

ever there is amiss. If he succeeds in bringing back to the cheek the bloom of health by his treatment, he will eliminate to a great extent the possible danger from cancer. The diet should consist of the various forms of digestible and unstimulating vegetable foods. Alcohol, as a food, should be entirely eliminated, and meats and other nitrogenous foods should be reduced to a minimum amount.

Careful attention should be given to the regular action of the bowels, which should take place at least once each day. The urinary secretion should be examined and proper means adopted to correct any disorder or diseased condition of the kidneys.

To epitomize the treatment of the cases of cancer, it should simply be the effort of physicians to endeavor to bring their cancerous patients into the highest condition of personal health and excellence of hygiene.

The second and very different type of cancer we would like to name the plethoric type.

These women come to the physician often suffering very little except from a slight sanious discharge, which seems to them so trivial that it is hard for them to think that they require any medical attention. They are generally indolent, stout, well-nourished and consume an abundance of food. In fact, they consume too much animal food. As they consume more food than the body needs, the waste nitrogenous matter accumulates in the system and they suffer accordingly. Suffering, as they do, from an over-plus of nourishment, they require purgatives, starvation and enforced exercise.

These young women, when they first appear in the rôle of patients, think very lightly of their symptoms, but finally to their horror, the fatal diagnosis of cancer is made and they are rudely awakened from their dream of security.

CONCLUSION.

Finally, I wish to state, that it is perfectly astonishing and lamentable to see the apparent helplessness of most of the members of our profession, when confronted with the cases of cancer.

Generally, no attempt is made by the physicians to treat these patients by medication, or to improve their hygiene, and the whole treatment seems to be confined to the knife, the *x*-rays, or some form of electricity.

Valuable as these agents are in the treatment of cases of cancer, yet it is my firm belief that our success in these cases would be far greater, if we would combine with them appropriate medical treatment. Each case must be studied individually and treated accordingly.

ROENTGENIZATION IN THE TREATMENT OF CANCER.

WITH AN EXHIBITION OF CASES IN WHICH THE EVIDENCES OF MALIGNANT DISEASE HAVE DISAPPEARED
UNDER ROENTGEN RADIATION.*

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One of the burning questions before the medical profession to-day is "How shall we treat our cancer cases?" The first thought that responds is "With ablative surgery;" the second brings before us the disheartening proportion of hopeless recurrences that follows such management and which varies from 60 to 80 per cent. in

different hospitals; the third invokes the Roentgen ray; the fourth, destruction of the affected tissues by caustic pastes; and the fifth, destructive sterilization of such tissues by massive mercuric cataphoresis.

Of the last-mentioned, not enough is generally known as yet to render possible the formation of reliable conclusions, but the results obtained by the father of this method, Dr. G. B. Massey, Philadelphia, and by a few others, are such as to give ground for the belief that it is destined to play a not unimportant part in the future management of malignant disease. Caustic pastes are rationally applicable only to superficial processes, and failures and recurrences are by no means uncommon. This narrows down the choice of procedures in the vast majority of these cases to employment of the knife or the Roentgen ray, or a combination of both.

The possibilities and limitations of ablative surgery in cancer have been pretty thoroughly determined and are very generally recognized and admitted; those of the Roentgen ray are fairly well understood and generally admitted among properly qualified Roentgenotherapists, but the rest of the profession are very much in the dark as regards this agent and it is of the utmost importance to sufferers from this disease that knowledge of the subject should be widely disseminated.

To attempt such dissemination by word of mouth alone, however, involves such a strain on the credulity of those not familiar with the subject that I shall precede my statements to-day by an ocular demonstration of the results which have been attained on a few patients who have undergone Roentgenization for cancer during the past four years. Results speak for themselves, and one undeniably positive result speaks louder and more significantly than a dozen negative ones.

CASES.

CASE 1.—Patient was a farmer, aged 55. Several members of his family had had cancer.

History.—About 8 years ago he first noticed a small scab on the side of his nose opposite the inner canthus. It increased in size and ulcerated. Various remedies had no effect on it and when he first consulted me, Feb. 12, 1903, it was three-eighths of an inch in diameter, deeply ulcerated with raised, indurated edges, and discharging profusely.

Treatment.—From this time until April 4, a period of two months, he received 18 Roentgen-ray applications with complete healing as a result. There has been no recurrence and no treatment of any kind applied to the part since. The cosmetic result is perfect.

CASE 2.—A man, aged 66, farmer by occupation, whose mother, aunt, and one sister suffered from cancer.

History.—About 5½ years ago he noticed a small brown spot on his left temple which was accompanied by itching, gradually grew larger and finally ulcerated. He consulted a physician, who recommended the use of a caustic plaster, the application of which was not followed by any beneficial result. The lesion continued to increase in size and the pain in severity, and he finally consulted a surgeon who told him that the case was inoperable.

Treatment.—He consulted me first on April 29, 1902, about a year and a half after having first noticed the growth; it was then the size of a silver twenty-five-cent piece with raised, indurated edges. From this date to June 30, a period of two months, he was Roentgenized 20 times with complete disappearance of the lesion as a result. This was four years ago, lacking one month. There has been no recurrence and he has had no treatment of any sort since. The cosmetic effect is irreproachable.

CASE 3.—A man, aged 60, painter by occupation, with no history of cancer in his family.

History.—About 10 years ago he noticed an itching mole on the right side of his nose which broke down and increased in size for 3 months, at which time he applied a caustic plaster

* Read with exhibition of patients at the one hundred and fourteenth annual convention of the Connecticut Medical Society at New Haven, Conn., May 24, 1906.

which did not cause it to heal. He then went to the New York Cancer Hospital where the growth was removed surgically. It shortly recurred and increased in size until at the time of his consultation with me it was the size of a twenty-five-cent piece, discharging profusely, and deeply excavated with raised, indurated edges. The accompanying illustration is from a photograph taken at that time, but it does not show the depth of the ulceration, as, through a misunderstanding, the photograph was taken when the lesion was covered with a scab.

Treatment.—He received his first Roentgen treatment March 10, 1903, and during the next 4 weeks was Roentgenized 8 times. During this period the only change observable was that the scab formed more rapidly than before, there was slight lessening of discharge and slight redness of the healthy tissue about the lesion. At this time he was forced to discontinue treatment by an attack of acute rheumatism which kept him at home for 6 weeks. He then called on me again but the lesion had entirely healed during this interval and has never recurred or been treated in any way since. The cosmetic result is all that could be desired, the excavated area having filled out to the level of the surrounding parts so that scarcely any depression even is visible.

A peculiarly interesting feature about this case is the striking way in which it exemplifies the cumulative action of the ray. Almost no change of a reparative nature was observable at the time he received his last application, but during the following 6 weeks the transformation, resulting from the treatment, developed rapidly. These three patients have been well and free from recurrence between three and four years.

In cases of mammary cancer it is my belief that the best interests of the majority of such patients demand immediate, radical extirpation, to be followed, in every case, by Roentgenization after the wound has healed. It is but fair to state, however, that some operators, with greater experience in mammary cancer than myself, regard Roentgenization, at least in primary, localized cases, with more confidence than the knife, either alone or in conjunction with the ray. Their results are such as to render the point a justly debatable one, and positively determinable only by future investigation.

The last case to which I desire to call attention was reported in full by me to the Electrotherapeutical Section of the International Electrical Congress at St. Louis, in September, 1904, and constitutes, so far as I have been able to ascertain, the most remarkable exemplification of the curative power which the Roentgen ray exercises over malignant disease, thus far observed. Certainly no case so striking has been reported.

CASE 4.—A school-teacher, aged 39, on whom hysterectomy and ovariectomy were done 8 years ago for what was supposed to be a fibroid tumor of the uterus; no microscopic examination was made.

History.—About 2½ years after this operation she noticed a hard tumor in the lower abdominal wall in the region of the cicatrix. There was no pain and no discomfort but rapid growth.

She consulted Dr. Maurice H. Richardson, of Boston, who referred her to Dr. W. B. Coley of New York, for treatment by the erysipelas toxins. During the next 10 months she was treated with the toxins which caused the growth to decrease in size during the earlier part of this period, but they then lost their power and at the end of this time, in January, 1902, when she was referred to me by Dr. C. A. Bevan of West Haven, the mass measured 10 inches from side to side at the level of the anterior superior spines of the ilia, 8 inches vertically in the median line, and about 5 inches antero-posteriorly in the median line. Microscopic examination of sections removed from the tumor while she was under Dr. Coley's care demonstrated it to be a fibrosarcoma and the mass was rapidly increasing in size. The patient was losing flesh, markedly cachectic, very weak, and complained bitterly of pressure symptoms.

Treatment.—Roentgenization was begun Jan. 28, 1902, and

during the next 4 months she received 40 applications. Her general condition commenced to improve at once but the tumor itself had increased somewhat on the right side, but decreased slightly on the left side; on the whole, the tumor was slightly larger at this time than it had been when we started, and the only feature about the case that encouraged me to continue the treatment was the marked improvement in her general condition.

She then went to her home in Massachusetts for a short visit and when she returned a decrease in the size of the tumor of about 20 per cent. was noticed and made it necessary for her to shorten her waist bands and the fronts of her skirts to keep them from dragging on the ground.

From June 17 to September 3, a period of 2½ months, she received 31 Roentgenizations. Her general health continued to improve and the tumor steadily decreased in size and at the end of this period she resumed her occupation of teaching school, which had been interrupted for about a year and a half.

To make a long story short, the whole treatment of this case extended over a total period of two years and three months, during which time she received 136 applications of the Roentgen ray, more than half of which were given during the first 8 months. She received her last Roentgenization May 20, 1904, at which time no trace of the tumor was discoverable, nor had it been, according to the testimony of her family physician, for several weeks previously. The fact of its disappearance at this time was confirmed by examination by Dr. C. A. Bevan, West Haven, and in July by Dr. W. B. Coley, New York, so that this patient has been perfectly well without any evidence of recurrence for more than two years. At the present time she weighs more than she has ever weighed in her life before, is apparently perfectly well in every way, and has taught school uninterruptedly since September, 1902.

BENEFITS OF ROENTGENOTHERAPY.

These cases justify the bald statement that cancerous processes are amenable to Roentgenotherapy, whether superficially or deeply located, and that it is capable of accomplishing beneficial results in cases of so severe a type as to present absolutely no hope even of relief under any other management. It must not be understood, however, that all cases of malignant disease will respond happily or with equal readiness, even when the highest degree of technical skill and the dictates of the ripest experience are invoked in the administration. Individual idiosyncrasy, as regards protoplasmic vitality and the strength of the tendency toward the normal development of cell types constitutionally inherent in different patients, enters the problem with great force. In some persons cell vitality is at so low an ebb that but little disturbance is required to produce a widespread aberration from the normal cell types; in others it is so pronounced that very large degrees of such irritation as usually induces malignant cell growth, are undergone with impunity. These same principles apply as regards the amount of corrective influence required to restore normal conditions in any individual case. But the cardinal fact that the beneficent power is inherent in the ray remains demonstrated and it is our future function to ascertain, if possible, gain control of those extraneous factors and conditions which introduce the element of uncertainty into the treatment of the individual case. Roentgenization appears, then, to be destined for a prominent rôle in the therapy of cancer.

ROENTGENOTHERAPY AND SURGERY.

The next thing to be ascertained, viz., definition of that rôle, at once brings up for consideration the question, "Shall the ray be relied on alone, to the exclusion of the knife, or shall it be applied in conjunction therewith, and if so, how?"

As regards the first part of the question, clinical ex-

perience has shown that it is justifiable, and usually preferable in judiciously selected cases, to rely on Roentgenization to the exclusion of the knife in cases of superficial epitheliomata involving only the external skin. The proportion of successful results is just as large (some operators claim that it is larger) as that attainable with the knife or caustic pastes, the cure is just as radical, and the cosmetic results are much better. An additional advantage is that if recurrence takes place it is usually permanently amenable to a further course of radiation, whereby the extensive removal of tissue is avoided. I will say, in passing, that malignant processes involving mucous membranes do not respond as kindly to Roentgenization as do those which are confined to the external skin. In inoperable cases, wherever situated, Roentgenization must of necessity be relied on to the exclusion of the knife. That it merits consideration in even the most desperate of these, however, is demonstrated by the abdominal case already described.

As regards the second part of the question, clinical experience has shown that when the growth is deeply located or large in size, a much larger proportion of satisfactory results can be obtained by combining the knife and the ray than by relying on either alone. The logic of this proposition is as follows: When a large mass of malignant tissue disappears under Roentgenization, its disappearance is usually accompanied by a variable degree of general systemic toxemia which has been known to be severe enough to kill the patient of itself, and which is always liable to impair general or local metabolism sufficiently to interfere greatly with, and sometimes entirely to defeat, the restoration of normal conditions. Its removal by the knife, *en masse*, eliminates this danger. 2. When the disease process is deeply located, the intensity of the influence which it is possible to exert on the lesion, is so lessened by the passage of the ray through the overlying tissues as seriously to impair its remedial effect. Removal of the lesion by the knife confines the work demanded of the ray to the destruction of microscopic, outlying foci of malignancy, whereby the probability of a favorable outcome is greatly enhanced.

Whether or not a cutting operation for cancer should be preceded by Roentgenization is still a mooted point. In its favor is the probability that limitation of the process can be effected through inhibition of the growth of malignant cells at its periphery, thereby increasing the probability that complete removal can be attained. On the other hand, grave impairment of the reparative functions of parts thus treated has been noted, and the loss of time involved in delaying the operation may at times be a serious matter. There is so little unimpeachable evidence that well-applied Roentgenization has ever been instrumental in actively disseminating a malignant process, and so much in opposition to this theory, that this part of the subject is hardly considered to merit discussion among present-day Roentgenotherapists and we can dismiss the subject without further mention. As regards pre-operative radiation, therefore, the conditions surrounding each individual case must determine its management.

Roentgen operators are unanimous, however, in the belief that every ablation for cancer should be immediately followed by Roentgenization, as a routine measure, which belief is based on the following:

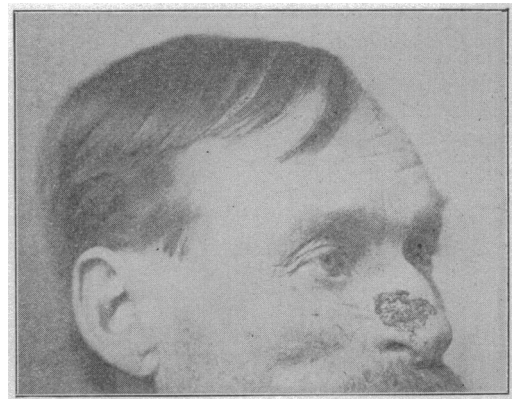
1. A large proportion of recurrent malignant growths does not respond kindly to Roentgenization, perhaps because of the increased malignancy with which opera-

tive interference seems to imbue some cancers, notably sarcomas.

2. If Roentgenization is delayed until recurrence is manifest, the process may then have become so widely disseminated as to preclude the possibility of benefit from radiation.

3. If the affected area is radiated immediately after radical extirpation of the lesion, the degree of remedial (destructive?) influence demanded of the ray will be limited to such as will be necessary for the elimination of microscopic foci of malignancy, whereas if recurrence is awaited, the remedial influence required will be much greater because the lesions will be much larger and better developed, and the degree of increase demanded may be so great, especially when deeply-located structures are involved, as to be impossible of attainment. Under such circumstances we would be confronted with a condition which might have been eradicated had we acted promptly, but which our omission had allowed insidiously to develop and compass the destruction of the patient.

4. We know that in a certain proportion of cases treated by a cutting operation alone, recurrence will not take place and the cure will be radical. On the other hand, we also know that we never can assure any one pa-



CASE 3.—Before treatment.

tient that recurrence will not take place in his case, and we are perfectly certain that recurrence will declare itself in a large proportion of all cases. If immediate post-operative Roentgenization is omitted in any one case, that may be the very one in which we shall encounter recurrence and it is highly probable that had we applied the ray immediately after the operation the accident would have been prevented. By Roentgenizing every operative case we are assured of having exerted every effort for the relief of the patient, and that we have saved all of our patients that it was possible to save.

5. It is imperatively incumbent on us to apply any measure which has the power to destroy or inhibit malignancy, to the task of lessening the proportion of post-operative recurrences; that the Roentgen ray manifests such a power is proved beyond a doubt, and the clinical experience of those who have thus employed it, with a correct technic, has amply confirmed the validity of this contention.

The consensus of expert opinion to-day, then, may be broadly summarized as follows:

1. In superficial malignant lesions involving only the integument, Roentgenization is the procedure of election; 2, in operable lesions more deeply located or involving mucous membranes, the advisability of combining ablative surgery and Roentgenization should always

be earnestly considered, and such combination will give the best results in the majority of cases; 3. a course of Roentgen ray applications should follow every cutting operation for malignant disease, as a routine measure, and sometimes, perhaps, should also precede the operation; 4. Roentgenization should be persistently applied to all inoperable cases as long as the patient shows any signs of response, however slight.

IMPORTANCE OF TECHNIC.

By far the most important factor which is active today in determining whether the results of Roentgenization shall be satisfactory or the reverse, is the degree of knowledge possessed by the operator concerning Roentgen ray phenomena, both physical and clinical, and his ability to utilize this knowledge practically; in other words, the technic. The difference between the results of intelligent, scientific, efficient Roentgenotherapeutic technic and the reverse resembles very closely that which would obtain between appendectomies performed in a tenement-house kitchen without antiseptic precautions by a second-year medical student and the same operation performed in a well-equipped hospital by a master of surgery. The subject of technic is too specialized in character to admit of discussion in detail at this time, and I shall not enter into it further than to call attention to the following facts which have more or less vital bearing thereon:

1. There are electric conditions generated in the neighborhood of an excited Crookes tube, and perhaps other radiations than those of Roentgen emanating therefrom, which probably play a considerable part in the physiologic influence exerted.

2. The Roentgen radiation from any Crookes tube, whether of high or low vacuum, is composed of rays of varying degrees of penetrative power present in varying proportions as regards quantity.

3. Only those rays which are absorbed by the tissues, i. e., reach but do not penetrate through them, effect physiologic modification thereof. Hence an operator must know which rays are best adapted to the particular pathologic condition under treatment and be able so to manipulate the generating apparatus as to obtain them.

4. The penetration of the Roentgen radiance generated by a given Crookes tube is directly modifiable by the amount of current used to excite it and by the introduction of resistance (spark-gap) into the tube circuit. This latter factor is especially effective when a static machine is employed as the tube excitant, so much so, indeed, that a tube so low in vacuum that it gives off no appreciable Roentgen radiance at all without spark-gaps, can be made to deliver rays of high penetrating power by their use.

5. Rays of different degrees of penetrating power can be filtered out of the emanation from an excited Crookes tube by placing in its path various substances such as sole leather, plain or impregnated with normal salt solution, when it is desired to eliminate those rays that are absorbable by the skin, aluminum when it is desired to eliminate the so-called "soft" rays in general, silver when the rays of high penetration constitute an undesirable factor, etc.

6. Volume, as well as penetrative power, constitutes an important element in the physiologic influence and therapeutic efficiency of this force.

7. Volume is directly proportional to the amount of current traversing the tube and indirectly proportional to the degree of tube vacuum.

8. The intensity of the x-ray varies inversely as the square of the distance; hence, the location of the source of the rays (anode) as regards its distance from the lesion and determination of the time duration of the exposure are factors of the first importance. Fortunately these can be calculated mathematically and are easy to ascertain; unfortunately they are as much neglected by the average exponent of Roentgenotherapy as they are easy of attainment.

9. It is necessary that the quality and quantity of the rays therapeutically administered should be under intelligent control and susceptible of measurement, and here we are confronted with a grave difficulty. The penetrating power can be satisfactorily determined by Benoit's penetrometer and Pfahler's modification of this instrument¹ has rendered it entirely safe as far as injury to the operator is concerned; but no practical instrument has yet been devised which will measure ray volume or quantity with any degree of accuracy, and volume is of as much importance in this equation as penetrating power. The operator is, therefore, obliged to rely on his experience with his own individual tubes for his estimate of their physiologic and therapeutic efficiency, this knowledge of one tube is of no value as regards determination of the index of any other, and every tube is an unmodified interrogation point to any radiologist who has not used it before.

CONCLUSIONS.

From the foregoing it is apparent that, although a man may be an excellent surgeon or an erudite physician, these qualifications of themselves do not by any means constitute him a competent Roentgenotherapeutist or justify him in wholesale condemnation of this remedial measure because of unfortunate results or a lack of good results which may have come under his observation from Roentgenization as it is commonly applied to-day. The attainment of satisfactory results necessitates on the part of the operator a good knowledge of the physical properties of the ray, a broad and comprehensive familiarity with its clinical behavior, and an intimate knowledge of the possibilities and behavior of his individual tubes and generating apparatus. These qualifications are, unfortunately exhibited by but few of those who are Roentgenizing pathologic conditions to-day, a generous estimate placing their number in the United States at about 50, and it is a matter of wonder that there are so many happy results and so few accidents. It is also not to be wondered at that the vast majority of surgeon-radiologists are much better surgeons than radiologists, but this unfortunate fact is responsible for a very large proportion of the sweepingly pessimistic reports of cases from high sources that have been ineffectually Roentgenized.

Due appreciation of these facts is gradually permeating the general professional mind, however, and inducing Roentgen operators to fit themselves properly by conscientious, special study for their work, and the time is not far distant when the beneficent potentialities of this remedial agent will be accorded the high rank they deserve in the management of this most distressing and destructive ailment.

1. Archives of Physiological Therapy, June, 1906.

Doctor and Automobile.—Almost before the general public believed that the automobile was more than a passing craze physicians were buying cars and proving that even in its early, crude state it was of immense advantage to them in the pursuit of their professional duties.—Doolittle in *The Automobile*.