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LEPROSY IN THE PHILIPPINES, WITH AN ACCOUNT OF ITS TREATMENT WITH THE X-RAY.*

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MANILA, P. I.

As is generally known, leprosy is diffusely scattered throughout the entire Philippine archipelago, not being much more abundant in any one locality than in another. The actual number of cases is variously estimated at from 5,000 to 10,000. Whether the disease is increasing or decreasing at the present time can hardly as yet be even surmised, nevertheless we do know that in the neighborhood of Manila, where for several years an attempt has been made to segregate it in this hospital, we are constantly receiving new or previously unreported cases. The new admissions during the past three years since I have been in charge of the hospital, have been variable as to the apparent stage of the disease, but it is extremely rare to find a case in which the disease is limited to so small a localized region of the body, as to indicate recent local infection. On the other hand, a large proportion of new patients admitted to the hospital give an undoubted history of the disease dating back from one to ten years, from which fact I am sure that in practically all cases the disease could have been diagnosed earlier, had the patients been examined by an experienced physician. It is also quite probable that we are surrounded by, and more or less in constant contact with, numerous cases of leprosy in its early stages of development.

It is practically impossible to draw any reliable conclusions as to the exact duration of the disease in any given case on account of the general ignorance of the masses, with reference to its early recognition and differentiation from numerous other skin diseases so common here, as well as to their lack of fear of the disease and their consequent inclination to conceal its presence in order to avoid segregation or confinement. Also the point of inoculation or the source of infection can rarely, if ever, be determined on account of our inability to locate the cases at an early stage of the disease, or to ascertain the approximate time of infection. These difficulties are increased by the customs of the natives which dispose them to frequent change of residence and association, as well as by the fact that anywhere they happen to go they are liable to find one or more sources of infection in the immediate neighborhood.

While from these remarks it can be seen that the exact method by which this disease spreads is very doubt-

ful, still there have been a few facts noted among our cases which throw some light on the subject.

We find that for several years past there has been only one case where a husband and wife have been known to have the disease, and in this case the disease appeared at the same time in both, indicating a common origin rather than a transfer from one to the other.

Of numerous children born in the Philippines of leprous parents (seven in this hospital, three having both parents leprous, but not married), none have been known to suffer leprosy.

I have been able to locate five cases in which a parent and child have both had the disease, but the development occurred toward the end of the child's adolescence, appearing at about the same time in both parent and child, the child developing the disease first in three cases, and the parent first in two cases, thus indicating common origin and not transmission from parent to child.

We have had five families represented by two children; three families represented by three children; and one family represented by five children. In this latter family there were ten children, the other five with both parents remain free from the disease.

From these facts, I am inclined to believe that the disease is rarely, if ever, transmitted from parent to offspring, and is with difficulty transferred directly from one person to another, but there frequently exists a common source of infection to which the members of the same family may be subjected especially during early childhood.

For the purpose of the following comparative observations I have taken the histories of 239 patients, 238 of whom were in the hospital at the time when these statistics were prepared, December, 1904, while the other was admitted soon afterward and is included on account of the subsequent improvement and cure under x-ray treatment. As can be readily understood, many difficulties were encountered in obtaining accurate histories of these cases, the principal of which being the variety of languages spoken, Spanish, Tagalog, Ilocano, Visayan and Bicol being represented, and the sluggish mental condition of many of the patients due to their station in life and their long, hopeless confinement. In this work, as well as in the microscopic examinations of slides and the use of the x-ray apparatus, I have been efficiently assisted by Dr. Rizal Mercado, the house physician, and by Miss R. Mickle, one of our trained nurses, both of whom kindly volunteered their services.

With each case we carefully inquired into the history of the development of the disease, especially with reference to the time when the first symptoms appeared, the time spent in this hospital and the existence of the disease in relatives. Then an examination was made of the present condition of the body, noting the parts involved, the class of variety of the disease, whether hypertrophic, atrophic or mixed, the amount of disfigure-

* Read before the Manila Medical Society, 1905.

ment estimated in per cent. of disability and the percentage of vitality. Ordinarily, vitality and disability would vary inversely one with the other, but disability is here used to mean the disability caused by the maiming action of this particular disease, while vitality is used in its ordinary general sense.

After this procedure, microscopic slides were made of scrapings from the specific lesions and, in all cases found negative by the first slide, three additional slides were more carefully made and examined. If these slides were not positive, for the purpose of classification, we called the case bacteriologically negative, although in most cases we carried the work further for the purpose of reconfirming the negative examination.

In the classification of the varieties of this disease, I have used the terms hypertrophic and atrophic in place of the more ordinarily used terms tubercular or nodular and neurotic or anesthetic, as I find that these latter terms are liable to much confusion as well as being, in

The mixed variety is simply a combination of the other two, usually one form being apparently of much more recent origin than the other.

Of the 239 cases reported, 97 are hypertrophic, 47 atrophic, 92 mixed and 3 undetermined; one of the latter being probably atrophic and two not leprosy at all, but lupus vulgaris. In the entire number of patients the disease has existed to an extent to be recognized for an average period of 8.11 years, and the average period of their residence in this hospital has been 2.55 years. Seventy-seven of the patients have had the disease for 10 or more years, twelve for 20 or more years, one for 31 years and one for 41 years. Seven patients have been in this hospital for 10 or more years, two for 17 years and one for 18 years. Of the forty-seven atrophic cases, I find that the average time during which the patients have been known to have had the disease has been 12.28 years, while the average time in this hospital has been 4 years.

Fig. 1.—Case 9. C. de los S. This photograph was taken Nov. 9, 1904, and shows well-marked hypertrophic leprosy. She has improved slightly under treatment.

Fig. 2.—Case 8. M. M. This photograph was taken Nov. 7, 1904, and shows hypertrophic leprosy before treatment.

fact, misleading. Under the head of hypertrophic cases, we include cases showing tubercles and nodules or mass and plate-like increase of tissue, while under atrophic we include those cases showing scars and glossing of skin, anesthetic patches, wasting away of the fingers and toes, etc.; in other words, when hypertrophy exists we call the variety "hypertrophic," and when atrophy exists we call it "atrophic."

The hypertrophic forms develop most rapidly and are usually diagnosed earlier; they ulcerate freely and promptly and the lepra bacilli are easily found in great abundance in all cases by simply taking a scraping from any of the hypertrophied parts (Fig. 1). The atrophic forms develop more slowly, rarely, if ever, ulcerate; the bacilli are found with difficulty in scrapings and the patients display the greatest variety of deformities, with frequent loss of toes and fingers.

The average estimated disability or deformity for the entire 239 cases is 53 per cent.; twelve patients show no disability; ninety-six show less than 50 per cent. disability; thirty-seven show 50 per cent. disability and ninety-four show more than 50 per cent. disability.

The average vitality of the entire number is estimated at 68 per cent. There are five patients with 100 per cent. vitality, or practically normal; 158 with more than 50 per cent.; fifty-six with 50 per cent.; and twenty with less than 50 per cent. vitality.

On microscopic examination of scrapings from the leprotic lesions, I found 193 positive for the lepra bacilli by the first slide taken and 46 negative. Subsequently I made three slides from each of these 46 negative cases and found 20 of them positive, there remaining 26 permanently negative for lepra bacilli in scrapings from the skin. I have made numerous subsequent

Fig. 3.—Case 8. M. M. This photograph was taken Sept. 23, 1905, and shows marked reduction of leprotic deposits after *x*-ray treatment.

Fig. 5.—Case 5. D. P. This photograph was taken Jan. 19, 1905, and shows entire disappearance of leprotic deposit, only scar tissue remaining.

Fig. 4.—Case 5. D. P. This photograph was taken Nov. 7, 1904, and shows patient after disappearance of most of the leprotic deposit.

Fig. 6.—Case 12. A. M. This photograph was taken Jan. 19, 1905; *x*-ray treatment was begun Jan. 9, 1905, and marked improvement has already been noted. This photograph shows *x*-ray burn on the cheek.

examinations of many of these negative cases and continue to find them negative, but in a few patients who have since died, I have been able to demonstrate the bacilli in nerves which supply the atrophied regions of the body. It is interesting to note that all of these twenty-six permanently negative cases belong to the atrophic variety, except three. One of these three is classed as doubtful, but I am inclined to class it as atrophic, while the other two are probably lupus.

X-RAY TREATMENT.

The treatment of leprosy with x-rays was begun by me in this hospital in January, 1904.

In treating the patients, I have always selected the part of the body which presented the greatest amount of leprotic deposit and usually exposed it to the rays for ten minutes at a distance of from seven to ten inches. The distance and time of exposure were varied somewhat from time to time, and an effort was made to approach as near to the point of burning the skin as possible without actually doing so. In only two cases was the skin actually burned, and it is interesting to note that they are the first two patients herein reported as cured. During treatment, the patient never suffers and can only notice a slight tickling sensation over the area treated as if a slight wind was blowing on the skin. After two or three successive treatments, a blushing of the skin may or may not be noted, and usually a sensation of itching is experienced by the patient. Should superficial burns occur, treatment for the time should be suspended until tissue repair begins. These burns have shown little tendency to progress and have healed readily, leaving little or no scar.

Below will be found a tabulated list of thirteen patients treated during the past year. All these patients have been natives of the Philippines, and are numbered from 1 to 13 for easy reference:

No.	Sex.	Age.	Duration of Disease in Years.	Number of Treatments.	Date of Treatment.	Result.
1	F.	15	9	44	Jan. 31, 1904. Jan. 23, 1905.	Not improved.
2	M.	8	1	13	Apr. 23, 1904. Nov. 21, 1904.	Not improved.
3	M.	8	5	11	Apr. 23, 1904. Nov. 21, 1904.	Improved.
4	F.	10	3	12	Apr. 23, 1904. Nov. 21, 1904.	Not improved.
5	M.	37	1	14	Apr. 11, 1904. Sept. 8, 1904.	Cured.
6	F.	12	5	40	Sept. 10, 1904. Feb. 1, 1905.	Improved.
7	F.	14	4	37	Sept. 10, 1904. Jan. 23, 1905.	Improved.
8	M.	13	4	38	Sept. 10, 1904. Jan. 23, 1905.	Improved.
9	F.	12	7	14	Oct. 25, 1904. Jan. 23, 1905.	Improved.
10	M.	16	5	12	Oct. 27, 1904. Jan. 20, 1905.	Improved.
11	M.	36	18	15	Oct. 27, 1905. Jan. 17, 1905.	Improved.
12	M.	19	2	52	Jan. 9, 1905. June 7, 1905.	Cured.
13	M.	25	2	14	May 8, 1905. June 7, 1905.	Cured.

As will be seen by an examination of the table, three patients have been cured, seven improved and three not improved.

I am unable entirely to explain why Cases 1, 2 and 4 were not improved by the treatment, still in none of these cases did we have a large mass of leprotic tissue to which we could apply the rays. In Case 1 the patient had a few patches scattered over the face and body, and while the individual patches to which the rays were applied improved slightly, the disease apparently continued to progress in other parts of the body. In Cases 2 and 4 the patients had practically no localized patches,

and the treatment was stopped after a short unsuccessful trial.

In Cases 3, 6, 7, 9 and 10 the patients showed definite improvement with considerable decrease in leprotic deposit, the advance of the disease being apparently for the time checked. In Case 10 the patient showed marked decrease of facial hypertrophy, but at the same time a loss of general health, possibly due to an over dosage of necrotic elements.

Cases 8 and 11 were both unusually far advanced and the patients were badly disfigured; they both improved to a marked degree, not only in parts of the body exposed to the x-rays, but in distantly removed parts of the body which the rays did not reach. In Case 11 the man had enlarged and ulcerated ears, lumps on the face and enlarged, thickened and ulcerating hands, with loss of the ends of several fingers. After application of the rays to his hands, where the tissue showed the greatest hypertrophy, not only did his hands decrease in size and the skin clean off, but the ears became smaller, the ulceration healed and the skin of the face became more normal. In Case 8 the patient showed very unusual nodular developments over the face. With treatment, these nodules gradually disappeared to a very marked extent, as seen in Figure 3. The gradual improvement in this case seems to be progressing, if anything, more rapidly at this time, September, 1905, than at any previous time, although treatment has been suspended since January.

CASE 5.—D. M., male, native of medium size, aged 37, was admitted to hospital July 29, 1904. A clinical diagnosis was made of well-developed hypertrophic leprosy. On the day of admission duplicated slides were made from skin scrapings and were sent to the government laboratories; both were reported positive for lepra bacilli.

Examination.—On admission the patient appeared fairly well nourished. He talks Spanish unusually well and is much above the average in intelligence. He had been employed in the United States Quartermaster's Department as a laborer. The right side of his face showed marked thickening of the skin and superficial tissues, the entire surface being elevated from about one-half to three-quarters of an inch and of a deep purplish-red color. The thickening of tissues was so great that his right eye was practically closed and the right ear enlarged from two and a half to three times its normal size. On the point of the chin there was a nodular enlargement about the size of a horsechestnut. On the forehead, the left cheek, the chin and the neck were numerous small nodules about the size of a split English pea.

Treatment.—On August 11, x-ray treatment was begun, the application being the rays from a bifocal tube at a distance of ten inches for ten minutes.

Treatment as on August 11 was repeated on August 12, 13, 15, 16, 17, 18 and 23. On examination August 23, I found that the tumefaction of the face was markedly reduced and that the right eye could be more widely opened. Superficial ulceration or burns had appeared on the helix of the right ear and on the eminence of the right cheek, from which ran a seropurulent fluid. Treatment was suspended for the time.

August 31: The superficial burns had somewhat increased in size since last treatment and a tendency to break down was noted in the nodules on the chin and on the side of the neck.

September 4: The burns had dried over and were covered with scabs or crusts. X-ray treatment was resumed.

September 9: There was still a superficial burn about the size of a twenty-five cent piece on the eminence of the right cheek. The ear, chin and neck were better. X-ray treatment was given on September 4, 7 and 8, but had now been discontinued.

September 22: The burns on cheek and chin alone remained and they were nearly well. The face and ear were much reduced in size and all the nodules heretofore noted and also two or three on arms appeared to be gradually disappearing. The large nodule on the chin was much reduced in size.

October 15: The patient had gradually improved. Most of the hypertrophy of face and ear had disappeared, leaving considerable scar tissue. The eye was wide open and the outer canthus was beginning to be drawn outward by scar tissue. The right ear was still somewhat enlarged, especially the lobule. Pus taken from the partly broken down nodule on the chin showed lepra bacilli.

November 7: Photograph taken November 7 (Fig. 4) shows the condition clearly. The right ear, especially its lobule, was still somewhat enlarged. The face showed some inflammatory and much scar tissue. The chin showed some of the small nodules, but the large one had practically disappeared.

December 15: Skin scraped from the cheek showed a few scattered lepra bacilli. Skin and serum taken from healed nodule on chin showed a few scattered, imperfectly stained, apparently beaded and broken-up lepra bacilli. Pus and serum from crust on the right ear showed no lepra bacilli. The patient was rapidly improving so far as his leprotic manifestations are concerned, but his general physical condition was not good and he seemed to be losing in general health.

Jan. 12, 1905: Three days previously a soft, indolent, fluctuating abscess appeared in the right groin just above Poupart's ligament, and, on being opened January 12, discharged about eight ounces of yellow, thick pus. Microscopic examination of this pus showed numerous streptococci, but no lepra bacilli.

January 19: Photograph taken January 19 (Fig. 5) shows plainly the improvement in face and ear.

February 2: Microscopic examination of skin and serum taken from the right cheek showed a very few scattered, beaded and apparently broken-up lepra bacilli, but no clumps. Specimens taken from several other parts of the body were negative.

July 1: The appearance of face and ear were normal so far as leprosy is concerned, but there was considerable white scar tissue scattered over this area. No part of the body showed any signs of existing leprosy. Microscopic examination of skin scrapings from different parts of the body, especially right side of face, nose and chin, were all negative. The general physical condition of patient deteriorated rapidly during the past six months and he was suffering from general anasarca and from anemia; he also had albumin in the urine.

July 11: Patient died. The cause of death was general debility following atrophy of liver, anemia and general anasarca.

Autopsy.—Autopsy held by Dr. Maximilian Herzog, pathologist of the government laboratories, the summary of whose autopsy report, with his full microscopic report, follows:

D. P., male, Filipino, 37 years of age. Autopsy held three hours after death showed: Fatty degeneration of myocardium and kidneys, with interstitial nephritis, advanced atrophic cirrhosis of liver, purulent abscess in the anterior abdominal wall just above Poupart's ligament, anemia and edema of brain, general anasarca and general profound anemia. The serous cavities and soft tissues all contained serous fluid in considerable amounts. There were old pale cicatrices of the right side of the face; the integument in many places was somewhat scaly, but nowhere were there seen formations such as we find in tubercular leprosy.

Microscopic Examination: Tissues were taken for microscopic examination from the following places and organs: Two pieces from the left side of face from the area which appeared somewhat depressed, pale and cicatricial in character, from the ear which formerly had presented a nodular tubercular appearance, from the kidneys, spleen, liver and heart and from several peripheral nerves. These tissues were fixed in Zenker's fluid, subsequently embedded in paraffin, sectioned and stained with hematoxylin-eosin and with Ziehl's carbolic fuchsin and methylene blue.

In the sections from the skin and those from the ear, which latter took in all of the tissues of the concha, the subcutaneous layers showed patches of a subacute, loose, inflammatory infiltration composed of lymphoid cells. In these areas, however, neither epithelioid nor giant cells were found. Likewise lepra bacilli could not be demonstrated. The liver presented

the histologic picture of a well-advanced cirrhosis. The increased interacinous connective tissue was mostly of the fusiform variety with a few small, round lymphoid cells here and there. Lepra bacilli were not demonstrated in the hepatic sections. An examination of the renal, splenic, cardiac and nerve sections likewise failed to show lepra bacilli.

In other words, neither the histologic nor the bacteriologic examination in this case furnished any evidence at all that the patient at the time of his death was suffering from leprosy, either cutaneous or internal. (Signed) Herzog.

CASE 12.—A. M., male, Filipino, aged 19, was admitted to the hospital Dec. 12, 1904. A clinical diagnosis of hypertrophic leprosy was made. The duration of the disease was said to be about two years.

Examination.—On admission the patient appeared well nourished and in good general health. He had numerous dark, reddish, elevated leprotic patches on the face, arms, legs, and more especially on the back. The individual patches appeared congested and puffed out and seemed to be about one-eighth of an inch higher than the surrounding skin. The fingers of both hands were drawn to a half-shut position, and there was slight contraction of the muscles of the legs so that his walking was impaired. On December 14, microscopic examination of skin scrapings from cheek showed lepra bacilli present.

Course of Disease.—On Jan. 9, 1905, x-ray treatment was begun; applications were made to the lesions on the right side of the face at a distance of eight inches for ten minutes.

The x-ray was applied on January 9, 10, 11 and 12. On January 12 a small blister was noted on the cheek about the center of the point of exposure.

January 19: A photograph was taken (Fig. 6); a blister on the cheek had gradually enlarged to the size of thumb nail and then scabbed over. X-ray treatment had been transferred to a larger blotch on the back which is oval in shape, about three and a half inches by two and a half inches in size, abruptly elevated one-eighth of an inch above surrounding parts and deep red in color. A portion of the spot treated on the face showed some fading of color and reduction of elevation. One spot on forehead not treated directly has been reduced from a very perceptible elevation.

January 31: This patient had been treated seven times up to date, viz.: January 9, 10, 11, 12, 19, 20, 21 and 23, and showed marked reduction of the cutaneous manifestations of leprosy, not only at the points treated, but to just as great an extent on parts of the body most distant from the points of application.

July 1: There had been a wonderful improvement in all of the leprotic manifestations of this patient during the past five months, during which time he had had seventeen applications of the x-ray, making a total of twenty-four applications. All the elevated, dark-colored spots on the face and body had disappeared and were replaced by slightly depressed, light-colored, scar-tissue-like spots, which appeared slightly striated and drawn as if by newly formed connective tissue.

The deformity of the fingers had disappeared from all except the little fingers and had markedly decreased in them. The defect of the muscles of legs had entirely disappeared and the patient walked naturally.

July 21: Three microscopic examinations were made, one from cheek and two from back; all were found negative.

July 25: Three microscopic examinations were made; one from the face, one from a scraping of the mucous membrane of the nose and one from the back; all were found negative.

July 27: Microscopic examinations were made of tissue from arms and cheek; all were negative.

August 3: Three microscopic examinations were made; all were negative. The patient was considered cured.

August 8: Four microscopic slides were made by Dr. M. Herzog and examined at the government laboratories; all were found negative.

August 16: Three slides made on this date and three on August 14 were all found negative.

September 30: The patient remained apparently well, and frequent microscopic slides made recently all proved negative for lepra bacilli (Fig. 7).

CASE 13.—B. M., male, Filipino, aged 25, was admitted to

hospital Feb. 21, 1905. Duration of the disease was about two years. The clinical diagnosis was atrophic and hypertrophic leprosy.

Examination.—On admission the patient appeared to be in fairly good general health and a little above the average in intelligence. He had a slightly elevated, dark leprotic patch on the upper lip, covering in the region of the mustache and extending slightly beyond, a patch the size of a silver twenty-five cent piece about the center of the left cheek, and one the same size on the anterior surface of right elbow. The posterior surface of the right elbow showed some anesthesia and the skin was glossy. There was beginning atrophy of the right little finger nail, and this finger was contracted to an angle of about thirty degrees, the next finger was bent to an angle of fifteen degrees and this entire area showed slight anesthesia. A microscopic examination of skin scrapings from the patch on upper lip showed lepra bacilli.

Course of the Disease.—On May 8, 1905, x-ray treatment was begun on the upper lip.

July 1: X-ray treatment had been given fourteen times: May 8, 9, 12, 13, 17, 19, 22, 24, 26, 29, 31, and on June 2, 5

doubtful acid-fast objects which appeared to be broken-up and degenerated lepra bacilli. Slides taken on August 11 and 16 have all been negative.

GENERAL REMARKS.

As may be seen from the above, there is absolutely no doubt that at least one patient (Case 5) with genuine leprosy has been cured by the application of x-rays. This case I have reported in considerable detail with every practicable form of confirmatory evidence in order to establish the fact as a basis for future work along this line. As may be noted, this case was clinically diagnosed not only by myself, but by numerous other physicians, the diagnosis was twice confirmed, by microscopic examinations made at the government laboratories, and on three successive occasions confirmed by myself microscopically. The treatment and gradual improvement was watched

Fig. 7.—Case 12. A. M. This photograph was taken Sept. 23, 1905, and shows scar tissue where leprotic deposit formerly existed and entire disappearance of lepra bacilli.

Fig. 8.—Case 13. B. M. This photograph was taken Sept. 14, 1905, and shows absence of leprotic patch over upper lip and left cheek and disappearance of lepra bacilli after x-ray treatment. No photograph was taken before treatment.

and 9. The patient appeared practically well on July 1, only a slight discoloration remaining on the upper lip. Lepra bacilli could not be found there.

August 1: It was impossible definitely to outline the patch which formerly existed on the upper lip; not only had the infiltration entirely disappeared, but the discoloration practically all had been absorbed. It was difficult to locate the spot that formerly existed on the cheek, and the other manifestations had likewise decreased (Fig. 8).

On several occasions I have been unable to find lepra bacilli, and on account of the entire disappearance of deposits I have included this patient among those cured, although I am continuing treatment and am not satisfied of the permanency of the cure for two reasons: First, because the disappearance of symptoms has been too recent, and second, because in one of a number of slides taken August 3, from this patient I found several

by quite a number of physicians in Manila. Then we have the cure represented in a photograph and also confirmed by myself several times microscopically and finally confirmed both macroscopically and microscopically at the autopsy by the government laboratories. The only part of the record with which I am not satisfied is the photographic, as I should like to have had a photograph showing his condition on admission. The other two patients reported as cured are now in apparent good physical condition, and I hope that their future history may demonstrate the permanency of the cure.

HOW DOES THE X-RAY TREATMENT OPERATE?

I am inclined to believe that when a local lesion of leprosy is treated with x-ray, the organisms there localized are killed and their bodies absorbed by the system

thereby producing an immunity against the living organisms. This as may be seen would be practically analogous with the immunization of individuals against bubonic plague by injecting into them killed cultures of plague organisms. In our case we simply grow the culture of lepra bacilli in the human body as a culture medium and then kill them by the use of the x-rays.

In support of this theory, I cite the following facts:

First. The treatment of one leprous spot on a patient produces improvement in spots at a distance from the one actually treated.

Second. The cure in the distant spots seems to progress parallel to and to be just as complete as in the one treated.

Third. The best results seem to be obtained only when treatment is pushed to the point of killing or beginning to kill the tissues, which would also probably be to the point of killing the organisms.

Fig. 9.—Case 10. P. P. This photograph was taken Nov. 7, 1904, and shows a case of well-developed hypertrophic leprosy.

Fourth. Cases in which there are massive localized leprous deposits, as in Case 5, are most rapidly improved. As in these cases, we have an abundant culture on which to operate and thereby produce immunity more rapidly.

Fifth. In diffuse general involvement of slight degree or atrophic character where there are only a few scattered organisms we have had little success.

Sixth. In two well-advanced cases in which the amount of new leprotic tissue was excessively great, the improvement was marked and rapid, but followed by loss of general health and rapid physical decline (Figs 9 and 10). This may be an over dosage, so to speak.

LIMITATIONS AND DIFFICULTIES ENCOUNTERED IN THE USE OF THE X-RAY MACHINE.

Being so far away from the source of supplies, we have had much trouble in keeping a satisfactory supply of tubes and in having repairs made to our x-ray machine.

I have not as yet been able to find any one in or near Manila who really understands all the parts of an x-ray machine so that defects could be located and repaired without delay. The repair work has fallen mostly on myself, and while I am able to take the machine apart and frequently successfully to repair it, still it is often a process of try and see and often try again. The tubes frequently burn out or wear out, their internal resistance becoming too high and not infrequently the sparking power of the machine falls from ten inches to even three or four inches, thus rendering it useless. One time the batteries are at fault, next and most frequently the interrupter is at fault, then the Leyden apparatus is blamed, and finally the internal resistance of the tubes becomes too great. So I must admit that to use an x-ray machine for from twenty minutes to one hour a day over a period of several months and to get active effective results from it is not an easy matter.

Fig. 10.—Case 10. P. P. This photograph was taken Sept. 15, 1905, and shows reduction of leprotic deposit with loss of physical health after x-ray treatment.

In conclusion, I wish to express my gratitude to Major E. C. Carter, U. S. Army, our former Commissioner of Public Health, for the interest which he took in procuring the necessary apparatus and for the encouragement which he gave me during the progress of this work.

Tuberculosis.—Ch. Sangmann, in the reports of the sanatorium of Velefjord for 1904 (*Archives Générales de Méd.*), declares that Flüge's theory that tuberculosis is disseminated by coughing is not supported by his observations. Out of 182 physicians who have served in the sanatorium from 1846 to 1882, all before the recognition of the infectious nature of consumption, only nine ever suffered from tuberculosis. From further data collected by Sangmann, including the figures from 69 sanatoria with three or four physicians and 66 physicians connected with laryngologic clinics, he has not been able to find a single case of infection acquired by a physician in the exercise of his profession.