, a view which is held today by a majority of observers. But Friedleben,² in his classical monograph in 1858, declared that "enlargement of the thymus is not to be considered as a cause of death." Grawitz, in 1888, called attention to two cases of sudden deaths of infants in which the autopsy revealed an enlarged thymus. Then Paltauf,³ in 1890, described the constitutional state of "status lymphaticus" in which, according to his hypothesis, the changes in the thymus were but a small part of the clinical picture and while the thymus was enlarged in practically every case the en-

largement was, according to his theory, not the cause of the sudden deaths.

Svehla,⁴ in 1900, and later Escherich, suggested that the symptoms and fatal issue were due to hyperthymization of the blood. Hedinger⁵ in autopsies in 18 cases of "thymus deaths" in infants demonstrated pressure in each case. Beneke⁶ made similar observations and emphasized the fact that a simple throwing back of the head is often the direct cause of the sudden death. Rehn,⁷ by excising a small piece of the thymus and thus relieving the symptoms, first proved by operative procedure that the thymus was exerting mechanical pressure. Jackson,⁸ by bronchoscopy, demonstrated actual pressure upon the trachea in a case of enlarged thymus without any accompanying signs of status lymphaticus. In the last few years abundant verification of the direct relation of enlarged thymus and sudden death is to be found in the current medical literature and the dead room reports of any large hospital. It must of course be remembered that the post-mortem appearance of the gland is not always a true criterion of the condition of the gland just before death. Furthermore, the pressure is not always exerted on the trachea, but may be directed against the superior vena cava, recurrent laryngeal nerve, carotid or innominate arteries and vagus nerve or against the heart itself. Crotti's⁹ recent investigations seem to establish the pressure theory conclusively. Not only may the thymus compress the right or left auricle but by displacing the blood vessels cause irritation of the inferior laryngeal nerve and thus cause spasm of the glottis.

Some advances have been made in the past three years in the study of the physiology of the organ. That the secretion of

the organ is essential to the normal development of infants and early childhood seems definitely proven. Among the later experimental studies those of Klose and Vogt¹¹ are most thorough and conclusive. By splitting the sternum they removed the thymus from fifty-four dogs. All the operated animals died in from three to seventeen months after passing through certain stages. After a short latent period, characterized by a ravenous appetite, they pass into the second stage of adiposity in which they rapidly become heavier than their controls with apathy and muscular weakness. Soon, however, the third stage of *idiotia thymica* supervenes in which the animal becomes cachectic, clumsy and stupid. A coma of several days follows, ending in death. The most important developmental variation in these thymectomized animals is the small size of their skeleton and poverty of lime salts in the bones. The bone changes are those of osteoporosis and osteomalacia. The delayed ossification and diminished lime content resembles somewhat rachitic changes. These changes are explained on a basis of nucleinic acid intoxication which is normally neutralized by thymus secretion.

Karl Basch,¹² whose recent untimely death put an end to his important researches, has made similar observations upon thymectomized puppies. He has demonstrated that the thymus is involved not only in the growth of the bones and eyes and in the excitability of the nervous system, but that it has also a close connection with the lymphatic system.

Excessive functional activity of the glands has been studied experimentally by Svehla, who found that injections of a watery extract of the thymus gland into animals produced lowered blood pressure, acceleration of the pulse rate and finally death. These references to the experimental physiology of the thymus established some points which are necessary to the argument and purpose of this paper, namely: that a total loss of thymus secretion interferes

with development and may be fatal to young animals and that an excess of thymus secretion may likewise cause grave functional disturbances and even death. The pathology of enlargement of the thymus gland in the human is practically that of hyperplasia.² Aside from the rarer causes of enlargement such as lymphosarcoma, dermoid cysts, etc., congenital syphilis seems to play an important part.

The frequency of the occurrence of enlargement of the thymus in the human infant is not known. That it must be a very frequent occurrence many arguments may be advanced. Since it is often a part or accompaniment of the so-called lymphatic state in which the various lymphatic structures especially the tonsils and lymphatic tissues of the naso-pharynx are involved it is not unlikely that in every case in which enlarged tonsils and adenoids are present there is also an enlarged thymus. "D'Oelsnitz"¹³ has described the condition of latent hypertrophy of the thymus, the diagnosis of which is so important because of the danger of sudden death from exertion, anaesthetics or intercurrent disease." Often, however, the clinical syndrome known as status lymphaticus is present, but an enlarged thymus is not necessarily an accompaniment of status lymphaticus.

Ordinarily the clinical diagnosis of enlarged thymus is based upon the presence of dyspnoea, suffocative attacks and stridor, the modifications and detailed description of which are beyond the scope of this paper. Suffice it to say, however, that the dyspnoea is always of the expiratory or asthmatic type. The stridor is, however, inspiratory. Very important, however, from the roentgenologist's viewpoint is the differential diagnosis since we are sometimes compelled to depend entirely upon the clinical diagnosis in cases in which no definite evidence can be recorded upon the X-Ray plate. Congenital stridor is usually due to one of three things: enlarged thymus, inco-ordination of the vocal cords and malformation of the

entrance of the larynx which is very rare. When the symptoms develop some time after birth, enlarged tuberculous bronchial glands, adenoids, acute laryngitis and bronchitis and swallowed foreign bodies must be ruled out.

In most cases a direct diagnosis can be made from a good roentgenogram. The X-Ray shadow of enlarged thymus is a wide median one. In some cases the thymus shadow continues directly upward from the heart; in others the thymus shadow appears like a broad cap superimposed on the shadow of the heart and great vessels. But a broadening of the median shadow above the heart is not always due to an enlarged thymus. Benjamin and Goett,¹⁴ in a careful study of the interpretation of the radiograms of the chest in the infant, point out that a broadening of the shadow to the right may often be due to the superior vena cava. The appearance of the superior vena cava is, of course, familiar to every roentgenologist. The younger the child the more does the upper mediastinal shadow extend to the right. When the veins are distended, as from crying or struggling, this shadow may extend far to the right and may vary from time to time. When, however, the upper mediastinal shadow extends well to the left, the diagnosis of enlarged thymus is certain. False thymus shadows may be produced by asymmetry of the position of the child when the exposure is made. To avoid the flopping of the heart and mediastinum to one or the other side and thus giving false shadows, I have lately been placing the child prone and while an assistant or nurse holds the body and chest symmetrically an instantaneous exposure is made. In many cases, however, the X-Ray will fail to give conclusive evidence as to the presence of an enlarged thymus. This is especially true when the enlargement is chiefly in the antero-posterior diameter and very little in the lateral. Especial difficulty in demonstrating the thymus is encountered in very young infants because of the normally

broad shadow of the upper mediastinum. Furthermore, the superior opening of the thorax in a young child measures only two cm. in diameter, and it is in this so-called critical space of Grawitz that the pressure occurs. A thymus could therefore be comparatively small, that is, less than 2 cm. in thickness, and still might compress the trachea, oesophagus, blood-vessels, etc., which pass through the superior opening of the thorax.

In the treatment of this condition two methods have been proposed and tried out. Rehn and König,¹⁵ in 1896, operated on two cases of enlarged thymus by elevating the gland from behind the sternum and stitching it to the tissues of the neck (exothymopexy).

Later resection of the manubrium was tried, then thymectomy was introduced. To date, Parker¹⁶ has collected from the literature 50 cases of enlarged thymus treated by operative measures with a mortality of 33 1/3%.

In 1910 I reported before this society 5 cases of enlarged thymus in young children successfully treated by X-Ray exposure.¹ Previous to this report there were but two recorded cases, viz: case of Friedlander² and Crane, treated in Cincinnati in 1904, which was the first case of enlarged thymus treated by X-Ray exposure, and a second case, reported by Myers.¹⁶

Desiring to prove out the action of the X-Ray on the thymus experimentally and having in mind the classical studies of Heinicke on the effect of the X-Ray on lymphoid tissues which he published in 1903 the thymus glands of a series of young rabbits were exposed to X-Ray.³ The results were surprising. It was possible by X-Ray exposures to produce changes in the thymus from slight shrinking to complete fibrosis and destruction of all gland tissue. It was furthermore possible to produce any desired degree of fibrosis of the gland at will, either by varying the intensity of the treatments or by varying the intervals between

treatments. Likewise, it was possible to vary the rate of atrophy of the glands by varying the intensity of the irradiation.³

After completing these experiments I found that Rudberg,¹⁷ in 1907, had performed very similar experiments and had arrived at the same conclusions. Practically at the same time that my experiments were made Aubertin and Bordet¹⁸ were carrying out similar experiments in cats. More recently, D'Oelsnitz and Paschetta¹⁹ and Regaud and Cremieu²⁰ (the latter using dogs) have studied the artificial involution of the thymus in detail.

Coincident with publication of these experiments, the clinical application of the X-Ray to the thymus has increased, chiefly, however, among French clinicians. Recent literature contains reports of successful cases by D'Oelsnitz,²¹ Weill and Pehn,²² Ribodeau-Dumas and Weill²³ and Veau.²⁴ These cases, with published and unpublished cases of mine, will bring the total of recorded cases successfully treated by X-Ray exposures close to 30. In every recorded case the application of the X-Ray was followed by prompt and complete recovery. Contrast this with the mortality of 33 1/3% in fifty recorded thymectomies. By those advocating surgery for the relief of enlarged thymus two objections to X-Ray therapy are given: 1st, the X-Ray is said to be too slow in its action and hence not suited for urgent cases. 2nd, The effect of X-Ray therapy is only temporary, since the gland tends to regenerate so rapidly after cessation of the treatment.

When I published my first case I also made the statement that the X-Ray is not suited for urgent cases, owing to its slow action. This statement, I think, can be shown to be incorrect. Rudberg, in the earliest experiments upon animals, found that involution begins 3½ hours (perhaps sooner) after the first X-Ray exposure. The one or two early failures which I encountered were due undoubtedly to inefficient, over-conservative irradiation. The introduction

of the massive superficial dose method and the massive deep dose technique as developed for the treatment of certain gynecologic conditions has made it possible to administer at one exposure a dose sufficient to relieve the urgent cases; indeed, one massive dose may be sufficient in the milder cases to bring out a symptomatic cure. This does not mean that the thymus has undergone complete involution, but simply that its size and function have been decreased sufficiently to tide the patient over a dangerous period until the growth of the chest, etc., should cause abatement of the symptoms.

It is not infrequent to note relief of urgent symptoms in a few hours after a heavy treatment. One of the most urgent cases was recently encountered at the Cincinnati Hospital in an infant two months old. So urgent was the dyspnoea that a tracheotomy was done immediately upon admission to the hospital. This availed but little, and X-Ray treatments were begun. Within 12 hours the dyspnoea improved and within 24 hours the child was able to nurse. It seemed to be on the way to recovery, when it developed pneumonia and died. Tracheotomy is a very dangerous procedure in this type of case, as it may not only fail to relieve the symptoms since the pressure may be too low for the ordinary short tracheotomy tube to reach and may involve other structures than the trachea. The operation, furthermore, predisposes to pneumonia, owing to the lowered resistance of this type of child.

The second objection to X-Ray therapy as applied to enlarged thymus, namely: that the glands tend to regenerate rapidly after X-Ray involution, can likewise be shown to be an invalid one. Indeed, since the removal of all or even a greater part of the gland may influence the subsequent development of the individual in an undesirable way, it is a question whether complete thymectomy is ever advisable. Parker, an advocate of surgery of this condition, states

that the thymus cannot be wholly surgically removed in man. Again, he states the real efficiency of the operation does not always depend on the total amount of gland removed, for the removal of a small portion directly concerned in producing symptoms or obstruction has produced quite as striking relief as the removal of considerably larger portions less directly concerned in the compression. Then he cites an instance in one of his own cases in which regeneration to normal size followed a fairly complete thymectomy. Further, Klose and Vogt, in experimental thymectomies upon dogs, found that complete removal of the gland was absolutely necessary to elicit the effects of thymus deprivation and if a small portion of the gland was allowed to remain the gland quickly reproduced itself and carried on its function. It is thus evident that a complete thymectomy is fatal and an incomplete thymectomy is followed by regeneration of the gland. Hence thymectomy can claim no advantage over X-Ray therapy in this matter of regeneration. If recurrences of symptoms occur after X-Ray therapy they can be again controlled by repetition of the exposure.

A recent statement of a French surgeon is a most forceful argument for radiotherapy. Veau, of Paris, to a large extent originated the technique of intracapsular thymectomy and according to Parker's statistics of the fifty recorded thymectomies he has performed 11 such operations.

At the meeting of the Paris Pediatric Society, November 12, 1912, in commenting on Weill's report of three cases of enlarged thymus successfully treated by the X-Ray Veau added two successful cases of his own and said "For over a year I have not done a thymectomy and up to the present have never been disappointed in radiotherapy."²

The significance of this line of treatment is a far reaching one. It is not improbable that there is a close relation between adenoids, enlarged tonsils and an enlarged

thymus and it is logical to believe that enlargement of the thymus might be as frequent as adenoids and hypertrophied tonsils. Although symptoms are not manifest in every case, yet the enlarged thymus is always a potential source of danger and a possible cause of sudden death. With such a harmless and painless method of treatment at hand we are not justified in neglecting to irradiate suspicious cases because no urgent symptoms are manifest. Many mild cases are usually passed over by the physician in charge with the statement that the child will outgrow the trouble. This is true in some cases, but one cannot foretell the outcome. I am at present treating a six months old child with noisy and rapid respirations, which have been present since birth. The physician who delivered the child told the mother that the child would outgrow it. But an intercurrent infection or anaesthetic might be fatal before reaching the third year, at which time spontaneous relief usually occurs.

A recent case successfully treated by X-Ray therapy illustrated several interesting phases of the subject. A male child aged one year was referred for treatment because of the occurrence of suffocative attacks and noisy breathing. The history revealed the fact that this dyspnoea and stridor had been present almost from birth. The symptoms became so urgent that the parents were unable to sleep at night because of the child's stridor and suffocative attacks. It seemed that a tracheotomy might be necessary at any time. Repeated attacks of influenza and bronchitis exaggerated the symptoms and the prognosis seemed at times very bad. It had been treated for some time for spasmodic croup. Later the symptoms were attributed to the presence of adenoids and enlarged tonsils. These were removed without improving the symptoms. It was then thought there might be some obstruction in the larynx or some abnormality of the vocal cords. A direct examination of the larynx under anaesthesia was contem-

plated when the possibility of an enlarged thymus was suggested. The child was of the pale, fat and flabby type and very retarded mentally. Five X-Ray treatments were given over a period of four weeks. The suffocating attacks stopped at once. The stridor slowly diminished and disappeared. From an apathetic irritable child, the child became lively and playful and began to improve mentally in a way that surprised everyone. Almost a year has elapsed since the X-Ray treatment was begun, and there has been no recurrence of the symptoms. Once during this period, when the child had a rather marked bronchitis, one more treatment was given because of heavy breathing, but this was apparently a transient matter and disappeared in a few days.

The relation between the thymus and the thyroid is a close one. This subject was mentioned in my previous communication and in the three years that have elapsed the association of an enlarged thymus and hyperthyroidism has been generally recognized.

Reports of series of autopsies on fatal cases of Graves disease show that in almost 75% of the fatal cases an enlarged thymus is found associated with the enlarged thyroid. In autopsies upon post operative deaths Capelle found an enlarged thymus in 95% of the cases.

The exact role of the enlarged thymus in the condition known as hyperthyroidism is not clear. Whether it be a casual factor or an effect or whether it be a direct factor in producing death remains yet to be worked out. Hector McKenzie, quoted by Parker,¹⁵ says: "The thymus was enlarged in all fatal cases of Graves' disease observed by the author that came to autopsy and possibly every case in which there is a thymus persisting into adult life is one of potential or latent Graves' disease."

Gebele, quoted by Parker, states: "Status Lymphaticus is relatively frequent with Basedow's disease and is considered today as the most common cause of death in this disease." Zesas, in 1910, suggested thy-

mectomy as a preliminary measure to thyroidectomy, hoping thus to cut down the operative and post operative mortality. The report made by Crotti at our last meeting of the deaths following thyroidectomy, the autopsies of which revealed enlarged thymus, is familiar to you.

The point which these statistics impress is that X-Ray therapy may provide a means of determining this relation. By systematic pre-operative exposure in clinics, where such material is abundant, it should be possible to decide whether the thymus is a cause or a factor in the fatal outcome of Graves' and whether artificial involution of the thymus preliminary to thyroidectomy will lessen the operative mortality or not.

A brief reference to a recent case will illustrate the possible effects of the X-Ray upon the adult thymus. An unmarried woman, aged 35, was referred for an X-Ray examination of the chest. For the last year she had suffered with palpitation and choking sensations. Lately the pressure in the lower part of the neck became so severe that she swallowed and breathed with difficulty. She was unable to sleep and spent a large part of the day in swabbing the neck with cold towels, which seemed to give some relief. Physical examinations revealed a slightly enlarged thyroid, involving the lower part of the gland, and apparently extending into the thorax. A stereoscopic roentgenogram of the thorax revealed a very faint rounded shadow in the upper mediastinum continuous with the heart and great vessels. X-Ray therapy was tried and after one massive treatment she experienced relief, was able to swallow and slept through the entire night, the first sleep she had enjoyed for two weeks, heart action became slower and less violent and tremor had practically vanished. The change occurred in eight hours after the first treatment. Four such treatments were given on successive days and she was instructed to return in three weeks. She reports progressive improvement.

The practical deductions to be drawn from the experimental and clinical evidence as to the influence of the X-Ray upon the thymus may be summarized as follows:

1. Roentgen irradiation of the thymus produces artificial involution of the gland.

2. X-Ray therapy is the method of choice in cases of enlarged thymus in children, whether the symptoms be mild or urgent.

3. Urgent cases should receive oft-repeated massive doses.

4. Recurrences due to regeneration of the gland are to be watched for and controlled by further treatment.

5. Children whose physical or mental development is retarded should, if suspicion is directed toward the thymus, receive trial X-Ray exposure, even though a positive diagnosis of enlarged thymus cannot be established.

6. X-Ray therapy as a precautionary measure or as a pre-operative treatment may enable children of the so-called lymphatic type to withstand intercurrent disease and anaesthetics which might otherwise prove fatal.

7. Pre-operative exposures of older children and adults where there is a suspicion of a persistent thymus might lessen operative mortality.

8. Routine pre-operative X-Ray treatment in cases of hyperthyroidism should be resorted to with a view to lessening the operative mortality.

9. X-Ray exposure of the thymus gland has proven to be harmless whether applied to normal or abnormal individuals. A therapeutic test with the X-Ray is therefore always permissible.

REFERENCES

- 1—Lange—American Quarterly of Roentgenology—April, 1911.
- 2—Friedlander—Archives of Pediatrics—July, 1907. Arch. Ped. Oct. 1911. American Journal of Dis. of Children—July, 1913.
- 3—Friedleben—Die Physiologie der Thymus, Frankfurt, 1858.
- 4—Paltauf—Wien. Klin. Wchnschr., No. 46, 1889.
- 5—Svehla—Arch. f. Exper. Path. u. Med., 1900.
- 6—Hedinger—Jahrbuch f. Kinderheilk., 1906, Bd. 63.
- 7—Beneke—Berl. Klin. Wchnschr., 1894, No. 9.
- 8—Rehn—Arch. f. Klin. Chirurgie, 1906, Bd. 80.
- 9—Jackson—Jour. Am. Med. Assn. May 25, 1907.
- 10—Crotti—Jour. A.M.A. Feb. 22, 1913. Jour. A.M.A. Jan. 11, 1913.
- 11—Klose & Vogt—Beitrage zur klin. Chir., 1910 lxix.
- 12—Basch—Jahrb. f. Kinderh., 1908—lxvii.
- 13—D'Oelsnitz—Comp. rend. de l'Assoc. française de pedia. 1910, pp. 239.
- 14—Benjamin & Goett—Deutsch. Arch. F. Klin. Med. 1912, cvii, 107.
- 15—Parker—Amer. Jour. Dis. of Chil. Feb., 1913.
- 16—Myer—Arch. Ped. Aug., 1908.
- 17—Rudberg—Arch. f. Anat., 1907.
- 18—Aubertin & Bordet—Arch. des Maladies du Coeur, June 11, 1910, No. 6.
- 19—D'Oelsnitz & Paschetta—Bull. Soc. Pediat. de Paris, 1911, p. 462.
- 20—Regaud & Cremieu—Lyon med., 1912, No. 1.
- 21—D'Oelsnitz—Bull. Soc. ped. de Paris, Dec., 1911.
- 22—Weill & Pehn—Lyon Med. Dec., 1911.
- 23—Bull. Soc. de ped. de Paris, Oct., 1912.
- 24—Bull. Soc. de ped. de Paris, Nov., 1912.

DISCUSSION

DR. W. F. MANGES, Philadelphia: Mr. President: How can you keep children still long enough to treat them?

DR. GEORGE E. PFAHLER, Philadelphia: Did you make any roentgenographic studies of these children after treatment?

DR. LANGE (closing the discussion): I have some large sand-bags, which are not well filled with sand. I place the child flat

on the table, spread the arms and legs, and put a sand-bag over each limb. That holds the child well in position.

I have not made roentgenographic studies after the treatment. So often a period of six months or a year will elapse and the changes in the chest and the growth of the child are so great that the conditions then present cannot be compared with the plates made earlier.

A DEVICE FOR USING A CONSTANT STREAM OF WATER IN A WATER COOLED TUBE

By GEORGE E. PFAHLER, M. D., Philadelphia, Pa.

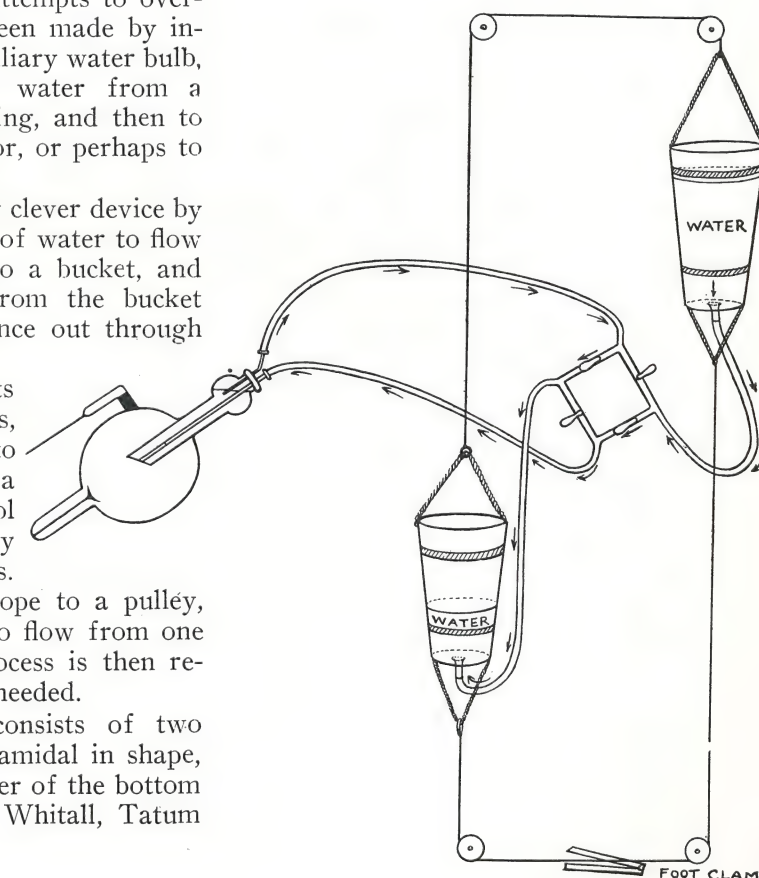
Successful, deep Roentgen Therapy depends in a great part upon the use of uniformly penetrating rays. To produce uniform rays, it is necessary to keep the vacuum uniform. With ordinary tubes this is difficult, because if the tube becomes heated, the metals throw out gases into the tube which lowers the vacuum, or may even raise it, but which unfortunately lead to the production of very poor rays. This difficulty is in part met by the use of water-cooled tubes, but unfortunately water cooled tubes require frequent interruption for changing of the water. Attempts to overcome this difficulty have been made by increasing the size of the auxiliary water bulb, by carrying a stream of water from a bucket through rubber tubing, and then to a second bucket on the floor, or perhaps to a drain.

Haenish suggested a very clever device by which he allowed a stream of water to flow slowly from the spigot into a bucket, and then drained the water from the bucket through the tube, and thence out through the sink.

All these arrangements have certain objections, therefore I have tried to meet the requirements of a constant stream of cool water through the tube by the use of two reservoirs. These are attached by a rope to a pulley, and the water is allowed to flow from one into the other, and the process is then reversed, as frequently as is needed.

The whole apparatus consists of two two-gallon glass tanks, pyramidal in shape, with an opening in the center of the bottom of each. (Obtained from Whitall, Tatum and Co.)

At the center of the bottom of these there is an outlet, to which we originally attached rubber tubing, but in running from an influence machine, it was found that the current which leaked along the water and rubber tubing, soon decomposed the rubber, and thereby led to frequent leaks. After many difficulties we therefore made use of flexible metallic tubing, which is permanently sealed to the outlet from the jars, and likewise attached to the inlet and outlet of the X-ray tube by means of special screw contacts. By this means we have



eliminated rubber entirely from all our connections, and have been able to prevent leaks. To the lower end of the jar the attachment is made by means of a metallic cap, which fits over the projecting outlet, and is permanently sealed by cement.

In order to keep the current flowing in the same direction at all times, we introduced a four valve connection, which is best described by reference to the diagram. This connecting valve is attached to a board which projects from the wall eight inches, and which we have found sufficient to give insulation. The two jars are swung from a rope, which passes over two pulleys in the ceiling, and two pulleys in the floor. The rope is prevented from slipping, and thereby holding the weighted jar upward, by means of a foot clamp attached to the floor, which grasps the rope.

The whole arrangement permits two gallons of water to flow through the tube, and then by simply releasing the clamp on the floor, the full jar is raised near to the ceiling; the empty jar lowered; the valves changed so that the water will flow through the tube in a uniform direction, and in this way, with a well seasoned tube, we have been able to use 4 milliamperes of static current continually for hours. This has enabled us to save considerable time, and to obtain more uniform results.

We have found difficulty in obtaining sufficient seasoned water cooled tubes, and when this is true, the arrangement which I have described unfortunately wastes time in changing connections for a water cooled tube. However, this is a difficulty which can be overcome.

The arrangement which I have described might perhaps be further simplified by omitting the four valve connections, which would then require the current of water, in one instance, to flow through the long tube directly against the anode, and when the jars are reversed it would enter at the top of the water chamber, gradually settle to the bottom, and thus come in contact with the hot anode, and return through the long tube. This may not make as much difference as we had first thought. Theoretically, if the cold stream is poured directly against the anode, it should have more cooling effect than if allowed first to settle through a partially heated water chamber.

In this device, the distinctly new feature is the use of metallic tubing. Besides this, the details of the two way water reservoir may be of some interest.

As a whole this is a device which has worked well, has saved us time, has produced more uniform results, and while it cost us much in developing, the actual cost of a reproduction should not be over \$15.00. The detailed cost of materials, exclusive of workmanship, is as follows:

Glass tanks—\$1.90; Webbing and Rings—\$.70; Pulley and Eyes—\$.15; Hinges and Screws—\$.45; Metallic Flexible Tubing (24 ft. of $\frac{1}{4}$ ")—\$3.61; 6— $\frac{1}{4}$ " Brass Unions—\$.90; 1—Universal Controlling Valve—\$1.00; Miscellaneous—\$1.00.

I believe that a description of such devices by our various members will be helpful, not simply for the purpose of reproduction, but because they stimulate other ideas, which will be a great improvement.

FRACTURE OF THE SKULL WITH AIR IN THE VENTRICLES

By DR. W. H. STEWART
222 West 79th Street, New York, N. Y.

I am indebted to Dr. W. H. Lockett, of New York City, for the privilege of reporting this case, which occurred on his service at Harlem Hospital. He has already published the details, but, believing it to be of such a unique nature, from an X-Ray standpoint, I have taken the liberty, with the endorsement of your honorable President, of reciting the case in full and showing the original radiographs. At the annual meet-

ing at Niagara Falls last year I read a short paper on "The use of the Roentgen Ray in the diagnosis of Fracture of the Skull." This case well illustrates the value of such procedure.

J. C., a machinist, age 47 years, was admitted to Harlem Hospital, November 24, 1912, after having been struck by a trolley car and thrown to the pavement. A diagnosis of fracture of the skull was made and

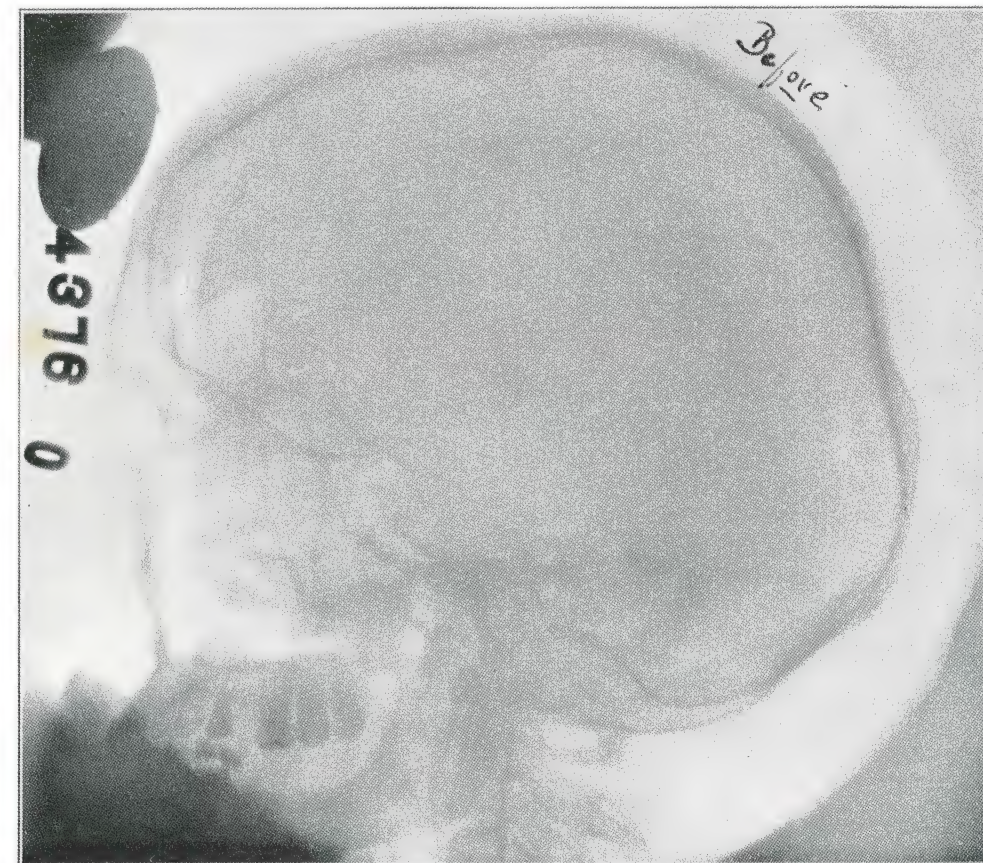


FIG. 1. Roentgenogram taken when the patient was first admitted to the hospital; the two small arrows indicate the fracture of the outer table of the right frontal sinus. This plate shows the condition before the ventricles became distended.

confirmed by the X-Ray; the radiographic report being: "At the site of a small lacerated wound, over the right eyebrow, the vertical plate of the frontal bone was fractured in the region of the outer edge of the right frontal sinus. Apparently, the external table had been crushed and driven inward against the internal, obliterating that portion of the sinus." Only a right lateral radiograph was taken as the man's condition was such that it was deemed best not to attempt the manipulation necessary to obtain one from behind forward.

The patient's symptoms steadily improving, operative interference was postponed. In less than a fortnight he insisted upon leaving the hospital and was allowed to do so upon signing a release.

On December 12, 1912, about a week later, the man was readmitted with the history that since his discharge he had had very severe headaches, with occasional vomiting and had become dull and listless, not taking any notice of his surroundings; would not converse with anyone but seemed to thoroughly understand what was said and apparently read the daily papers intelligently.

He was placed under observation. Two days after readmission, the Neurologist, Dr. William Leszynsky, made the following report: "At the time of the examination the man was conscious; he answered questions and obeyed commands intelligently, but cerebation was slow. He was inclined to lapse, from time to time, into a condition of mental confusion. There was no aphasia; no disturbance of speech; no tremor of hands or feet; the pupils were normal and reacted equally. Facial innervation and mobility of the tongue was normal; no tenderness on percussion over the skull was detected; no rigidity of the neck; upper extremities normal. The lower limbs showed no paresis or rigidity, but were resistive to examination. Both knee jerks and especially the right were increased." Neurological diagnosis: "Increased intracranial pressure, probably abscess."

On December 15, 1912, an ophthalmoscopic examination was made by Dr. Martin Cohen. He reported that "the veins of the right fundus were enlarged and tortuous, with the central vein markedly dilated over the disc and also at the exit from the nerve; the arteries were slightly contracted and the disc borders were indistinct from marked oedema." The same condition was noted in the left fundus. His conclusions were that "we were dealing with a bilateral optic neuritis, indicative of intracranial pressure." A blood count on the same day showed 15,900 leukocytes with 86% polymorphonuclears and 8% lymphocytes.

On December 13, 1912, the case was referred to my department for further X-Ray studies. A series of radiographs were made which included both laterals and frontal. To my surprise, I found that we were dealing with a condition entirely different than on the former examination.

The same fracture of the vertical plate of the frontal bone, in the region of the outer edge of the right frontal sinus, was observed. But, when the right lateral radiograph was examined, in comparison with the plate taken on November 25, of the corresponding portion of the skull, I was confronted with a peculiar dark, circular shadow, just back of the fracture. From the posterior portion of this shadow a wide area was extended backward, curving downward to the posterior border of the mastoid cells, then turning sharply on itself and narrowing, extended forward and terminated in the region of the sphenoidal cells. In the frontal view, taken with the head sharply flexed, the later conditions were present in a different form, now appearing oblong in shape, dark and small, rather high up, with radiating branches downward and to each side like an arch, a small, circular shadow lying below and between the downward arms. From the shape, location and course of these shadows, their varying density and character simulating gas in the

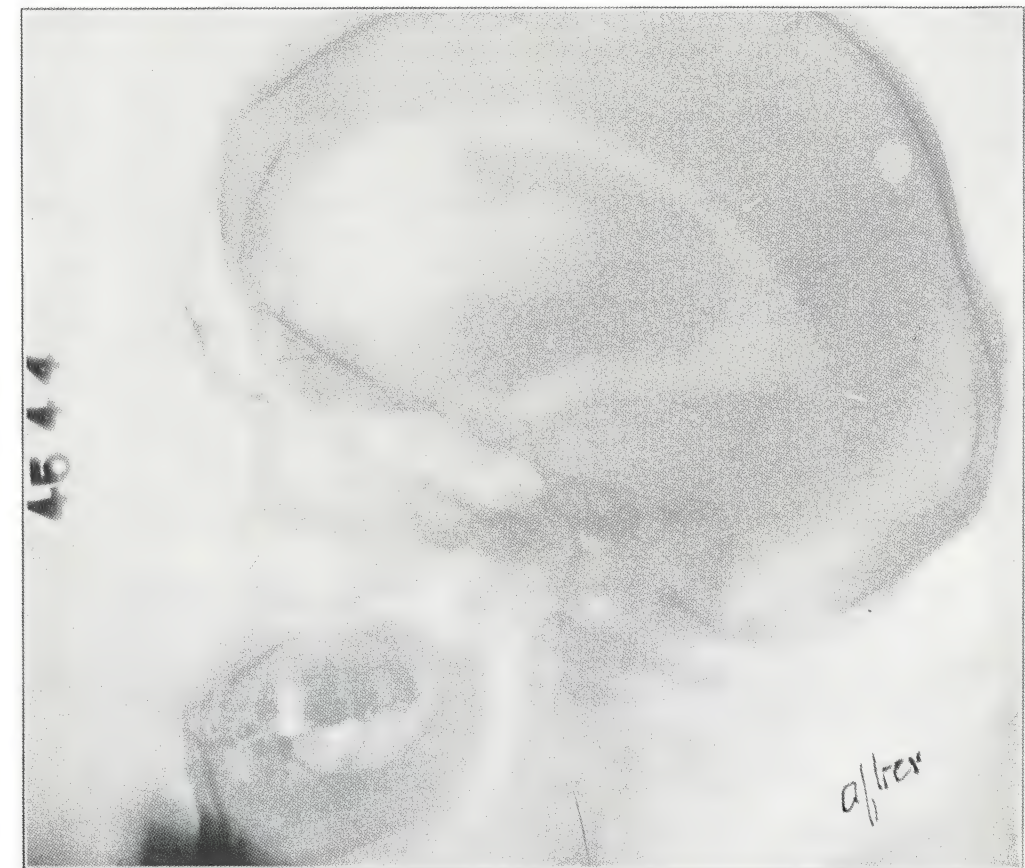


FIG. 2. Lateral plate made three weeks later showing the same fracture and the cerebral ventricles distended with air.

intestines, I was led to conclude that we were dealing with a case of fracture of the skull complicated by distended cerebral ventricles with air or gas. In this conclusion I was supported by Dr. E. W. Caldwell. The radiographic diagnosis, however, was received by the staff with some doubt.

The patient apparently getting worse, a right sided decompression was done by Dr. W. H. Luckett on December 16th. Upon exposure, the dura did not bulge and was particularly tense. No fluid escaped on incision of the dura or pia; a slight meningitis was noted. A needle was then passed into the anterior horn of the lateral ventricle; the removal of the trocar was fol-

lowed by two or three quick spits of air and fluid, and then clear cerebro-spinal fluid to the amount of 8 c. c. Because of the presence of meningitis, the large quantity of fluid and the presence of air in the ventricles, it was decided to drain the latter. A suboccipital operation was then performed. The bone was exceedingly thin, the dura was incised and then the pia into the cisterna magna, and immediately there escaped considerable clear fluid, generously mixed with bubbles of air. A small piece of twisted rubber tissue was inserted as a drain.

The patient did well until the fourth day after operation, when suddenly his temperature went up to 107 degrees and he died.

An autopsy was performed by Dr. Otto Schultze. That portion of his report referring to the head condition was as follows: "A wound two inches long, partially healed, was found on the right side of the forehead, extending upward and slightly outward, under which was found a decompressed fracture of the outer wall of the right frontal sinus, circular in contour, about 2 cm. in diameter, with its center depressed 1 cm. below the level of the margin. The inner wall of the frontal sinus presents a linear fracture extending posteriorly through the right orbital plate and directed slightly inward. The base of the right frontal lobe was found adherent to

the dura over the fractured right orbital plate; these adhesions were carefully separated and disclosed a linear tear of the dura mater over the fracture of the right orbital plate, already described as communicating with the right side of the frontal sinus, through the fracture in its posterior wall. The surface of the base of the right frontal lobe within the area of adhesions showed a soft, yellowish red laceration. The skull cap containing the brain was placed beneath the level of water and on raising the stump of the spinal cord, air bubbles emerged from the Foramen Magendie and when the extremities of the temporal horns of the lateral ventricles were incised, air

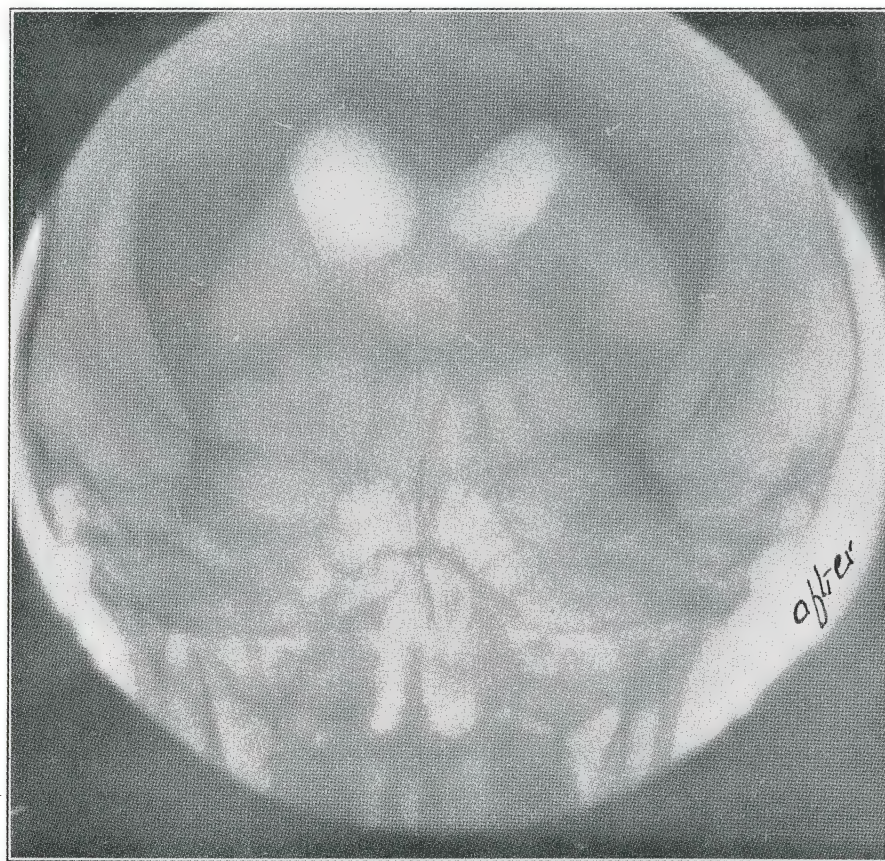


FIG. 3. Postero-anterior plate showing cerebral ventricles distended with air.

bubbles emerged from them. No blood was found in the ventricles. The right half of the brain with the lateral ventricles empty and with the opening in its medium surface, was placed in water with the medium surface downward and on turning its base upward air bubbles emerged through the laceration at the base of the frontal lobe, showing a communication with the anterior horn of the lateral ventricle.

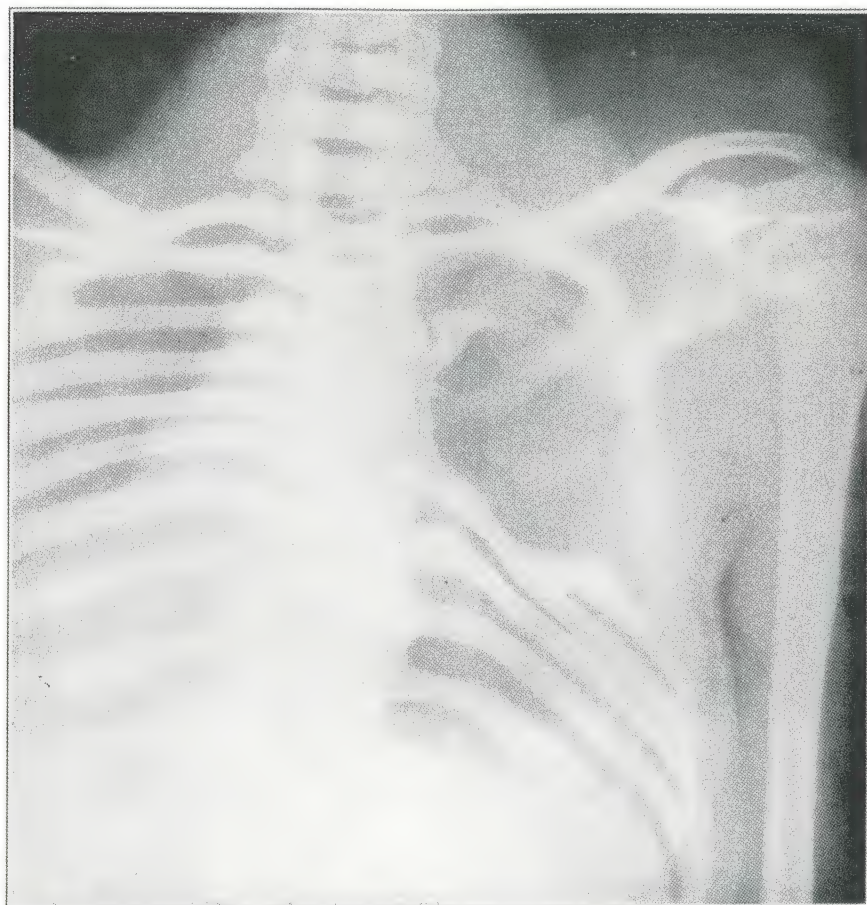
It was subsequently learned that a severe pain in the head, with a free discharge of clear fluid from the nose followed a violent blowing of the nose, the logical deduction being that the patient had established a communication between the nose through the right frontal sinus and anterior lobe of the brain into the right lateral ventricle; that when he blew his nose he also blew up the ventricles of his brain.

DISCUSSION

DR. GEORGE E. PFAHLER, Philadelphia: Mr. President: Dr. Pancoast and I had a case during the past year of a patient who had become delirious. No cause for the delirium could be found anywhere in the body. Finally, we made a study of the head, and found the sinuses normal, but there was an area of transparency in the left frontal region, the picture correspond-

ing somewhat with the appearance seen in Dr. Stewart's case. We interpreted it at the time as a possible softening of the bone, due to pressure. The patient recovered after about six weeks, and further roentgenographic examination failed to show this area. We are wondering whether this was a case similar to Dr. Stewart's.

The history suggested sinus disease, but the sinuses were quite clear.



Roentgenogram by Amédée Granger, M. D., New Orleans, La.

Malformed Right Side of Thoracic Cage. At the back the fourth rib is rudimentary and fifth rib is absent. At the side the third rib bifurcates to form a third and fourth, and the sixth rib bifurcates to form a fifth and sixth.

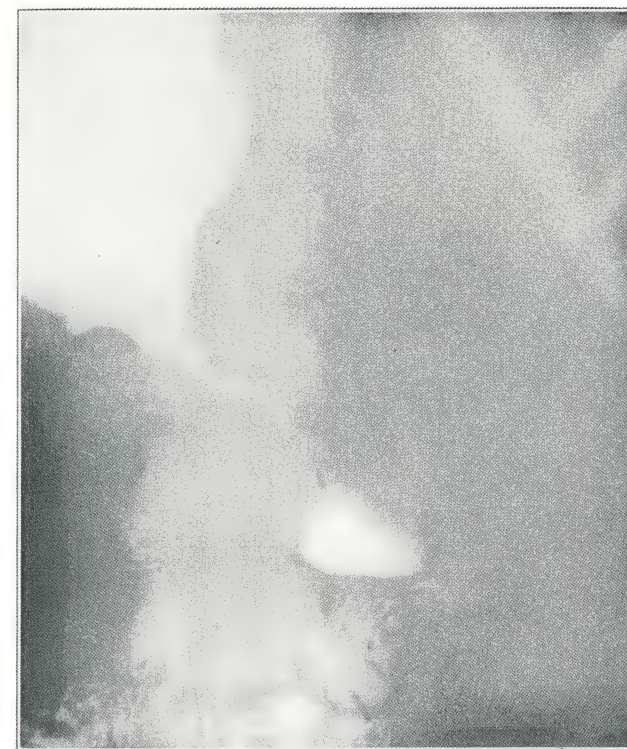


FIG. 1

FIG. 1. Hour-Glass Stomach. X-Ray diagnosis:—Some pathological process involving middle portion of stomach. Lesion extensive and appears to be annular in type. The age (22) is against carcinoma. Clinical diagnosis, hypochlorhydria. Final diagnosis, congenital lues. (Positive Wasserman.)

Drs. Dodd and Holmes

FIG. 2. Taken after patient had been under treatment with salvarsan for one month.



FIG. 2

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EDITORIAL

The publication committee decided that the official organ of the Society should be issued monthly. This naturally entails considerable additional work upon the editorial staff and the *active* co-operation of the members is urgently asked. Upon experimentation it has been found that the quality of the reproductions of roentgenograms is much enhanced by allowing the engraver

to work directly from the original negative; accordingly these should be sent properly packed to avoid breakage, sufficiently early to allow of their proper reproduction.

In discussing the results of the recent Boston meeting with a prominent member of the Society, it was suggested that there be established the custom of having an annual oration to be delivered at one of the evening meetings. The appointment of such an orator would permit the Society to honor a member whose research and thought along some particular line could best be told at greater length than in the short confines of a condensed paper at the sessions of the regular program. It was further suggested that out of respect to the memory of Dr. Chas. Lester Leonard that this be known as the Leonard Memorial Oration. These suggestions certainly have features of merit and should have due consideration.

The entertainment provided by the Boston members and their friends for the visiting members and their wives at the recent annual meeting was a beautiful token of genuine hospitality. It was certainly much appreciated and the memories of the pleasant times afforded will linger long in the minds of all who were fortunate to be present. Out of consideration to future local committees we must remember that not all cities will have the local membership which will enable them to practice hospitality on such a lavish scale and that such red letter meetings can only be hoped for occasionally.

Some five or six years ago a prominent dermatologist complacently expressed the opinion that the technic of roentgentherapy was complete and would probably not change. The recent visit of Drs. Krönig and Gauss to this country and their cordial reception and prominence in the Surgical Congress at Chicago is a most evident demonstration that roentgentherapy is bound to pass from the hands of slightly inter-

ested members of the medical profession to those whose exact technic and enthusiasm will produce results which were formerly thought impossible.

At the invitation of Dr. L. G. Cole, the editor went to New York to witness a demonstration given Saturday evening, December 27th, 1913, at the Hotel St. Denis, of a new form of Roentgen tube invented by Dr. Coolidge, D. S., Ph. D., of Schenectady, N. Y. This contribution to Roentgenology is, in the words of Prof Shearer, of Cornell University, the most important which American genius has ever offered. From the practical standpoint of Roentgen diagnosis and Roentgen therapy, it is the most important advance since the Jackson focus tube.

We have secured for the January issue of the Journal a paper from Dr. Coolidge on the physics and construction of his new tube. Briefly, the principles involved are the highest possible exhaustion of the tube and the tungsten terminals to get rid of the occluded gases and the liberation, at the time of use, of electrons from the tungsten cathode rendered incandescent by a storage battery. Through the regulation of this incandescence of the tungsten cathode the tube can be set for any desired penetration with a precision never before attained. In short, the Roentgenologist will have at his disposal a tube whose performance is as reliable and subject to as exact predetermined manipulation as is the output from a transformer,

or as Dr. Coolidge expressed it "a precise tool." The capacity of the new tube is remarkable as it will deliver 25 milliamperes for 50 minutes without deterioration, and with no change in the penetration during the exposure. Owing to the high exhaustion there is no fluorescence of the glass bulb, no visualization of the hemispheres when energized. Secondary rays from the glass walls are practically entirely absent. Inasmuch as the tube acts as a rectifier there is absolutely no inverse. It is almost uncanny to watch the tube when in use as it presents no signs of activity except the glowing of the cathode and a slight fluorescence of the glass where the wire is sealed in for the anode.

There was a decided warning given by the inventor as to the danger of the new tube in the hands of the inexperienced. Its apparent quiescence while producing the most tremendous quantity of high penetrating rays might easily lead to most disastrous over-dosage; the erythema dose has been given in a few seconds.

It is hoped by Dr. Coolidge that owing to the extreme exhaustion (about 1,000 times higher than an ordinary tube) penetrating rays of the therapeutic value of the gamma rays of radium may be produced; this of course opens up the most wonderful new possibilities for treatment.

The preliminary demonstration by Dr. Coolidge was entirely of a scientific nature, inasmuch as no arrangements have as yet been made for its commercial manufacture.

AMERICAN ROENTGEN RAY SOCIETY

Minutes of the Proceedings of the Fourteenth Annual Meeting of the Society, held in the Copley-Plaza Hotel, Boston, October 1-4, 1913.

FIRST DAY—MORNING SESSION

The society was called to order by the President, Dr. Henry K. Pancoast, of Philadelphia, at 9:30.

The Secretary, Dr. Sidney Lange, Cincinnati, presented the minutes of the previous meeting, as published in the American Quarterly of Roentgenology, for approval. On motion, the minutes were accepted as having been read, and found correct.

The Executive Committee, through its Chairman, Dr. Arthur F. Holding, of New York City, presented a brief report on matters of minor importance, begging for further time to present a final report. On motion, the request was granted.

At this juncture the President announced the death of one of the founders of the Society, Dr. Charles Lester Leonard, of Philadelphia, at Atlantic City, N. J., on September 23, 1913, from the effects of the Roentgen ray.

WHEREAS The American Roentgen Ray Society as a body, and the individual members personally, have lost, through the death of Dr. Charles Lester Leonard, a member renowned for his scientific attainments in Roentgenology, beloved by his colleagues for the un-failing interest he displayed in establishing this society with high standards and mourned not only as the nestor of Roentgenology in America, but also as our personal friend and adviser,

BE IT RESOLVED that the American Roentgen Ray Society adjourn for a period as a token of respect to the memory of Dr. Leonard, and that we extend to his family our sincere and heartfelt sympathy in the loss of a husband and father.

Signed,

P. M. HICKEY, M. D.
F. H. BAETJER, M. D.
E. H. SKINNER, M. D.

Dr. P. M. Hickey moved that the Chair be empowered to appoint a committee of three to draft suitable resolutions on the death of Dr. Leonard, that a draft of these resolutions be forwarded to Mrs. Leonard, and that they be published in the American Journal of Roentgenology. Seconded and carried.

The Chair appointed on this committee Drs. Hickey, F. H. Baetjer, and E. H. Skinner.

Dr. Threlkeld-Edwards moved that the Society adjourn for thirty minutes as a token of respect to Dr. Leonard's memory. Seconded and carried.

Adjournment was taken for thirty minutes.

At the expiration of the thirty minutes, the Society was again convened by the President. Dr. Hickey, on behalf of the Leonard Memorial Committee, presented the following resolution:

On motion of Dr. Thomas Stewart, of Philadelphia, the report was accepted unanimously by a rising vote.

The committee announced further that steps would be taken in the near future to secure lantern slide reproductions of the portraits of deceased members of the society whose deaths were due to the untoward effects of the Roentgen ray.

The report of the Committee on Nomenclature being called for, the Chairman of the Committee, Dr. Fred C. Zapffe, made a preliminary report, and asked for further time to present a final report. After some discussion, Dr. Hickey moved, seconded by Dr. Dunham, that the consideration of the report be made a special order of business at the morning session on Friday, October 3rd. Carried.

Dr. D. R. Bowen, Chairman of the Plate Exhibit Committee, presented his report, and on motion of Dr. Stover it was received and ordered placed on file.

Dr. Percy Brown, Chairman of the Committee on Arrangements, also made a brief verbal report on the activities of the committee, announcing the entertainments for which provision had been made.

On motion, the report was received and ordered placed on file.

The President here announced that the polls for the election of a member of the Executive Committee would be open at twelve o'clock noon, and be closed at twelve o'clock noon the following day. He appointed as tellers Drs. J. P. Marsh and D. D. Talley.

There being no further business to come before the Society at this time, the scientific program was taken up.

The papers comprising a symposium on bone diseases were then read, as follows: "Unusual Bone Lesions," by Adolph Hartung, Chicago.

"Typhoid Periostitis," by H. W. Dachtler, Toledo, Ohio.

"The Differential Diagnosis of Bone Diseases," by W. C. Hill, Cleveland, Ohio.

"A Further Consideration of the Roentgen Diagnosis of Luetic Skeletal Manifestations," by Percy Brown, Boston.

The discussion on this symposium was opened by Dr. P. M. Hickey, and continued by Drs. J. H. Edmonson, F. H. Baetjer, G. H. Stover and A. Hartung.

Dr. Roland Hammond, Providence, R. I., followed with a paper on "The Value of the Roentgen Ray in the Prognosis of Tuberculous Bone Lesions," which was discussed by Drs. J. T. Case, A. H. Pirie, R. H. Meisenbach, and, in closing, by Dr. Hammond.

The Society then adjourned until 2 P. M.

AFTERNOON SESSION

The President, Dr. Pancoast, called the Society to order at 2 P. M., and then introduced as guests of the Society Captain Wm. A. Duncan and Captain Arthur R. Christie, Medical Corps, U. S. Army.

The next paper on the program was entitled "The Roentgen Diagnosis of Lesions of the Lumbar Spine and Sacrum," by Drs. Robert E. Osgood and Robert Bucholz, Boston, the paper being read by the latter.

The discussion was opened by Dr. Meisenbach, and continued by Drs. Hickey, Osgood, Johnston, Stover, Soiland, LeWald, Meisenbach, Hunter, and closed by Dr. Bucholz.

Dr. W. S. Newcomet, Philadelphia, then contributed a paper entitled "A Method for the Estimation of Surface and Penetrating Effects of the Roentgen Ray," which was discussed by Drs. Pfahler and Newcomet.

Dr. Sidney Lange, Cincinnati, then demonstrated a portable frame for displaying lantern slides, and Dr. George E. Pfahler, Philadelphia, described a device for using a constant stream of water in a water-cooled tube. Dr. J. T. Case, Battle Creek, Mich., described the technic of gastrointestinal examination.

Adjourned.

SECOND DAY—MORNING SESSION

The Society reassembled at 9:30 o'clock, and was called to order by the President.

The scientific program was proceeded with at once. The first number on the program was the symposium on gastric and duodenal diagnosis, as a part of which the following papers were read:

"Diagnosis and Differential Diagnosis of Gastro-Duodenal Lesions," by Dr. Lewis Gregory Cole, New York City.

"The Positive Value of the Roentgen Diagnosis of Gastric and Duodenal Lesions," by Dr. Ariel W. George, Boston.

"The Action of the Pyloric Apparatus and the Stomach as Such, and the Factors Controlling Both, with a Review of the Literature," by Dr. Paul Eisen, Milwaukee (read by Dr. E. H. Skinner).

"Fluoroscopy of the Non-Deforming Diseases of the Stomach and Duodenum," by Dr. Edward H. Skinner, Kansas City, Mo.

"The Stomach as a Reflex Organ," by Dr. A. W. Crane, Kalamazoo, Mich.

"Indications Afforded by the Roentgen Ray for and Against Operation in Diseases of the Stomach, and the Result of such Operations," by Dr. A. Howard Pirie, Montreal, Canada.

The discussion on this symposium was opened by Dr. Percy Brown, and participated in by Drs. Hunter, Pfahler, Case, Stover, Baetjer, LeWald, Holding, Manges, Johnston, Soiland, Gray, Newcomet, Hartung, and closed by Drs. Cole, George, Skinner and Crane.

Dr. Arthur F. Holding, Chairman of the Executive Committee, then presented the following amendments to the Constitution, to be acted on later during the meeting:

ARTICLE III, Sect. 2: Active members shall be graduates in medicine and residents of America, etc.

ARTICLE III, Sect. 6: Corresponding members shall be residents of foreign countries and may be admitted on application, providing it is approved by the Executive

Committee. They shall be physicians who have specialized in Roentgenology, and who are in good ethical standing in their community. Their dues shall be \$5.00 a year, which shall include one subscription to the American Journal of Roentgenology, or a copy of the proceedings of the Society.

ARTICLE III, Sect. 3: Associate members shall be persons of scientific attainment who are interested in the advancement of Roentgenology, and whose membership is not otherwise provided for. They shall be admitted on application, providing said application has been approved by the Executive Committee. They shall be in good standing professionally, and have their applications endorsed by two members of this Society. Their annual dues shall be \$5.00, which shall include one subscription to the American Journal of Roentgenology.

ARTICLE V, Sect. 5: In the last line insert after word "for"—consider and report to the Society all new business of the Society.

ARTICLE VII, Sect. 1: This Committee shall appoint the Editor of the American Journal of Roentgenology.

Dr. Holding announced that the Executive Committee had passed favorably on the applications for membership of Drs. Frank S. Bissell, Minneapolis; Stanley Clark, South Bend, Ind.; B. C. Darling, New York City; F. S. Law, New York City; W. B. Palmer, Rochester, N. Y.; Samuel Stern, New York City; Frances C. Turley, Chicago.

On motion, that portion of the report dealing with new members was accepted, and the applicants declared duly elected to membership in the Society.

Adjourned.

AFTERNOON SESSION

The Society reassembled and was called to order by the President at 2:15 o'clock.

The Treasurer, Dr. Leonard Reu, presented his report, and, on motion, it was referred to the Executive Committee for audit.

The Chair appointed the following Nominating Committee: Drs. W. C. Hill, E. W. Caldwell and D. D. Talley.

The following papers were then read in the symposium on the intestinal tract:

"Colon Observations," by Dr. Leonard Reu, Buffalo.

"Roentgen Diagnosis of Membranous Pericollitis," by Dr. George H. Stover, Denver.

"The Early Use of the Roentgen Ray in the Study of the Alimentary Tract," by Dr. W. B. Cannon, Boston.

"Further Studies on the Ileocecal Valve and the Appendix," by Dr. James T. Case, Battle Creek, Mich.

The papers of this symposium were discussed by Drs. Pfahler, LeWald, Hartung, Baetjer, Reu, Stover, Case, and Cannon.

At this juncture tellers Marsh and Talley reported that Dr. Roland B. Hammond, of Providence, R. I., had received the greatest number of votes cast for member of the Executive Committee. The President therefore announced that Dr. Hammond had been elected to membership on this committee, and that his term would expire in 1916.

Dr. H. Threlkeld-Edwards, South Bethlehem, Pa., contributed a paper on "Intensifying Screens and Screen Technic," which was discussed by Drs. Pirie, D. R. Bowen, Snook, Caldwell, Crane and Edwards.

Dr. Leopold E. Jaches, New York City, followed with a paper on "Pyelography," which was discussed by Drs. Stover, W. H. Stewart, and in closing by Dr. Jaches.

The Society then adjourned.

THIRD DAY—MORNING SESSION

The Society reconvened and was called to order by the President at 9:30 o'clock.

The first order of business was a consideration of the amendments offered by the Executive Committee.

The amendment to Article III, Section 3, dealing with the question of associate

members, was read and, on motion, was laid on the table.

The other amendments offered to Article III, Sections 2 and 6; Article V, Section 5, and Article VII, Section 1, on motion, were adopted.

The Executive Committee then presented the following recommendations, which, on motion, were adopted by the Society:

1. That the present Committee on Exhibits

- (a) Be extended a vote of thanks;
- (b) Be reappointed for the ensuing year;
- (c) Be authorized to issue a catalog of exhibits for the next annual meeting, cost of said catalog shall not exceed \$200.00.
- (d) Be empowered to close the period of applications for exhibit three months previous to the date of next annual meeting.
- (e) Shall have the power to exclude from reproduction in the American Journal of Roentgenology all exhibits which are not properly entered and exhibited.

2. That a Memorial Service for Roentgen Martyrs shall be accorded a permanent place in the program of each annual meeting of the American Roentgen Ray Society: it is suggested that this service shall consist of lantern slide projections of the photographs of said martyrs, accompanied by appropriate remarks; said Memorial Service to be arranged for by the local Committee of Arrangements each year.

3. It is the sense of the Executive Committee that it would tend to higher efficiency in conducting the affairs of the Society if the Secretary were to serve more than a single term.

4. That Dr. W. B. Cannon, of Boston, Mass., and Sir James Mackenzie Davidson be elected Honorary Members of the American Roentgen Ray Society, and that the Secretary of the Society notify said Roentgenologists of this action.

5. It is the sense of the Executive Committee of the American Roentgen Ray Society that the making of Roentgenographic examinations for public corporations at any rate less than the minimum of the local tariff for said examinations is unjustifiable and deleterious to the best interests of Roentgenology.

The Executive Committee also presented the following resolution:

It is the sense of the Executive Committee that the standing of Roentgenology is seriously interfered with by making Roentgen examinations for public service corporations at a fee lower than a minimum fee charged by roentgenologists for the same service, and that in the event that any members of the Society indulge in such a practice, the matter shall be brought before the Board of Censors for action.

On motion of Dr. Baetjer, seconded by Dr. Pirie, the resolution was laid on the table.

The Committee on Nomenclature, through its Chairman, Dr. Fred C. Zapffe, then presented its final report. The Committee recommended the adoption of the following terms for use in connection with all work in which the Roentgen ray is the agent employed in order that the movement would receive the official sanction of the Society, thus insuring its favorable reception by all those who have occasion to make use of such a terminology:

Roentgen: To be pronounced rent-gen.

Roentgen ray: A ray discovered and described by Wilhelm Konrad Roentgen.

Roentgenology: The study and practice of the Roentgen ray as applied to medical science.

Roentgenologist: One skilled in roentgenology.

Roentgenogram: The shadow picture produced by the Roentgen ray on a sensitized plate or film.

Roentgenograph (verb): To make a roentgenogram.

Roentgenoscope: An apparatus for examination with the fluorescent screen excited by the Roentgen ray.

Roentgenoscopy: Examination by means of the roentgenoscope.

Roentgenography: The art of making roentgenograms.

Roentgenize: To apply the Roentgen ray.

Roentgenization: Application of the Roentgen ray.

Roentgenism: Untoward effect of the Roentgen ray.

Roentgen diagnosis: Roentgen therapy; Roentgen dermatitis. These terms are self-explanatory.

On motion of Dr. Caldwell, seconded by Dr. Pfahler, the report was adopted and the Secretary instructed to notify the important medical journals and all book publishers of the action taken by the Society.

Dr. E. W. Caldwell, Chairman of the Committee on International Standards, whose report was called for at this time, requested that the committee be excused from making a report at this time, as the members had not had an opportunity to meet and discuss the matter. On motion, the request was granted.

Adjourned.

AFTERNOON SESSION

The Society reconvened and was called to order by the President at 2:30 o'clock.

Dr. George E. Pfahler, Philadelphia, then read a paper entitled "Roentgen Therapy of Gynecologic Conditions." It was discussed by Drs. Skinner, Pirie, Hartung, Titus, and, in closing, by Dr. Pfahler.

Dr. George H. MacKee, of New York City, followed with a paper on "Therapeutic Technic."

Dr. Arthur F. Holding, New York City, read a paper entitled "Roentgen Technic of Deep Therapy." The paper was discussed by Drs. Stevens, Hunter, Pfahler, Pirie, Titus, Lange and MacKee.

Dr. Sidney Lange, of Cincinnati, followed with a paper on "Recent Results in Roentgen Therapy of the Thymus," which was discussed by Drs. Manges, Pfahler and Lange.

Dr. W. S. Newcomet, Philadelphia, reported cases of Raynaud's disease successfully treated by the Roentgen ray.

The report was discussed by Drs. Caldwell, Pfahler, and Newcomet.

Dr. Wm. H. Stewart, New York City, reported a case of "Air in the Ventricles of the Brain," which was discussed by Dr. Pfahler.

Captain Wm. A. Duncan, U. S. Army, read a paper on "The Portable X-Ray Machine and X-Ray Work in the United States Army."

Captain Arthur B. Christie, U. S. Army, followed with a paper entitled "The Development of X-Ray Work in the Army with the Stationary Machines."

These two papers were discussed by Dr. Le Wald.

Adjourned.

FOURTH DAY—MORNING SESSION

The Society reassembled and was called to order by the President at 9:30 o'clock.

The following papers, in the symposium on "The Diagnosis of Thoracic Conditions," were then read:

"Therapeutic Pneumothorax made Safer by the Roentgen Ray," by Dr. Kennon Dunham, Cincinnati.

"The Exact Location of the Heart Valves," by Dr. L. T. Le Wald, New York City.

"TeleRoentgenography as an Aid in the Diagnosis of Heart Lesions, and Controlled by Percussion and by Means of the Roentgen Ray," by Drs. Walter J. Dodd and George C. Shattuck, Boston.

"The Roentgen Diagnosis of Lesions in the Region of the Mediastinum," by Dr. George F. Thomas, Cleveland. (Read by Dr. Hill.)

These papers were discussed by Drs. Baetjer, Pfahler, Hammond, Pirie, Stewart, Le Wald, Cole, Dunham and Hill.

At this juncture the Executive Committee announced that Cleveland, Ohio, had been selected for the next place of meeting, in 1914.

On motion, the action of the Committee was approved.

The Executive Committee, through its Chairman, Dr. Gray, then announced that the Treasurer's books had been duly audited and were found to be correct.

The Publication Committee announced that it had been decided to issue the American Journal of Roentgenology monthly hereafter in place of quarterly, a decision which was received with loud applause.

Dr. Baetjer moved a rising vote of thanks to the local committee. Seconded and carried.

Dr. George C. Johnston moved that the Society make an appropriation of \$250.00 in favor of the local committee for the purpose of assisting in defraying the expenses of the meeting incident to the entertainment of the membership. Seconded and carried.

The Nominating Committee here presented its report:

President, Dr. Charles F. Bowen, Columbus; Vice-Presidents, Dr. Sidney Lange, Cincinnati, and Dr. Albert Soiland, Los Angeles; Secretary, Dr. W. F. Manges, Philadelphia; Treasurer, Dr. Leonard Reu, Buffalo; Librarian, Mr. H. W. Dachtler, Toledo; Member of Publication Committee, Dr. Geo. H. MacKee, New York City.

Dr. George H. Stover placed in nomination for the office of President, Dr. Sidney Lange. The nominations were then closed, and a ballot being taken for the office of President, Dr. Lange received the highest number of votes cast and was declared duly elected to the office of President by the Chair.

On motion, Dr. D. D. Talley, Richmond, was nominated for the position of First Vice-President. The nominations were closed, and Dr. Talley was declared duly elected for the position named.

On motion, duly seconded, the remainder of the report of the Nominating Committee for the offices of second Vice-President, Secretary, Treasurer and Member of the Publication Committee, was adopted and the nominees declared duly elected.

The scientific program was then proceeded with.

Dr. George C. Johnston, Pittsburgh, read a paper entitled "Roentgenography of the Pituitary in Epilepsy and Pituitary Disorders."

Dr. Sidney Lange, Cincinnati, followed with a paper entitled "The Practical Value of the Routine Roentgen Examination of the Mastoid."

Dr. P. M. Hickey, Detroit, read a paper entitled "The Roentgen Examination of the Head in Children."

Dr. W. F. Manges, Philadelphia, followed with a paper entitled "The Roentgen Ray Findings in Obscure Head Lesions."

Dr. Alfred L. Gray, Richmond, read a paper entitled "Roentgen Examination of Head Injuries."

The discussion of this symposium on the head was opened by Dr. Caldwell, and continued by Drs. Stewart, Le Wald, Manges and Gray.

Dr. Gray, the Chairman of the Executive Committee, then announced that the committee recommended the instruction of the Treasurer to add to the mailing list of the Society the names of the leading medical journals, in order that the official organ of the Society, the American Journal of Roentgenology, will receive exchange courtesies. On motion, the suggestion was adopted and the Treasurer correspondingly instructed.

At this juncture the President, Dr. Pancoast, introduced the President-elect, Dr. Lange, who addressed the Society briefly, extending his thanks for the honor conferred on him, and soliciting the support of the membership in the carrying out of the work of the ensuing year.

There being no further business to come before the Society, an adjournment was taken subject to the call of the Executive Committee.

ABSTRACTS

Bumm, E.: Results of Roentgen Ray and Mesothorium Treatment for Carcinoma of the Uterus (Ueber Erfolge der Roentgen- und Mesothorium-Behandlung beim Uterus-karzinom). *Zentralbl. f. Roentgenstrahlen*, 1913, IV, 395.

The intense irradiation of carcinoma of the uterus has been practiced for a year at the Berliner Frauenklinik. The quantity of the ray has been increased to 1,000 Kienbock X and 25,000 milligram hours mesothorium. The tolerance of the mucosa of the genitalia against hard rays is exceedingly great. An inoperable carcinoma of the uterus, which had been presented at the Berliner medizinische Gesellschaft a year ago has now become operable as a result of irradiation with 1,600 X, and the carcinomatous proliferation has been very favorably influenced. This success gave rise to further extensive trials. At the meeting of the aforementioned society in May, 1913, Bumm demonstrated on roentgenograms which were taken before and after the treatment the results which were obtained in 12 cases, one of which was carcinoma of the urethra and 11 carcinoma of the uterus. Some of the cases were clinically cured. The definite results can be decided only after several years' observation. The carcinomatous new-formations perish relatively quickly when the tissue is exposed to a great intensity of roentgen, radium or mesothorium rays.

In one case the cancerous growths were severely damaged at 1 cm. depth after nine days' exposure; in another case no carcinomatous growths were left after 24 days and 1,300 milligram hours mesothorium. Hyaline degeneration and sclerosis of the connective tissue are simultaneous with the decay of the cancerous nests. "The induration and shrivelling of the new-formation, its sharper stratum against the surroundings, the scab and callous formation is ef-

fectured by the sclerosis of the connective tissue; the cessation of hemorrhage and ichorous suppuration as well as the healing over are the result of the decay of the cancerous nests."

The intensive effect can only be decided by microscopic examination of the diseased organs themselves which are either obtained by a later removal or at autopsy, and not by microscopical examination of test incisions, which give information as to the condition of the tissue of only that one portion. In most cases fresh carcinomatous cells were still found. Bumm examined two extirpated uteri which had been exposed mesothorium for 21 and for nine days. In the first case the carcinomatous cavity was clean, leaving only a narrow seam of necrosed carcinomatous tissue; in the other case there was still a carcinomatous layer of 1 cm. thickness, which was, however, in a state of disintegration.

Potocki, Delheim & Laguerriere: Roentgenography of the Foetus in Utero (*La Radiographie du Foetus "in utero"*). *Arch. d'electricite med.*, 1913, XXI, No. 364, pp. 188-189.

The three authors have at their disposal the powerful installation of the new hospital "de la Pitie" in Paris (model Gaiffe) and have studied the roentgenography of pregnancy.

The difficulties arising from the thickness of the maternal parts and the delicate opacity of the bones of the foetus were overcome by a tube of medium penetration, for example, one which gives a good roentgenogram of the lumbar spine. There is, however, another difficulty which arises from the mobility of the subject which is to be reproduced; that is the spontaneous movement of respiration of the mother, the circulatory pulsation and contraction of the uterus and the movement of the foetus. It is, therefore, necessary to immobilize the

mother in a comfortable position (dorsal decubitus, tube under the table and the plate fixed upon the abdomen), and secondly to make short exposures with intensifying screen and intensive exposure. With the time of exposure varying from one-fifth to several fifths of a second the authors were always able to obtain the picture of the foetus at term. If, however, the thickness of the abdominal wall exceeds 35 cm., then the picture of the foetus is incomplete. Frequently they were successful with roentgenography at five months and in one case at four months and a half.

A series of roentgenograms of pregnancy at all stages is shown.

Fraenkel & Budde: Histologic, Cytologic and Serologic Examination of Roentgenized Guinea-pigs (Histologische, zytologische und serologische Untersuchungen bei roentgenbestrahlten Meerschweinchen). Fortsch. a. d. Geb. d. Roentgenstrahlen, 1913, XX, 355-363.

The results of the experiments performed by Fraenkel and Budde in the policlinic in Bonn on roentgenized guinea-pigs were shortly as follows: 7 guinea-pigs who were exposed to large roentgen doses one to two days and four days showed exceedingly bad contents of complement in five cases. The histologic findings in one animal which lived 7 days were symptoms of degeneration of the spleen, and in the other animals acute inflammation of the spleen. Leucocytosis was early observed, then leucopenia, which led to a leucocytosis; in two cases the hemoglobin and erythrocyte count was exceedingly high. Lymphocytes prevail at the beginning, but soon disappear. There is a close relation between the severity of the histologic changes and the blood picture; there are none, however, between the cytologic blood picture and the histologic picture of blood forming of the blood forming organs on the one side and the content of haemolytic complement on the other. Five animals which were daily roentgenized with a dose of one-half Er. for a longer period

showed the mentioned histologic changes in a more marked degree and in one case the complement dissolved badly. Ten animals were roentgenized once with doses of 2 to 4 Er.; five of these died spontaneously within 6 to 10 days, and 5 were killed on the tenth and eleventh days. The complement content did not vary in these cases. Leucopenia and the other findings same as above. In the spleen and lymphatic glands there is inflammatory edemata, and in some parts there is beginning degeneration of the follicles.

Neither the conduct of the leucocytes nor that of the blood forming organs explain the origin of the haemolytic complement sufficiently.

Regaud & Nogier: Effect of High Doses of Roentgen Rays Filtered Through 3-4 mm. Aluminum, etc. (Les effets produits sur la peau par les hautes doses de rayonn X selectionnes par filtration a travers 3-4 millimetres d'aluminum. Application a la Roentgentherapie). Arch. d'electricite med., 1913, No. 350, pp. 49-66.

Regaud and Nogier of Lyon have for several years studied the action of roentgen rays, filtered through 3-4 mm. layers of aluminum, upon the normal skin and upon neoplasms in contrast to the rays which were filtered only through thin screens or not filtered at all. Seventy cases came under observation. Doses of 36 H and higher filtered through 3-4 mm. thickness of aluminum caused only a slight loss of epidermis and slight burn, which, however, healed quickly and left a normal skin. The authors call this condition "radioepidermitis" in differentiation to "radiodermatitis." 7 to 8 H of unfiltered rays cause a reaction of second degree, but if filtered through 4 mm. aluminum cause only a light erythema without swelling. 20-22 H unfiltered cause ulceration with necrosis and on the other hand if filtered radioepidermitis without any deeper injury. The thinner the screen the stronger the effect upon the skin. The endothelium of the

vessels is very little affected by filtered rays. The hair of the scalp falls out when a dose of 44 H is given under 4 mm. screen, that of the beard with 10 H and the hair of the axilla and the pubic hair with 14 H.

Experiments with dogs showed that those animals which had passed through a radioepidermitis and were then operated on, showed a greater tendency for healing of the wounds; the scrotal skin of a dog which had been exposed under a screen of only 2 mm. aluminum until epilation showed, became ulcerous and necrotic after an incision.

The use of thick screens is very suitable for preoperative roentgenization and guarantees an homogenous irradiation at a great depth; the cytocaustic effect of this method is much finer, and the effect upon the most sensitive cells is persistent.

The filtration of the roentgen rays through 4 mm. thickness of aluminum permits giving high doses without noticeable damage to the sound and healthy skin, which would never be possible without the screen. With dose III and 4 mm. aluminum screens the same dermo-epidermic effect is obtained as with unfiltered dose I. The article cannot be exhaustively given in an abstract, but is worth while reading in the original.

Demoulin: Technic of Roentgenoscopy for Urinary Calculi (Technique de l'exploration des calculs urinaires par la radiographie). Arch. d'electricite med. 1913, XXI, No. 364, p. 189.

Based upon their habitual location, Demoulin divides stones of ureters and kidneys into those that are low in the terminal pelvic portion of the ureters and those that are high located in the kidney or the pelvis of the kidney and the initial portion of the ureters.

After having studied the location and disposition of the low calculi the author marks those points for the radiologic examination which is relatively easy on account of the immobility of the stones and because such

an examination does not require short intensive exposure with intensifying screens.

He then enumerates the causes for the principal mistakes, which may be made in reading the roentgenogram and tries to differentiate them.

For the high calculi the author determines the limits of the anatomic zone where the stones may be encountered and makes guiding marks with grease paint for the roentgen examination.

Kleineberger: Treatment of Leukemia (Die Behandlung der Leukemie). Fortsch. a. d. Geb. d. Roentgenstrahlen, 1913, XX, 533-541.

Kleineberger reviews the various methods of treatment of leukemia. With Roentgen rays he has treated 28 cases of myelaemia and 13 cases of lymphoemia. Such cases in which the symptoms have been manifest for a year and in which anaemia has not yet reached a high degree offer the best prognosis. Symptoms of cachexia and diseases of the sensory organs offer no contra-indication. Some cases show a favorable effect only after 20 roentgenizations of 20 minutes duration; the duration of the effect of renewed treatment in relapses and the danger of erythema and burns varies in the various individuals, and some cases do not react at all. In all acute forms the roentgen treatment is contra-indicated. A contra-indication for continuance of the treatment is increasing anaemia, cachexia, fever and severe general disorder. The treatment has to be interrupted if toxic symptoms appear. In myelaemia the appearance of myeloblasts is a strict contra-indication for continuing the treatment. With reduction of the leucocytes and the general condition and the blood picture failing to improve, an interruption is also indicated.

In only a few cases a long and persistently applied roentgenization had the result that it created ability to work and enjoyment of life for several years; in several cases

of the author the success was prompt, lasting 3 to 5 years and in one case even 7 years. Unfortunately, even a seemingly perfect success is often followed by a relapse, and a renewed treatment is not always successful. The author was able to cure four relapses in one case by renewed irradiation. One female patient came for treatment at the very last stage of the disease in an apparently hopeless condition; she was roentgenized, recovered, became pregnant during a remission and gave birth to a living child, which showed no blood changes. This patient succumbed, after several years, to a relapse which could in no wise be influenced by renewed treatment.

With few exceptions, the blood remains pathologic and contains myelocytes, erythroblasts, eosinophile and basophile cells and lymphocytosis.

The current should be $\frac{1}{2}$ -1M-A, spark 8-14 cm., penetration 5-8 Walter, and focus to skin distance 30-40 cm.

An extensive bibliography is added to the article.

von Cackovic, Miroslaw: Roentgenographic Examinations of the Topography and Function of the Normal Alimentary Organs and the Localization of Foreign Bodies Therein. *Liječnicki vijesnik*. 1913, XXXV, H. 3-5. Ref.: *Zentralbl. f. Roentgenstrahlen*, 1913, IV, 322-324.

The first part of the work gives a detailed review of today's standard of our knowledge of topography and function of the alimentary apparatus. For the representation of the air passage the author proposes to try thorium nitricum, which has been used for inhalation in tuberculosis cases.

Four cases of foreign bodies are reported, one in the intestines and three in the esophagus and one in the left bronchus as a contribution for the differential localization of the esophagus and the bronchus.

Foreign bodies can be made visible in the roentgenogram if their denseness is greater than that of the body; they may,

however, if of lesser denseness, also be localized in cases where they obstruct. Negative findings do not exclude the presence of a foreign body, and positive findings may be simulated by a pathologic process. A foreign body is localized if with clinical symptoms the history is positive and a shadow corresponding to the foreign body is visible in the place where the organ would normally be. A foreign body in the neck is located in the esophagus if it is seen in the sagittal diameter somewhat to the left of the median line and in the frontal diameter near the spinal column. In the thorax the foreign body in the esophagus will be nearer to the median line and in the bronchus more laterally. A long foreign body lies vertically in the esophagus; in the bronchus it lies obliquely from below laterally upwards to the median line and the foreign body itself or its prolongation will cross the median line in the height of the fourth dorsal vertebrae. A long foreign body in the esophagus can take an oblique position only when it perforates wholly or partly. If in the stomach the foreign body will be seen mostly at the caudal pole, generally to the left of the umbilicus. Foreign bodies in the stomach must be differentiated from those in the duodenum, jejunum and colon transversum. In the small intestine the foreign body changes its location very quickly; when in the colon transversum it will remain in the same place for a long time. When in the stomach the foreign body makes great excursions upon palpation; in the colon, however, it can be but little moved; it is characteristic for the colon to return into the same position after it has been shifted and of course a foreign body in it will follow these movements. If the stomach be filled with fluid and is then viewed in different positions of the body, the foreign body will be found to make very big excursions. Food, when given to the patient during the examination, may be seen advancing toward the foreign body. The colon transversum is mostly below the

umbilicus, and a foreign body in it will be seen advancing from the right to the left. Before it gets to the point characteristic for the colon transversum it will be seen in places that mark the ileum, cecum and colon ascendens. If the lower abdomen is drawn in or pressed down with the hands it can be seen whether the foreign body is in a mobile abdominal organ (stomach and intestine) or in an immobile part (pancreas). A mobile foreign body will rise, and an immobile one will stay in its place. It is characteristic of a foreign body that it changes its position frequently when in the intestines, especially in the small intestine, whereas it will stay for a longer time in the same place when it is in the stomach. A foreign body in the duodenum is visible to the right over the umbilicus; when it is in the jejunum it can be seen in the middle of the abdomen; and when it is in the caecum it is seen in the right iliac fossa or in the right side of the pelvis; when it is in the flexura sigmoidea it is visible in the left fossa iliaca or in the left pelvis. Some air bubbles may be seen around the foreign body when it is in the colon.

Kienbock: Roentgentherapy of Malignant Tumors (*Radiotherapie des affections malignes*). *Arch. d'electricite med.*, 1913, XXI, No. 364, pp. 190-191.

The ideal method of treatment of tumors is the removal of the pathologic cells without injury to the adjoining normal tissue and the rest of the organism. This result has been obtained with roentgen rays and other similar rays for a certain kind of tumors on account of the superior sensitiveness and the selective action of the pathologic cells. Roentgen rays and radium rays may exterminate the most malignant and even largest tumors if they are very radiosensitive. Numerous recoveries are already known. If a tumor, and especially a sarcoma, disappears very rapidly as a result of the treatment, it seems that we need not fear a relapse. If in a case of a tumor the risk be the same if surgically treated

or by irradiation, the latter therapy should be chosen for humanitarian reasons. The chances for a permanent cure of carcinoma are not very great, even if the tumor looks operable at the beginning. Czerny said some time ago that about three-quarters of the cases of carcinoma which have been operated later show relapses.

The technic is of great importance. The greatest progress here has been made by the work of Perthes, Dessauer and their followers. The filtration with thick aluminum is very important and above all for tumors which are not very radiosensitive, or which are deep seated. Another important progress has been made by Reicher Lenz, which renders the skin insensitive by injections of adrenalin. Lately it has often been said that the roentgen rays may do damage in cases of malignant tumors and some authors confuse even the term of weak dosage and irritating dosage. If proper technic is employed there are in fact only a very small number of cases which are unfavorably influenced. The cause of this is probably not so much a stimulation of the growth of the tumor, as the presence of an inflammatory infiltration in the neighborhood of the tumor cells; this inflamed territory on which the tumor is located becomes less resistant under the influence of the rays and as a result the tumor grows rapidly on this ground.

Kienbock protests against the idea that weak doses are always or at least often irritating. If these doses really had an irritating effect this is certainly not the case with certain well defined dosages in strictly limited regions, and this bad effect is practically not to be feared.

Almost all means and methods to replace the operation in the treatment of malignant tumors have been abandoned, but thanks to their efficiency the roentgen rays have had a better fate. We see that the technic of roentgenization and the indications for roentgentherapy have been steadily perfected and the employment of roentgen rays

will increase in general practice more and more in spite of all disputes and quarrels.

Koehler: Roentgen Diagnosis in Tuberculosis of the Kidneys (La radiodiagnostic de la tuberculose renale). Arch. d'électricité med., 1913, XXI, No. 364, p. 189.

At the International Medical Congress in London, Koehler presented some very good roentgenograms of a case of tuberculosis of the kidneys which show the lesion excellently. The lower two-thirds of the diseased kidney gives a very homogeneous shadow. The kidney shows the same distinct contrast in the roentgenograms as a stomach or a part of the intestines filled with bismuth. The calcifications which have produced this shadow are probably in the cortical capsule where they had also been found in the other kidney which had been extirpated previously. The case is particularly interesting because in place of the extirpated kidney a second small kidney is found which shows the same dense shadow in the roentgenogram.

Levy-Dorn: Effect of the Roentgen rays on Malignant Tumors. (Zur Wirkung der Roentgenstrahlen auf maligne Geschwülste). Strahlentherapie, 1913, III., H. 1, p. 210-215,

Levy-Dorn reports his experiments with carcinomatous and sarcomatous mice which he roentgenized and comes to the conclusions that axillary tumors may probably be reduced with doses not less than 80 X hard rays; some tumors, however, from the same vaccination material were but little affected. This shows that the reaction of the tissue plays a great part in the effect of roentgenization besides the susceptibility of the tumor to the rays. The obvious shriveling of the tumor is an unmistakable expression of the reaction of the tissue.

It is an axiom that Roentgen rays have a quicker effect on rapidly growing tumors because here the early forms of the cells which have an especially great susceptibility for the rays are increasing. Those of the

vaccination tumors in mice, however, that are growing quickly cannot easily be influenced by the rays, and the axiom is therefore limited. The healing reactions produced by the roentgen rays require a considerable time for their development, and if the tumors grow faster than this time then we cannot expect a thorough effect.

Two cases are reported: A woman 28 years old had been operated on for lymphosarcoma of the right cervical glands on July 1st, 1904. In November, 1905, the glands on the left side began to swell, the supraclavicular and the submaxillary and a new tumor appeared in the operation scar. Arsen and Priessnitz application increased the tumor. Operation was contraindicated on account of the extensiveness of the disease. Six weeks after the relapse roentgenization was started and in January, February and April 6 or 7 exposures were given of 10 X each on the left side and the same dose three times on the right side. Patient improved; then relapse in December, 1906, and again 11 irradiations, after which the swellings disappeared completely. Three years later, in 1909, the inguinal glands began to swell whilst the neck remained normal. The trouble increased during the next fifteen months and roentgenization was commenced first for two weeks and then again three weeks later. Since then the patient has been well and free from her trouble.

The second case was one of periosteal sarcoma of the femur in a 17 year old male patient. He had had pains in the left thigh for the last two years, probably the result of an injury sustained during mountain climbing. At that time nothing abnormal could be found by Roentgen rays. Physical therapy and antineuralgic remedies and sanatorium treatment were tried without result. On April 26, 1906, a capable surgeon diagnosed periosteal sarcoma and proposed operation, which was, however, refused. Roentgenization was begun April 26, and continued to May 7, one erythema dose in

three exposures, from the front to the back and from both sides and repeated from May 29 to June 1, and then five irradiations were given from June 25 to July 5. The tumor decreased in size and two more treatments were given up to February, 1907. In September of the same year the patient had recovered so far that he gave up analgesic drugs and in the fall, 1908, almost all symptoms had disappeared so that he was able to continue with his study and his mountain climbing. Roentgenogram taken in November, 1911, shows the femur a little swollen, but the trabeculae have disappeared; only periosteum and corticalis are thick.

A third case of sarcoma of the thumb is reported. The third phalanx of the right thumb of a man 31 years of age had been amputated for sarcoma and been supplanted by a piece of bone one and one-half years previously. Relapse occurred then and the thumb had a circumference of 15 cm. when roentgenization was begun. In seven months 6 times 10 X were applied, without filters, with the result that the thumb is now 8 cm. in circumference. The different stages after beginning of the treatment are illustrated with roentgenograms.

Klein: Results of Roentgentherapy for Carcinoma of the Uterus, Mamma and Ovaries (Erfolge der Roentgentherapie bei Karzinom des Uterus, der Mamma und der Ovarien). Strahlentherapie, 1913, III., 260-271.

From 1904-1907 the author roentgenized six cases of carcinoma of the uterus and one of the vulva: "Cauterized and early roentgenized relapses after coeliotomy or vaginal total extirpation are prevented from growing, and pains and suppuration are lastingly diminished. The connective tissue which surrounds the cancerous focus becomes solid through the roentgenization and forms a sort of mantle or wall, which probably contributes to prevent the progress of the carcinomatous growth for some time. The life of patients with inoperable carci-

noma of the uterus may be prolonged by roentgenization. A cure of the carcinoma of the uterus was not effected."

In May, 1911, the roentgentherapy was taken up again in the Gynecologic University Policlinic in Munich and up to January, 1913, twenty-seven cases of carcinoma of the uterus were treated, that is, thirteen after extirpation of the cervix or corpus carcinoma of the uterus and fourteen with inoperable carcinoma of the cervix. The prophylactic roentgenization after extirpation is of great importance. To extirpate the disease focus first and then to roentgenize promises better results.

Case of a forty-four year old woman with inoperable malignant adenoma of the cervix: The left parametrium was filled with a tumor up to the abdominal wall; two complete excisions were done in 1912, removing a malignant adenoma thoroughly from the deepest parts. From July, 1912, to June, 1913, twenty-nine abdominal and twenty vaginal irradiations 211 minutes with 142 X were given. The tumor then became softer, the suppuration ceased and a tissue, covered with normal epithelium was formed looking like a portio; the parametrium became freer toward the abdominal wall. The general condition has been perfect for nine months after the excision, and the patient is constantly improving. That does not mean a cure, but shows a remarkably good result of the combination of excision with roentgenization.

Remarkable is also the case of a forty-nine year old woman with a carcinoma of the cervix, upon whom a radical operation was performed in January, 1912. Relapse occurred in July and October, 1912, and both times excision and cauterization were performed with roentgentherapy before and after the operations. Thirty-five abdominal and thirty-one vaginal irradiations were applied in 238 minutes, with 240 X. When examined in June, 1913, the patient was without relapse, the scar in the vagina smooth and movable and the parametrium

and the paracolpium free from infiltrations. The patient looks rejuvenated. Here, also, a longer period has yet to elapse before we can speak of a definite result and the roentgenization will be continued at longer intervals.

Five cases of inoperable carcinoma ended fatally, but not on account of the roentgen treatment, but in spite of the same, because the process had advanced too far.

When there are no relapses the irradiation is repeated at intervals of from one to two months; if there have been no more relapses for one year or more, the intervals may be prolonged.

For inoperable carcinoma there is no limit as to dosage and intensity and duration of the treatment and the limit should be risked.

Carcinoma of the Mamma: Two inoperable cases were treated. The mammas and the axillary glands were, however, extirpated as far as this was possible technically, and then roentgenization begun. The therapy was intensive. Both cases improved considerably and the carcinomatous masses in the axilla have become indurated. A third case was treated in 1907, for adenocarcinoma of the left mamma, which was amputated December 18, 1907. The axillary glands were free. November 20, 1902, adenocarcinomatous nodules of the size of peas were extirpated and this had to be repeated again in April, 1910, and in March, 1911. Before and after each of these relapse operations intensive roentgenizations were given by Drs. Bruegel and Kaestle. In December, 1911, again a nodule had to be removed which, however, did not contain carcinomata. In May, 1913, the patient was seen again and had been without relapse. This is possibly the only case of a cure of adenocarcinoma of the mamma which has lasted for five and one-half years in spite of the formations of recurrences.

Adenoma and Carcinoma of the Ovaries: After extirpation of adenoma, malignant papilloma or carcinomata of the ovaries, roentgenization was performed as an after-

treatment in six cases, because a radical operation was impossible. Tumor masses had been left in the abdominal cavity, and the course of the disease was more favorable than in cases without roentgentherapy.

In his conclusions Klein says that with no other therapy has it been possible to obtain as good and as quick results as in the roentgenized cases. The prospects are best after total extirpation of the diseased parts. It is better to operate first and let the roentgenization follow.

Meyer, Fritz M. (Berlin): Roentgentherapy of Carcinoma of the Female Genitalia (Zur Frage der Roentgenbehandlung der weiblichen Genitalien). *Zentralbl. f. Roentgenstrahlen*, 1913, IV, 365-369.

The author discussed the question of roentgentherapy for carcinoma of the uterus at the session of the Berliner Medizinische Gesellschaft, April, 1912, and emphasizes the great merits of the systematic procedure of Bumm as practiced at the Frauenklinik in Berlin, and comes to the following conclusions:

1. The importance of the reports of Bumm is in the system of his procedure and experiments.

2. At present the operable carcinoma belong to the surgeon; only cases which are inoperable or in which an operation is contra-indicated should be treated with roentgen rays or mesothorium.

3. Excessive dosages should be avoided because there is a possibility of secondary damage; even medium strong doses bring good results.

4. The roentgenizations should be performed by expert roentgenologists and the results should be controlled by the gynecologist.

Dohan: Gynecologic Roentgenization (Zur Frage der gynecologischen Roentgenbestrahlung). *Fortschr. a. d. Geb. d. Roentgenstrahlen*, 1913, XX, 390-392.

Dohan's experience is founded upon 23 cases of myomata, metrorrhagia, metritis,

perimetritis, and menorrhagic troubles without hemorrhage. He had good results in all cases except in one case with large myoma and panniculus adiposus.

His method is a combination of other methods and is varied according to the age of the patient, the panniculus adiposus of the abdominal walls and the severity of the case. A thin abdominal wall permits shifting and in order to be able to use a stronger dosage of rays without injuring the skin. He pulls the abdominal wall to the right, to the left, upwards and downwards, and fixes it in the desired position with adhesive plaster, to which sandbags are attached to keep them in place; thus he is able to expose different parts of the skin at every sitting, and roentgenize the same organ. He was able to apply a dosage of 50 X and with heavy leather screens even 70 to 80 X in one series. The area which has been exposed is marked with a grease pencil each time, and thus an irradiation of the same portion of the skin is avoided. For screens he uses 1 cm. thick sole leather or 2 mm. aluminum plates, and a dosage of 6 to 10 Kienbock X is measured under the screen.

Hirsch: Roentgentherapy for Myomata and Fibrosis uteri (Die Roentgenbehandlung bei Myoman und Fibrosis uteri). *Fortschr. a. d. Geb. d. Roentgenstrahlen*, 1913, XX, 373-389.

In 1911 roentgentherapy was begun at the University Policlinic for Diseases of Women in Munich and up to March, 1913, one hundred and fifty women were treated; of these forty-six were cases of myoma, thirty-five of fibrosis uteri and twenty-six carcinoma (five ovarian and twenty-one uterine), six menorrhagies, ten cases of dysmenorrhea and menorrhagies, five cases of pruritus vulva, three of pyosalpinx and parametric exudate, one case of tuberculosis of the mamma and two cases of tuberculosis of the peritoneum and the uterus. As interrupter, first a Rotax, then the electrolytic interrupter Polyphos-Simon, and finally the double interrupter Rythmeur were used.

The tubes used were Mueller's water cooling tube, Gundelach and Polyphos, and intensive therapy tube with 9 to 10 Wehnelt as the lower limit of hardness. One to two folds of leather were used as filters and later on only 2 mm. aluminum. The finally accepted method was developed from the original Albers-Schonberg method, and consists in three field irradiation, increasing the single irradiations to nine, three irradiations each on three successive days, right, middle and left, thus making a series of 24 to 27 X. The interval is 14 to 16 days, allowing the application of two series between the menses. With aluminum screens of 2 mm. the skin to focus distance was 25 cm.

The conclusions of the author are that today roentgenization enables us to destroy the ovaries in any woman of any age and thus to cause amenorrhea. Patients with myoma require an average dosage of 80 X and those with fibrosis uteri an average dosage of 44 X to become amenorrheic.

In view of the good results which were effected with this three field irradiation and small doses the author considers the method which is used in the clinic in Freiburg, where they apply hundreds and thousands of units, as unnecessarily dangerous, though he admits the great merits of that institution.

Berdez (Lausanne): Roentgentherapy of Myomata (Ueber die Roentgentherapie der Myoma). *Fortschr. a. d. Geb. d. Roentgenstrahlen*, 1913, XX, 393-397.

Malignant degenerations and submucous myomata should be treated surgically. Metrorrhagia in women under forty years of age should also be treated surgically or the surgical treatment be assisted or accompanied by intensive roentgenization. Eighty-two fibromyomata were treated, which were mostly complicated with metrorrhagia and twenty cases were of metrorrhagia without tumors. The results were good. There were no serious complications, only falling out of hair, sometimes erythema, and increased menorrhagia during the first one or two months; further

nervousness, flushes of heat and a certain inclination to sleeplessness were observed; these, however, are symptoms of the commencing success of the treatment. Derdez used hard tubes, 7 to 8 Benoist (9 to 11 Wehnelt) and lately 3 mm. aluminum screens. A loofah sponge in the shape of a hemisphere, of 14 cm. diameter and 7 to 5 cm. thickness, was used for compression and directly above it at a distance of 2 to 3 cm. the 9 cm. wide opening of the protecting box of a simple Lambert stative. The opening is covered with an aluminum plate, which is 2 cm. below the tube. If possible, the treatment is applied during the menses, in order to take advantage of the physiologic hyperaemia at this time.

d'Oelsnitz & Paschetta: Value of Roentgenoscopy of the Thorax for the Diagnosis of Respiratory Affections in Infancy (*Valeur de l'exploration radiologique du thorax pour le diagnostic des affections respiratoires de l'enfance*). *Arch. d'electricite med.*, 1913, XXI, No. 364, p. 184.

After reviewing the different affections of the respiratory organs of infants and describing their radiologic manifestations, the authors come to the following conclusions:

The radiologic examination of the thorax systematically practiced in the respiratory organs of the infant, gives the clinician a precious and useful assistance. This does not exclude the usefulness of other means of investigation which we have, and frequently the information which is given us by these is indispensable for the proper interpretation of the roentgenogram; nevertheless, it constitutes a reliable aid in the practice of pediatrics and today we cannot do without it. The roentgenologic examination alone sometimes makes the diagnosis, often it rectifies it, and always it completes it. It clears up the prognosis, as it shows the degree and the extent of the lesion and directs attention to its evolution

and finally, in the majority of cases, it is the safest and most useful guide in directing and applying the treatment.

Beclerc & Beclerc: Roentgentherapy of Leukemia (*La radiotherapie dans les leucamies*). *Arch. d'electricite med.*, 1913, XXI, No. 365, pp. 225-231.

Since 1904 the authors have treated 110 patients suffering from leukemia with the roentgen rays (Hospital St. Antoine, Bordeaux).

Of these 110 cases twelve were lymphatic leukemia, ninety-three myeloid leukemia and five cases acute leukemia. The cases of lymphatic leukemia are divided into three groups: (1) the exclusively glandular form; (2) the pure splenic form; (3) the mixed glandular and splenic form. In all these cases roentgenization has given immediate and good results, and a return to almost the normal has been effected. The conditions most dreaded and to be prevented are relapses. One of these patients was under observation for five years and died from another affection. Three patients have been under observation for two years and are apparently well, but are subjected to treatment at long intervals which is regulated according to the blood findings.

Of myeloid leukemia only the splenic type has come under observation. The glandular phase of the disease is observed only at the terminal stage and only in rare cases.

The technic consisted in irradiation of the spleen alone, the latter being divided into zones of 8-10 cm. Aluminum of 1 mm. thickness was used as a screen. The applications were made on the anterior, posterior and lateral region. Rays 8-9 according to radiochromometer of Benoist were used; sittings of four hours each for three weeks.

The result of this method was that the authors always effected an improvement in the cases of myeloid leukemia in about two months. The patients were constantly watched for relapses; the blood examination showed persistently traces of myelocytes.

The conclusions of the authors are that the roentgentherapy is a wonderful medication for leukemia, that it gives unexpected results, that it is, however, only a symptomatic medication and often only transitory.

Roentgenization in acute leukemia never seemed to influence the evolution of this disease to any degree, and the authors reserve their opinion as to the influence in certain abnormal forms of disease of the blood.

Weitzel: Intensive Deep Roentgentherapy (*Erfahrungen mit der Roentgen-Tiefen-Therapie*). *Strahlentherapie*, 1913, III, 272-275.

Weitzel reports the results with intensive roentgentherapy at the gynaecological clinic in Dresden from October, 1912, to May, 1913. They employed field irradiation with 8 areas of 7 cm. diameter equally divided right and left upon the abdomen upward from the symphysis. Irradiation from the back was not performed. The tubes were of 7-9 Benoist with 4-5 milliamperes. Aluminum screens of 3 mm. thickness were used at a skin-focus distance of 18 cm. Material of lead is used to protect the patients completely. The tube is encased in a lead glass mantle. For measuring the rays Kienboeck's method was employed. The patients are always irradiated on two successive days through four windows with one erythema dose each, corresponding 5-7 minutes. One sitting requires in this way one-half to three-quarters of an hour and is not disagreeable for the most sensitive patient. In one series the patient receives 80X Kienboeck with 14 days' interval, which is lately reduced to 10-12 days between the series without consideration of the menses. Dessauer's reform apparatus was used, which permits the simultaneous employment of two tubes. After many experiments Mueller's water cooling tubes and Vaifa's tubes proved the most satisfactory.

64 patients were treated and 30 of them are still under treatment. In two cases the treatment was prophylactic after amputa-

tion of the mamma. So far no relapse has occurred but the time is too short to draw definite conclusions. Of 21 myoma patients 20 became amenorrhoeic; in one patient was a rather strong increase in the growth of the tumor after 5 series; a supravaginal amputation was performed and a myomatous nodule without malign degeneration was found in the myomatous uterus which had the size of a child's head.

Amenorrhoea occurred generally after 2,1 months, without being influenced by the age of the patients, which varied from 38 to 53 years.

5-600 X were given in 7,4 series. The irradiation is continued until menstruation has not appeared for 8 weeks.

In 14 cases the myomata had become a little smaller and in two cases they decreased considerably in size. In five cases the size of the tumor was but little affected, the symptoms, however, disappearing. The menstruation increased in quantity after the first series. In the five cases of hemorrhagic metropathy amenorrhoea was effected in 1,4 months, with 3,6 series or 250-300 X. In older patients the effect was quicker than in the younger ones.

Of interest is the following case: A myoma patient had become pregnant shortly before the roentgenization was begun; two weeks after the first sitting severe hemor and a four week old ovum was expelled. In this case, then, an abortion had been caused, though unintentionally, by roentgenization.

There were no visible injuries to the skin and neither vesical nor intestinal disturbances.

For non-pedunculated subserous and submucous intramural myomata Roentgentherapy is indicated. Pedunculated subserous and submucous myomata must be operated on. Severe hemorrhages are no contraindication for Roentgentherapy. Hemorrhagic metropathies and above all climacteric hemorrhages are very favorably influenced by this therapy.

Conclusions: If errors in diagnosis are avoided, if exploratory curettage is performed to make sure that there is no carcinoma, and if the patients are constantly controlled, the roentgentherapy can be employed for myomata and hemorrhagic metropathies without danger to the patient and a cure in the clinical sense can be effected.

Langes: Roentgentherapy of Myoma and Metropathies (Erfahrungen mit der Roentgenbehandlung bei Myomen und Metropathien). *Strahlentherapie*, 1913, III, 285-299.

Langes gives the results of his experiments with irradiation from the back and the perineum:

A thin laminaria was inserted in the cervix and twelve hours later a one-half cm. thick Kienboeck strip, covered with a sterile rubber finger placed into the uterine cavity. Field irradiation was then performed from different points with 1-2 erythema doses, a focus to skin distance of 18 cm. and 3 and 4 mm. screens of aluminum.

I. Experiment: 1 field irradiation with quadratic vignette upon the middle of the lower abdomen. With a 4 mm. screen 20 per cent of the rays got into the uterus.

II. Experiment: 1 field irradiation upon the sacral region: with 3 mm screen 10% of the rays got into the uterus; with 4 mm. screen 20% of the rays got into the uterus.

III. Experiment: Irradiation of a quadratic field in the gluteal region: with 3 mm. screen 5% of the rays got into the uterus; with 4 mm. screen 10% of the rays got into the uterus.

IV. Experiment: Irradiation of the middle of the perineum with a tubus of 5 cm. diameter; with 3 mm. screen 17% of the rays got into the uterus.

The conclusions drawn from these experiments are:

1. The same quantity of rays gets into the uterus through irradiation of the sacral region as through irradiation of the abdomen.

2. Through roentgenization of the gluteal region only half the quantity gets into the uterine cavity, but it must be considered that treatment of mainly the ovaries is intended and that these receive undoubtedly a greater quantity of the rays than the uterine cavity because they are nearer to the rays.

3. In these experiments the use of 4 mm. aluminum screens has proved more effective for intensive roentgenization than of 3 mm.

4. Irradiation from the perineum is also efficient.

24 cases of myomata were treated. Five of these did not continue the treatment; three are still under observation and one with psychosis committed suicide. Of the remaining fifteen cases nine became amenorrhoeic and one myoma increased in size after the first series of roentgenization and an abdominal total extirpation was performed because malignancy was suspected, which, however, proved erroneous on microscopic examination. One case died from adherent ileus after the patient had received 290 X and p. m. autopsy showed myomata, uterus and the ovaries shrivelled, the ovaries being smaller than those of a senile woman, though the patient was only 31 years old. The myomata were rich on connective tissue fibres; in the ovaries were only a few pre-mordial follicles whose epithelium and ovule cells showed marked symptoms of degeneration, and an intensive proliferation of connective tissue had taken place; the vessels were very numerous and showed hyaline degeneration of the walls.

50 cases were treated for metropathies. Ten of these have not been sufficiently long under observation and of the remaining 40 cases 24 have become amenorrhoeic, 9 oligomenorrhoeic, six were not influenced at all, and in one patient the hemorrhages became worse. The result is not very satisfactory, but the cause of this is the inefficiency of the technique employed in the beginning.

The conclusions are as follows:

The technique consists in 6-9 field roentgenization from all sides, 20 X pro loco with 4 mm. aluminum screens measured with Sabouraud tablets.

According to experiments, roentgenizations of the sacral gluteal and perineal region seem rational.

The success with this technique was satisfactory, as 100% of myomata and metropathies treated with same were cured.

In the beginning the technique with two fields and 1 mm. aluminum screens proved unsatisfactory.

Larger doses than 200 X in one series seem exaggerated and dangerous on account of possible intestinal injuries.

Serious injuries with the aforesaid technique have not been observed.

Pasteau & Belot: Roentgenography in a Case of Calculus of the Ureter (*Radio-graphie clinique dans un cas de calcul de l'uretère*). *Arch. d'électricité médicale*, 1913, XXI, 292.

The authors have studied a case of calculus of the ureter with the help of diverse clinical and roentgenographic procedures. They were able not only to determine the presence of the calculus, but with the help of a specially graded sound also the exact dimensions of the calculus were established. An injection of colargol showed that the ureter was dilated and that the calculus was arrested 4 centimeters from the orifice of the bladder at that point where the caliber of the ureteral canal diminishes. This study shows the necessity of a collaboration of urologists and roentgenologists.

d'Oelznitz & Paschetta: A Rare Form of Pulmonary Tuberculosis Which Was Not Diagnosed During Life (*Forme rare de tuberculose pulmonaire non diagnostiquée pendant la vie*). *Arch. d'électricité med.*, 1913, XXI, 292.

The authors report a case of pulmonary tuberculosis in a three year old child which presented all the functional symptoms of a pulmonary disease which

made them think of a hydatide cyst according to the roentgenogram. At the autopsy a caseous mass was found and the microscopic examination revealed an enormous quantity of tubercle bacilli.

Christen: The Physical Laws for the Dosage of the Roentgen-rays (*Die physikalischen Grundlagen fuer die Dosierung der Roentgenstrahlen*). *Strahlentherapie*, 1913, III, 162-165.

Christen says that repeatedly it is heard and seen that fundamentally different things in roentgenology are not sufficiently differentiated. For example, the influence of dispersion and absorption upon the proportion of surface dose and depth dose, in which the dispersion is related to the focal distance and the absorption to the degree of hardness. Thus Loose says, that with medium hard rays a better effect in the depth can be obtained than with hard or extra hard rays; he does not, however, explain the fact that a 7 mm. irradiation which at a depth of 5 cm. is reduced to 1% of its surface value should at this depth have a better effect than a 2½ cm. deep irradiation of which at the same point still 25% are left. Surely, the degree of hardness has an optimum for intensive irradiation and, if a stronger radiation than this optimum is applied, the effect in the depth is again lessened. The highest possible degrees of hardness are yet below the optimum for the ovaries, though here again Meyer, Rost and Krueger found the contrary.

Unsolved is furthermore the question of filtration. The conception of a heterogeneous mixture of rays stands in contradiction to Walter's experiments where the shifting of the focus upon the anticathode caused no enlargement of the same in the magnetic field; this, however, ought to be the fact if there were cathode rays of different velocity.

Incorrect is certainly the idea that screens intercept those rays which are dangerous to the skin and that they allow those that have

intensive effect (in the depth) to pass; the skin absorbs also of the hardest rays always more than an equally thick layer in the depth, owing to dispersion as well as absorption in the upper layers.

Three points should be settled: the intensity, the surface energy and the dosis.

1. Intensity is the quantity of radiating energy falling upon the surface unit in the time unit:

$$I = \frac{E}{T \text{ Surface}}$$

2. To figure out the effect, not only the intensity, but also the time of irradiation must be counted in. The double effect is obtained just as well by doubling the intensity as by doubling the time of exposure. Therefore we use the product of intensity and the time of exposure which has the following value:

$$I + T = \frac{E}{s}$$

This shows that the product of intensity and time is equal to the amount of energy which falls upon the surface unit; if we call surface energy F we have this equation:

$$F = I T = \frac{E}{s}$$

Different from this is the dose. Here we deal with the energy which is absorbed in the volumen unit. In the denominator we have a volumen instead of a surface and instead of the second power of length the third power of it.

It can be shown that the one unit of length added in the denominator is the half value layer of the radiation. The dose has the value

$$D = \frac{F}{a} \cdot 0.7$$

It is important to ascertain that not the surface energy depends from the degree of hardness, but that the dose does. Qualita-

tively this has been proved by H. E. Schmidt and quantitatively by Hans Meyer. This goes as well for Kienboeck's quantimeter as for Sabouraud's tablets.

A great advantage and progress for all future examinations is the "Iontoquantimeter," constructed by Reiniger, Gelbert & Schall A. G.; with this apparatus that quantity of electricity is measured which loses a capacity over an ionized air line.

The greater the intensity of radiation is, the stronger is the ionization and the more electricity starts in the time unit. The longer the irradiation lasts, the more electricity is coming off. The "Iontoquantimeter" measures the product of intensity and time of exposure and that means the surface energy. The relation between intensity and ionization is rather independent from the degree of hardness and we are thus able to compare intensity, surface energy, and doses of various degrees of hardness.

Haendly: The Effect of Mesothorium and Roentgen rays on Carcinoma, on the Uterus and Ovaries (Die Wirkung der Mesothorium und Roentgenstrahlen auf das Karzinom, den Uterus und die Ovarien). *Strahlentherapie*, 1913, III, 300-307.

Haendly has thoroughly examined the effect of mesothorium and Roentgen rays upon the uterus, the ovaries and carcinomata at Bumm's clinic in Berlin. The patients were from 35 to 40 years old and the specimens obtained by operation or p. o. dissections had been exposed for a different length of time, so that he was able to obtain a nearly complete picture of the different stages. His conclusions are: The carcinomatous tissue decays to a large extent under the influence of the rays; the defect which is caused by this decay is replenished by new formation of connective tissue. This newly formed connective tissue becomes sclerosed and degenerates like the rest of the connective tissue. The smooth musculature atrophies and disappears almost com-

pletely; the muscle fibrilli undergo hyaline degeneration; the primary follicles in the ovaries are almost completely destroyed. The vessels show hyaline degeneration of the adventitia and media; they become calcified occasionally. Proliferation of the intima causes the obliteration of numerous vessels. The future will teach us to estimate the clinical result of these changes.

Speder: Roentgentherapie in Hypertrichosis (Die Roentgenbehandlung der Hypertrichosis). *Strahlentherapie*, 1913, III, 314-332.

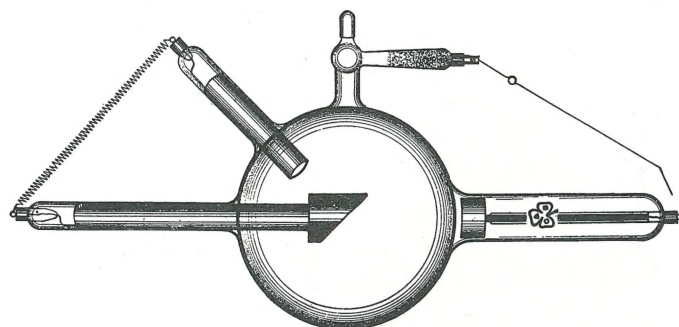
The author gives a historical review of the Roentgentherapie for epilation, discusses the principles of the method and reports the technique as applied in the Roentgen laboratory of Bergonie-Bordeaux, as well as the primary and secondary results.

His conclusions are that in cases where single hairs or a few hairs standing together in groups are to be removed electrolysis is strictly indicated. Roentgenization is indicated in cases that deal with many, large and well developed hairs, and with long and numerous lanugo hairs. The best technique seems to be to employ hard rays (8 Benoist), filtered through 1-1½ mm. aluminum screens, directed upon the region which is to be epilated, in the maximal dosis which the skin will stand. The reaction of the irradiation should never be stronger than to cause erythema. When hard and filtered rays are applied a larger quantity of them becomes absorbed by the cells of the hair papilla than by the stratum germinativum and a sufficient quantity of rays may be applied in a few sittings in order to destroy

the papilla without damaging the skin to any degree. The larger the applied doses were (of course in the above mentioned limits) the quicker and the better were the cosmetic results.

In cases which are specially adapted to roentgenization a definite falling out of hair can be effected with three or four irradiations of the same region which should be performed at 1½-3 months intervals. In dealing with long lanugo hair a definite alopecia can be effected with six to seven irradiations.

In the first two sittings a dose is applied which corresponds the teinte I-II or I measured with Bordier's chromoradiometer, and in the following sittings a dose corresponding teinte 0-I is applied. The total quantity of the applied rays is so much less, the stronger the applied dose was. For patients with large and well developed hair the total dose does not exceed 12-16 I; in other cases about 20 I are applied. The examination of patients who had been under treatment 16-24 and more months ago ascertained the fact that with this technique any secondary damage as atrophy of the skin, cyanosis, and telangiectasis can be avoided. Roentgentherapie is contraindicated for the epilation of lanugo cilia even if they are of a length of 8-10 cm. If an intervention is really indicated in dealing with abundantly developed lanugo hair it is recommended to effect the transformation of lanugo cilia into real hair by epilation with pincers, by shaving or with epilation salve and then to perform roentgenization as soon as this transformation has taken place, because the prognosis is then better.



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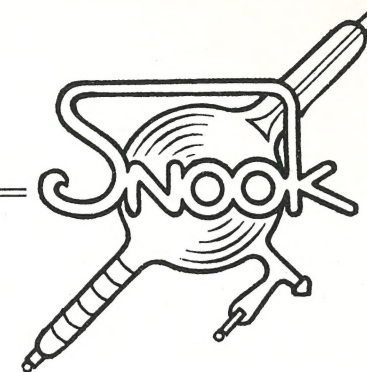
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