Original Articles.

A REVIEW OF THE LITERATURE OF THE THERAPEUTIC USE OF THE X-RAYS.

BY HARVEY P. TOWLE, M.D., BOSTON,

Assistant to the Physicians for Diseases of the Skin, Boston City Hospital; Assistant, Carney Hospital, Skin Out-Patient Department.

As all will remember it is now six years since Röntgen startled the world by the announcement of his discovery of a new form of energy, which, because of its unknown character, he called the x-rays. These rays had the power of penetrating the human body, and were recognized at once as a most efficient aid to diagnosis. The use of them speedily became general. It was not long, however, before it was recognized that care must be exercised in the use or harm might result. The medical press began to receive report after report of injuries attributed to the x-rays. These injuries it was noted were all of the same type, varying only in degree. As the reports multiplied it gradually became known that the x-rays, or something accompanying them, had a distinct action upon the skin. Freund was the first to recognize this action and to suggest the use of the rays for the treatment of diseases of the skin. It was in connection with their use in dermatology that I was led to investigate the reports of the cases of skin disease, in the treatment of which the x-rays had been used as a therapeutic measure, in order to learn, as far as was possible through the literature, the theory of their action; the changes induced by them in the skin; in which diseases they had been used; the value of the treatment and the method of using them. The following is an attempt to show what has been found, without going into unnecessary detail or multiplying examples, giving, merely, an illustrative case under each topic and a very brief statement of the facts.

As has been already hinted, a vigorous discussion arose, which is still in progress as to the real nature of the rays, and as to whether the results obtained arose from the action of the rays themselves, or of something accompanying them. One early opinion was that the effects were due to the generation of ozone upon the skin.¹ There was another theory that the rays were chemical, like the ultraviolet.³ In this connection it is interesting to note that Dr. Bowles, who has been investigating the effects of sunlight on the human body, and especially of the reflected rays from snow, concludes² that he cannot avoid the feeling that the x-rays will be shown to be modifications, only, of ordinary light. It was also asserted by another observer that the spot treated was bombarded by particles from the platinum electrode. Eder and Freund³ advanced the theory that there is a disturbance of the electrical equilibrium of each molecule causing it to yield up its electricity. Still another theory was that the x-ray was a combination of different rays each doing its own work. Jutassy⁴, among others, supports the theory that the changes are due to the x-rays themselves. Bal-

thazard, as reported by Jutassy,⁴ thinks that the effects are produced by the electric zone which arises about the Röntgen lamp. In an article published May, 1900, Schiff⁵ quotes Freund's opinion as being that there is ground for assuming that the therapeutical effects obtained are due to electric waves, arising, in the case of the electric discharges, in the vacuum tubes under the same potential of discharge as the x-rays. Hall-Edwards⁶ states that Tesla has shown that the placing of a sheet of aluminum between the tube in action and the skin has the effect of stopping all danger of burns. "Now, as aluminum is exceedingly transparent to the x-rays and allows them to pass through with great freedom, it is safe to say that the x-rays themselves play little or no part in the process." He is inclined to think that the effects produced are entirely electrical in their origin. (Further observations having a bearing on this point will be given in the description of the histological changes.)

In the earlier days of the use of the rays, before their management was as well understood as at present, "accidents," *i.e.*: cases of dermatitis, were not uncommon. Every author now emphasizes the fact that great care must be exercised in the use of the x-rays and that no one without experience in the use of the rays should attempt to employ them. As it was these so-called accidents which first called attention to the possibility of using the x-rays therapeutically, and as they present certain features which throw light on the peculiar effects of the x-rays, and which help to explain why they are used as a curative agent, it will be profitable to consider rapidly this x-ray dermatitis.

It has been noticed that a certain sequence of events always follows on the continued use of the rays when the use is pushed to the point of visible reaction. Albers-Schönberg describes the process as follows:⁷ "First, a slight yellow coloring appears growing to a diffuse redness which later becomes a darker red. Light itching and prickling are experienced by many at this stage. Next there is a general feeling of warmth. With increasing redness comes edema of the skin. On continued exposure the skin becomes even darker. Small vesicles appear which become excoriated and the process spreads all over the exposed area. The process resembles that in burns. This may go on until a gangrenous ulceration results which has absolutely no tendency to heal. Over the excoriated parts healing is extraordinarily slow and it is months before a normal skin is reproduced."

I wish to give a few cases of x-ray dermatitis to illustrate the points given above, particularly the slowness of recovery. Drury⁸ reports a case which was exposed for one hour, tube distant one to two inches. Three hours later nausea. Later, case exposed one and one-half hours. Redness next day which increased (without further exposure) until, on the fourth day, vesicles appeared which ruptured, leaving excoriations with a profuse discharge. Healing was very slow. Sixteen weeks after exposure the ulcer was still open and

it became necessary to etherize and curette. Crocker⁹ reported the case of a boy who had one exposure of one hour. Tube distance, 5 inches. Next day, skin red; sixth day, skin stiff; ninth and tenth days, vesicles; eleventh day, vesicles began to rupture, leaving an excoriated surface which healed very slowly. The ulcer was not entirely healed three months later. Bannister¹⁰ reports the case of an army officer who was exposed for a radiograph to locate a bullet. As attempts to get a good picture failed the patient was given eleven sittings with a total exposure of over fifteen hours. On the first day of the last series the skin began to show signs of inflammation which extended during the trial. The epidermis was shed leaving exposed a red hyperesthetic area one-half the size of a man's hand. There was also a profuse outpouring of serum. Large blisters formed rapidly such as are seen in scalds. The man had been in bed for a month at the time of the report and the wound was still so tender that he could not endure a dressing upon it. Apostoli¹¹ reports a case where the wound was open for over one year.

These cases will serve to show the caution that care must be exercised in using the rays no idle one. Mies,¹² Sehwald,¹³ Fuchs,¹⁴ Lee,¹⁵ King,¹⁶ Gilchrist,¹⁷ and Bronson,¹⁸ among others, have reported cases of x-ray dermatitis in which serious injury with a very slow recovery was a marked feature. These cases recovered and I have not yet come upon a case in which death has resulted directly from the x-rays, but reprinted in a recent number of the *Boston Medical and Surgical Journal* was a case, taken from the *Lancet*, of an old lady of sixty-eight who was exposed by a layman several times. A large slough developed and several months later she died, being unable to stand the drain in her enfeebled condition.

It is only fair to state at this point that accidents are now rare, the knowledge that they may occur enabling the present day operator to guard against them. All operators now insist that a patient's susceptibility to the rays must be determined before further treatment is carried on, a measure taken to prevent such injuries as those mentioned above.

Before leaving these cases I wish to call attention to the variability of the time of the appearance of the first symptoms, the similarity of the lesions to those produced by burns and the marked tendency to a slow recovery. These points are still further brought out in a series of 69 cases reported by Dr. Scott,¹⁹ especially the varying susceptibility to the rays as shown by the time of the appearance of the first symptoms and the varied lengths of exposure which caused symptoms. In this series the average is three and one-half hours—the longest was twenty-four hours, the shortest twelve minutes. The average distance of the tube from the part exposed was in 25 cases a little over 6 inches—the greatest 18 inches with 19 exposures; the shortest $\frac{1}{2}$ inch with one exposure of half an hour. The shortest time noted for the first appearance of symptoms was

during exposure, the longest four weeks(?), the average in 31 cases being one and two-sevenths days. These figures are taken from cases collected in 1897. Today, as will be shown later, in speaking of the method of using, the length of exposure and the tube distance have been very much modified.

In addition to this review of the macroscopical changes a closer study of the microscopical changes is necessary in order to understand on exactly what grounds the therapeutical use of the x-rays is based. Kaposi³ had explained on clinical grounds the effects produced. He said, there is caused first a fleeting hyperemia then a paresis of the deeper vessels of the skin, which change then extends to the superficial vessels and induces a true hyperemia. It is interesting here to compare this opinion given early with one given lately by Schiff and Freund²⁰ that according to present knowledge and experiments the greater part of the action is upon the vessels of the skin. Since Kaposi's explanation was made many microscopical examinations have been made. In a recent article by Allbers-Schönberg and Hahn⁷ it is said that Oudin, Barthélemy and Darier found a thickening of the epidermis, increase of keratohyalin and atrophy and disappearance of the hair follicles and glands. Kibbe²¹ in a mild case of dermatitis found changes in the outer cells of the rete especially in the nuclei, increase in the keratohyalin. The corium showed the ordinary changes of a mild dermatitis, capillary dilatation with round-celled infiltration most marked about the hair follicles. Gassman⁷ in an ulcer caused by the x-rays found that "repair was by granulation tissue not different from that in ordinary ulcers; the vessels of the cutis and subcutis showed characteristic changes—growth and vacuolising degeneration of the intima." According to Jutassy⁴ most authors are agreed that the histological changes are the same as those in ordinary inflammation. He also found the hair papillæ atrophied and the hair follicles filled with a connective tissue rich in cells. Unna was the first to discover special changes in the collagen. He also found that the lymph spaces had nearly disappeared and that the elastic fibres could not be demonstrated.

It is interesting at this point to compare the changes caused by the use of the x-ray with changes caused by the direct spark as given by Freund²⁰ as the result of some experiments made by him. He says that the direct spark, whether as a direct discharge from the pole or as an "affluvia," will cause in animals a falling of the hair; that the direct spark will kill bacteria; that the effect can be produced through thin sheets of wood, paper, aluminum and the human skin; that the physiological effect of the negative spark is greater than that of the positive; that the x-rays, according to these researches, have themselves no physiological meaning; that the pathological changes in the skin, caused by the direct spark, consist of hemorrhages into the cutis, in inflammation and in vacuolization of the vessels.

As the x-rays seem to have an especial value in the treatment of certain diseases due to bacteria,

certain investigators made a study of their bactericidal powers. The only positive result which I have seen was that obtained by Rieder.²⁷ He used different culture media, such as agar, gelatine and serum, spread on glass plates. Over these was placed a sheet of lead in which was a circular aperture. The whole was so arranged that a portion of the culture was freely exposed to the x-rays through the aperture, the rest being protected by the lead. Ordinary light was excluded by pasting black paper over the hole. Cultures of cholera bacilli, anthrax, diphtheria and bacterium coli were exposed from one to three hours to the x-rays from a very powerful machine. The vacuum tube was distant 12 inches. Under the protecting lead the bacteria developed freely; under the aperture no colonies or only a few developed. The x-rays were also effective in stopping the growth of colonies and in this respect were more effective than sunlight. There was no change induced in the gelatine as was shown by the fact that bacteria afterward grew upon it. Wolfenden and Ross,²² Lyon,²³ Delepine,²⁴ Sabrazes and Rivière,²⁵ and Wolff,²⁶ all made similar experiments. Various cultures of anthrax, bacillus prodigiosus, diphtheria, cholera vibrio and typhoid bacilli were exposed in test tubes to the x-rays. The results were all negative, growth not being interfered with. The weight of the evidence, therefore, would seem to be against the x-rays having any direct bactericidal power.

We have now seen upon what grounds the theory arose that the x-rays might be of therapeutic service in diseases of the skin. This theory was based, not upon a bactericidal power of the x-rays but upon the changes induced in the tissues, especially in the vessels and hair follicles. Freund was the pioneer in the application of the rays to therapeutic uses. His first case was one of nevus Pigmentosus Piliferosus of the back. This being his first case he had not then perfected the method he now uses, so that, in consequence of too long and too intense exposure a dermatitis developed. Notwithstanding this, he considered the results obtained so encouraging that he was led to institute further experiments, both alone and with Schiff, in the removal of hair and in other diseases, notably lupus, until now they have published more cases than any other experimenters. Their reports are especially instructive because they note the strength of current used, the tube distance, the length and number of exposures and the results, with the time elapsed since last treatment, necessary details which many omit from their reports. In June, 1898,²⁹ they published a series of cases of the removal of hair by means of the x-rays. Similar cases have been reported by others — Behring,³⁰ Daniel,³¹ Wood,³² Kolle,³³ Gocht.³⁵ In addition, the falling of the hair has been incidentally noticed by observers who were using the rays for another purpose. In most of these cases and in Schiff and Freund's earlier ones the hair showed signs of returning. Kaposi predicted that in such cases, as soon as the paresis of the vessels had worn off, the tissues would re-

gain their tone and the hair would return. As has been shown in the cases of dermatitis given, the process of repair is a very slow one so that cases now apparently successful may later on show themselves unsuccessful. Freund and Schiff have recognized this fact and have accordingly instituted a method which they think renders the effects permanent. They say in an article, published on June 28, 1898,³⁴ that it is probable that the hair bulbs and papillæ never will regain their functions because of the changes caused in them by the inflammation. So, by short sittings at the time the return of the hair may be expected, they hope to so upset, and to keep upset, the nutritive condition that the functions will be destroyed either by mechanical alteration or by a paresis of the vessels. They consider that they are borne out in this hope by the fact that the only return was in a case in which these supplementary sittings were omitted. Their cases were, however, reported within a few weeks after the cessation of treatment. In a supplementary report it was stated that six weeks after the first report 1 case was beginning to show a return. This would seem to show that the fact of no return in six or eight weeks is not conclusive. Since then, however, they have reported cases in which there had been no return in two years. One case which has come under my own observation seems to cast some doubt upon the permanency of the effect produced even by repeated series of exposures. The man operated an x-ray machine for a large institution and in the course of his work suffered many and repeated exposures. A very severe dermatitis of the hands resulted but he did not give up his work permanently until he was forced to enter a hospital as a patient. In addition to the dermatitis of the hands, he had lost most of the hair of the face. He did not use the x-ray machine again for several months. Toward the end of this period it was noticed that the hair was returning again. Upon resuming his work the hair fell out again, but when he once more gave up his work the hair returned. This process has been repeated several times. Upon exposure the hair would fall, upon the cessation of work the hair would return slowly after some time. This would seem to indicate that even after the severest injury and when to all appearances the loss of hair is permanent a long time must elapse before the apparent result is accepted as a permanent result.

One case will serve to show the method used by Schiff and Freund in removing hair. A woman applied for the removal of hair on the upper lip and chin. She was given seventeen sittings of ten minutes each from January 4th to 31st: Tube distant, 15 to 20 centimetres; volts, 10 to 11½; amperes, 1½ to 2; intensity medium, 30 centimetres. January 29th: Most of the hair snow white; skin with a dark pigmentation. January 30th: Hair falling. February 3d: Skin smooth, bald; no trace of brown color or erythema. March 20th: About twenty hairs returned. March 20th and 21st: Two sittings of ten minutes each. March

23d: Hair white; fell spontaneously. April 23d: About five hairs to be seen on the chin. April 23d and 24th: Two sittings. April 25th: Hair fell out; no return at the end of May.

The chief therapeutic use of the x-rays, however, has been in the treatment of lupus vulgaris. Freund and Schiff,⁸ Kummell,⁸⁶ Gocht, Albers-Schönberg,⁷ Jutassy,⁴ Hall-Edwards,⁶ Jones,⁸⁷ Himmel⁸⁸ and several others have reported cases treated by the x-rays. Schiff and Freund report 2 cases in May, 1898. In the first case treatment was given from January 8th to February 18th. Nineteen sittings of twenty to twenty-five minutes each. March 6th it was noted that there was complete healing over. Smooth white scar. Isolated nodules in surroundings. The second case was treated from December 30, 1897, to April 4, 1898. Forty sittings of ten minutes each. Slight dermatitis interrupted sittings for a time. Result, cure. Schiff⁸ reports the case of a girl with two lupus ulcers. One ulcer healed in two months, the other in five months. Also, the case of a boy who was exposed one-half hour to one hour daily for ten days only. Nevertheless the therapeutic action continued, and the lupus was healed in four months without further treatment. Kummell⁸⁶ has treated 16 lupus patients, in whom there was at least improvement in all but one. Cures in from four weeks to several months. He then states that the time elapsed is too short to claim too much as to results. Albers-Schönberg⁷ reports 12 cases. He has had some returns, "but what procedure has not." Of these 12 cases he considers 7 absolutely cured. Several have remained free for over one year, and one for one and a half years. The opponents of this method of treatment, he says, will not consider a period of from nine months to one and a half years long enough. He looked with suspicion on the other 5 cases—some had returned, and all were unsatisfactory. Hall-Edwards⁶ reports 3 cases, in only one of which was the result considered satisfactory, "due perhaps to defective procedure." Jutassy⁴ reports 2 cases cured. In commenting upon the published cases he says, "that a large part of the lupus cases reported are still too recent to be judged. In about one-half of the older cases there has been a return." Many other cases have been reported as cured by the x-rays, but all are recent. The oldest cases which I have seen reported are those of Schiff, Gocht, Kummell and Albers-Schönberg. These men have reported cases in which there has been no return in over one year, and a few cases in which there has been no return in two years. These cases are surely encouraging, but remembering the peculiar delayed healing as shown in the cases of dermatitis, and how slowly the changes set up are overcome, perhaps, as Jutassy has said, the time is still too short to allow of an absolute judgment.

The reaction of the lupus tissue to the x-rays is considered by Freund and Schiff to be characteristic. They describe this reaction as follows: The visible lupus nodules grow gradually dark red and turgid. Then there appear, on places apparently

normal, dark spots, which gradually assume the characteristics of lupus nodules. Later the nodules fall out, leaving a hole the size of a pin's head, which looks as if it were made by a curette. In the place of the nodules are left fine subcutaneous scars. The intervening skin is white and smooth. Himmel concludes that the x-rays exert a greater and deeper action upon the lupus tissue than upon the healthy skin.

Lupus vulgaris and cases of hypertrichosis are the diseases in which the x-rays have been used therapeutically most often, but there are also several other diseases in which they have been used more or less.

A few cases of lupus erythematosus have been reported. Jutassy claims better results in the treatment of this disease from the x-rays than from any other treatment.

Gocht reports a case where hairs growing in a wound prevented healing. The hairs were removed by the x-rays, and the wound then healed. This use of the x-rays is similar to a suggested use in removing the hair in certain parasitic diseases, such as tinea, favus, etc., where a permanent removal is not desired, but merely a temporary removal, to enable treatment to be carried out more easily and effectively.

Before the French Academy of Sciences, on behalf of Dr. Sorel and Professor Soret of Havre, M. Mascat⁸⁹ showed a series of photographs of the hand of a patient who had been suffering from elephantiasis. The patient had recovered, and solely by the use of the x-rays, after three sittings of a few minutes each.

A few cases of eczema have been treated by the x-rays. According to Albers-Schönberg⁷ the x-rays remove absolutely and surely the eczema accompanying lupus. Dr. Pusey⁴⁰ states that "the cases of eczema in which this method has a field of usefulness, are the very intractable cases of chronic eczema, in which there is a necessity for a marked stimulation of the skin, in order to get absorption of the inflammatory products." He concludes that the field of usefulness in eczema will be limited.

A few cases have been reported recently of the use of the x-rays in cutaneous cancer. Stenbeck claims to be the first in this field. He reports⁴¹ a case of a woman with two ulcerations on the dorsum and right half of the nose. At first, daily sessions of ten to twelve minutes each were given; lamp distance fifteen to twenty centimetres. Reaction began after four sessions. After eight or ten exposures profuse suppuration ensued. After thirty-five exposures the ulcers began to look clean and smooth, the epidermal islets were cast off, and new epithelial tissue began to form. Treatment now began to be more vigorous, and the exposures were prolonged to fifteen minutes each, with the lamp at ten centimetres. A weak reaction appeared, but the newly formed epidermis was not affected. The greatest resistance was offered by the wall-like circumference of the ulcers. An entire month was required to overcome it. It decreased in height and width, and then broke up

into individual segments, which in time completely disappeared. Sequira⁴² has reported a like case. Against these cases can be urged the same objection as against many of the lupus cases, time enough has not elapsed to judge of the final results, but even so, they are encouraging enough to warrant further trial.

Enough has been said to show the nature of the changes in the skin set up by the use of the x-rays and of the diseases in which advantage has been taken of these changes to apply them to therapeutic use. It remains but to speak briefly of the method of using the rays. The necessity of care to prevent injury has been spoken of already. To avoid such injuries Freund and Schiff have published a method of procedure which, if followed, they think will render the use of the rays perfectly safe. They state that for epilation without inflammation the maximum limit of strength of current should be 2 amperes; tension, $1\frac{1}{2}$ volts; tube distance, 20 to 25 centimetres. The length of exposure should not be over ten minutes. To excite inflammation as in the treatment of lupus, increase the strength to $3\frac{1}{2}$ amperes and the tension to $12\frac{3}{4}$ volts. Shorten the tube distance to 10 centimetres or less. Length of exposure should be the same. Protect the parts not to be treated with sheets of lead. To test the patient's resistance to the rays, give one or two test sittings with the tube distant 20 centimetres. If there is no reaction in three weeks, it shows that the patient can stand the treatment. All observers unite in saying that care is necessary, and that treatment must be suspended upon the first appearance of dermatitis. By observing these rules it is claimed that the treatment is rendered entirely safe; indeed, a number of men who have exposed hundreds of cases to the x-rays say that they have never had a case of dermatitis follow.

We may conclude: (1) That the real nature of the x-rays is not yet determined definitely, nor whether the therapeutic action following their use is due to the action of the rays themselves or of something of electrical origin accompanying them; (2) that the treatment is not without danger, unless the greatest care is used; (3) that the effects of the x-rays remain for a long time, and recovery is very slow; (4) that whatever may be the exact origin of the effects produced, a definite reaction is caused in the skin by the use of the x-rays; (5) that the changes induced in the skin are similar histologically to those seen in ordinary inflammation; (6) that the x-rays are not proved to have any bactericidal power; (7) that their therapeutic effect is probably due to the inflammation excited; (8) that hair can be removed by their use, and that lupus and several other diseases can be healed over; (9) that in a few reported cases we may fairly assume that a permanent cure has been effected, but that in a majority of the reported cases too little time has elapsed to rule out the possibility of a return of the disease; (10) that the effect of exposure to the x-rays is so extraordinarily slow in disappearing that months should elapse before an absolute cure is assumed; (11)

that while the permanency of the cure effected may perhaps be doubtful as yet, it is certainly desirable to experiment further.

REFERENCES.

1. Lillenthal. New York Medical Record, February 20, 1897.
2. Bowles. Lancet, London, 1896, i, 655.
3. Schiff. Arch. f. Derm. u. Syph., xlii, 3.
4. Jutassy. Pest Med. Chir. Presse, January 28, 1900.
5. Schiff. British Medical Journal, May 5, 1900.
6. Hall-Edwards. Edinburgh Medical Journal, February, 1900.
7. Albers-Schönberg u. Hahn-Münc Med. Woch., February 27, 1900.
8. Drury. British Medical Journal, 1896, ii, 1877.
9. Crocker. Loc. cit., 1897, i, 8.
10. Bannister. New York Medical Record, January 23, 1897.
11. Apostoli. Compt. Rend. Acad. d. ss. Paris, 1897, cxxiv.
12. Mies. Deutsch Med. Woch. June, 1897.
13. Sehrwald. Loc. cit., 1896, xxii, 665.
14. Fuchs. Abstract, New York Medical Journal, January 16, 1897.
15. Lee. Journal American Medical Association, 1897, xxviii, 124.
16. King. Canadian Practitioner, 1896, xxi, 789.
17. Gilchrist. Johns Hopkins Hospital Bulletin, 1897, viii, 17.
18. Bronson. Journal Cutaneous and Genito-Urinary Diseases, xv, 478.
19. Scott. American X-ray Journal, 1897, i, 57.
20. Schiff u. Freund. Wien. Klin. Woch., September 13, 1900.
21. Kibbe. New York Medical Journal, lxxv, 71.
22. Wolfenden and Ross. Lancet, London, 1898, i, 1752.
23. Lyon. Lancet, London, February 22, 1896.
24. Delepine. British Medical Journal, 1896, i, 559.
25. Sabrazes and Riviére. Compt. Rend., cxxiv, 1897, p. 979.
26. Wolff. Berl. Klin. Woch.
27. Rieder. Lancet, London, 1898, i, from Münch Med. Woch., xlv, 773.
28. Freund. Deutsch Med. Woch., 1897, lxxvii, 428.
29. Schiff u. Freund. Wien. Med. Woch., June, 1898.
30. Behring. Deutsch Med. Woch., December 23, 1897.
31. Daniel. New York Medical Record, April 25, 1897.
32. Wood. Lancet, London, January 27, 1900.
33. Kolle. Brooklyn Medical Journal, 1896, x, 276.
34. Schiff u. Freund. Wien. Med. Woch., May 28, 1898.
35. Weiss. Centralbl. f. d. ges. Therapie, 1898, xvi, 330.
37. Jones. Philadelphia Medical Journal, January 6, 1900.
38. Himmel. Arch. f. Derm. u. Syph., i, 3, p. 523.
39. Mascot. Lancet, London, 1898, i.
40. Pusey. Journal Cutaneous and Genito-Urinary Diseases, July, 1900.
41. Stenbeck. Medical Review of Reviews, vi, 670.
42. Sequira. British Medical Journal, February, 1901.

PATHOLOGY OF THE NEWBORN AS ILLUSTRATED IN THE PRACTICE OF THE WRITER.¹

BY FREDERIC W. TAYLOR, M.D., CAMBRIDGE, MASS.

WHEN your president did me the honor to request from me a paper for this meeting, he suggested that it be clinical rather than scientific. Acting on this suggestion I have chosen to look over my records of obstetric cases with reference to the condition of the children.

The cases number in all 654, 563 being cases of which I was in charge, and 91 being cases at which I was present as assistant or consultant. I find that 64 — nearly 10% — of the children were abnormal either at birth or during the first few days of life, and it is a report of these that I present for your consideration tonight. All had been carried at least seven months.

¹ Read before the Obstetrical Society of Boston, January 15, 1901.