

The Journal of the American Medical Association

Published under the Auspices of the Board of Trustees

VOL. XL.

CHICAGO, ILLINOIS, MAY 2, 1903.

No. 18.

Original Articles.

AN EXAMINATION INTO THE CLAIMS OF THE RED-LIGHT TREATMENT OF SMALLPOX.

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In a small book on "Phototherapy," written by Dr. Niels R. Finsen of Copenhagen, in 1901, he says: "In July, 1893, I proposed a new treatment for smallpox, which consists in placing the patients in rooms from which the chemical rays of the solar spectrum are excluded by interposing red glass or thick red cloth. The result of this method of treatment is that the vesicles, as a rule, do not enter on the stage of suppuration, and that the patients get well with no scars at all, or at most with extremely slight scarring." These claims, if correct, would prove the method to be of inestimable value, not only in preventing the disfigurement occasioned by smallpox, but in saving life, for, as is well known, death in smallpox nearly always results from the variolous septicemia caused by the cutaneous suppuration.

The use of red light in the treatment of smallpox dates back many years, and Finsen's statement, "I proposed a new treatment," is misleading, although I presume unintentionally so, for later he admits that his studies were influenced by the observation of others who had treated smallpox by the exclusion of daylight. The red-light treatment of smallpox was first employed in the fourteenth century by John of Gaddesden, who, though court physician, is said to have been "a very sad knave." Gregory wrote in 1843, "What think you of a prince of royal blood of England (John, the son of Edward the Second) being treated for smallpox by being put into a bed surrounded with red hangings, covered with red blankets and a red counterpane, gargling his throat with mulberry wine and sucking the red juice of pomegranates? Yet this was the boasted prescription of John of Gaddesden, who took no small credit to himself for bringing his royal patient safely through the disease."

Black¹ in 1867 revived the question of the influence of light in smallpox and claimed that the complete exclusion of light even in unvaccinated cases of smallpox effectually prevented the pitting of the face.

A few years later, in 1871, Waters² declared that "if daylight is entirely excluded from the patient, there is no doubt the disease is less severe." Barlow³ stated that a marked contrast resulted in the two sides of a patient's face, one-half of which had been covered with a colored

gelatin to exclude the actinic rays of the sun, while the other half was left exposed.

FINSEN'S RED-LIGHT THEORY.

Finsen has further elaborated the red-light treatment of smallpox, although it is said that he has not, or at any rate had not at the time he promulgated the theory, seen a single case of smallpox. He explains the action of red light on the principle enunciated in the following query: "What is more natural than that the chemical rays should exert an injurious influence on a diseased skin, when we see such severe inflammation produced by their influence on the healthy skin?" It has been conclusively established that sunburn results not from exposure to solar heat, but from the action of the chemical rays of sunlight. The use of red panes of glass or red curtains in a room, as urged by Finsen, excludes the chemical rays. It is further stated that in smallpox "the face and the hands, the parts of the body exposed to light, are the seats of the deepest and most confluent scars."

OBJECTIONS TO THE FINSEN THEORY.

There are numerous facts which militate against the correctness of Finsen's view. While prolonged exposure to the direct solar rays, particularly in the hot months of the year, commonly induces inflammatory reaction, yet there is no evidence of such noxious influence by ordinary exposure to diffuse daylight.

Smallpox is essentially a cold weather disease, and the months in which it flourishes most are characterized by cloudy skies and the presence of but little direct sunlight. It is difficult to believe that ordinary exposure in the sick room to diffuse winter daylight could result in any irritative action on the skin. If the theory were correct, summer smallpox should be more severe than the winter type, for the actinic rays of the sun are stronger in the former season. If there is any difference in the character of winter and summer smallpox it is milder in the latter, for during this season the epidemic influence is usually absent.

The predilection of the smallpox eruption for the face and extremities is not because these parts are exposed to light, for it would be difficult to explain on this theory the copious involvement of the feet, which are often attacked as severely as the hands.

There is every reason to believe that the preferential election of the face and extremities is due to the greater vascularity of these parts. That this is true is evidenced by the oft-noted observation that increased vascularity of any portion of the cutaneous surface from the application of an irritant determines the development of lesions in such areas. Time and time again have we observed the use of a mustard plaster, tincture of iodine, kerosene, or the presence of abrasions or sunburn on the

1. Lancet, June 29, 1867.

2. Lancet, Feb. 4, 1871.

3. Lancet, July 1, 1871.

skin excite confluence of variolous lesions in the irritated or congested portion of integument. (See Figs. 1 and 2.) But it is here to be noted, and the fact has an important bearing on Finsen's theory, that if irritation of the skin takes place after the appearance of the variolous eruption, it does not increase the number of lesions nor otherwise unfavorably influence the eruption. The augmentation of the lesions only occurs when the skin is congested prior to the appearance of the exanthem. For example, the tincture of iodine applied to the skin before the eruption has appeared, by congesting the skin, attracts lesions to the area painted. We have convinced ourselves that no influence of this kind operates after the eruption is out for we have used iodine painted on the face in hundreds of cases.

It appears reasonable, therefore, that the alleged benefit resulting from the exclusion of the actinic or chemical rays of sunlight is not explicable on the grounds maintained by Finsen, for, inasmuch as irritation of the skin after the appearance of the exanthem does not unfavorably influence the eruption, it can not be held that the prevention of sunlight irritation favorably modifies it.

Finsen expresses the view that many remedies which have been claimed to exert a favorable influence on the smallpox eruption have done so through their ability to exclude the solar rays. He says: "The tincture of iodine,

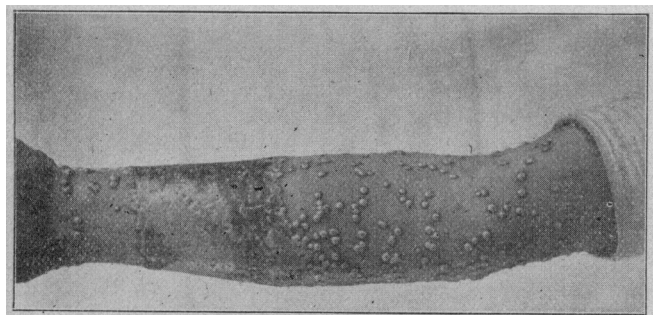


Fig. 1.—Confluence of variolous lesions caused by the application of iodine for a sprain *before* the appearance of the eruption.

which stains the skin yellow, protects it specially from the chemical rays. The solution of nitrate of silver also absorbs these rays and later stains the skin black, by which the rays are excluded."

If Finsen's theory concerning smallpox and light were correct the negro ought to suffer much less severely from the disease than his white neighbor; the black man has been given by nature the best possible protection against the injurious influence of the actinic rays of the sun. He has a protective layer of pigment in the epidermis which excludes the chemical rays. Does he suffer as severely from smallpox as the Caucasian? Most writers claim that smallpox is more severe in the negro than in the white race; in our experience, however, comparing the unvaccinated of both races, the mortality has been about the same. The absence of any freedom from pitting on the part of the negro strongly challenges the truth of the light theory. Finsen has admitted that "pigmentation constitutes a defense against the effects of the chemical rays," and has proved the truth of this assertion by the following experiment on himself.

"To imitate the color of the negro's skin, I traced in India ink on my forearm a band about two inches wide, and then exposed it for three hours to a very hot sun. I then removed the black color, and the skin under it appeared perfectly white and normal, while that on

each side was red." Some hours later the contrast between the protected and the exposed portion was still greater as the latter became swollen and inflamed.

One more theoretical consideration. It does not appear plausible that the exclusion from the skin of the chemical solar rays (those rays which exert a bactericidal influence) would be advantageous in dealing with a disease in which there are thousands of small microbe-containing abscesses in the skin.

THE QUESTION OF PITTING IN SMALLPOX.

Pitting is due to destruction of the papillary layer of the true skin by the suppuration of the variolous pocks. The more deeply the skin is attacked the greater will be the scarring. The occurrence or prevention of scarring is less determined by any special method of treatment than by the vaccinal condition of the patient and the severity of the disease. The type of smallpox has been very considerably changed since the introduction of vac-



Fig. 2.—Confluence of variolous lesions on the forearms due to sunburn a week or so *before* the patient fell ill with smallpox.

cination. Where this agent does not confer complete immunity against variolous infection, it is still quite sure to exercise a more or less marked modifying influence over the disease. Mild smallpox is nearly always characterized by superficially seated lesions. During 1902-03 there were treated at the Municipal Hospital of Philadelphia in the neighborhood of 2,300 cases of smallpox, of whom one-half were not vaccinated, the other half consisting of adults who had not been vaccinated since infancy. In the vast majority of instances the once-vaccinated cases suffered mild attacks and were not scarred. Indeed, at least 60 per cent. of the patients discharged had no indelible scars. The epidemic was mild compared with the severe epidemics of 1871 and 1881, the death rate being about 18 per cent. The most important treatment of smallpox for the prevention of scarring is the prophylactic treatment—vaccination; and yet mild smallpox in unvaccinated persons often runs its course and leaves no scars. This is particularly

true of children in whom the eruption is, as a rule, more superficially situated.

In determining the value of any remedy in the treatment of smallpox, conclusions should be drawn only from its employment in unvaccinated cases. Furthermore, the prevailing type of the epidemic should not be left out of consideration, for it is a well-known fact that a varying percentage of cases recovers in different epidemics. Certain therapeutic procedures employed during mild epidemics may be accorded an entirely undeserved commendation and value. If during the uniquely mild epidemic of smallpox that has been prevailing throughout the United States during the past few years, some special therapeutic agent had been advised and generally used, there would have appeared no more incontrovertible fact in the history of medicine than that this remedy was an invaluable specific in the treatment of smallpox. And yet the mildness of this widespread epidemic with a mortality rate among the vaccinated and unvaccinated of less than 2 per cent. was not influenced to any appreciable extent by any therapeutic measures. Such observations serve to point out the pitfalls into which the ultra-enthusiastic therapist may fall.

PRACTICAL RESULTS OF THE RED-LIGHT TREATMENT OF SMALLPOX.

The treatment of smallpox by the exclusion of the chemical rays of the sun has now been tried by a number of physicians, chiefly in Denmark, Sweden and Norway. Practically all of these men have been favorably impressed with the results.

Drs. Lindholm and Svendsen of Bergen, Norway, treated eight patients, four of whom were unvaccinated children. The latter physician says: "The period of suppuration, the most dangerous and most painful stage of smallpox, did not appear, there was no elevation of temperature and no edema. . . . The hideous scars were avoided."

Professor Feilberg of Copenhagen employed the treatment in eleven patients. There was no secondary fever and in all the patients the vesicles (?) began to dry up from the ninth to the eleventh day. "In every instance the patient left the hospital with pigmented or hyperemic spots, but without loss of substance of the skin."

Dr. Strangard of Denmark treated four cases of variola by this method, and stated that he had a "very clear impression that this treatment exercised a favorable influence on the disease."

Dr. Benckert of Gothenberg, Sweden, treated 16 cases of smallpox, 11 of variola vera and 5 of varioloid with red light. Three died, one from puerperal infection, one from hemorrhagic smallpox and one from the fever of suppuration. Dr. Benckert regarded the results in grave cases as surprisingly favorable; "suppuration is usually abolished; scars are extremely rare and the duration of the disease is shorter."

Dr. Mygind of Denmark employed red light in 22 cases of smallpox, of which 12 were variola vera and 10 varioloid. "All left the hospital (save one fatal case admitted late) without loss of substance, but several hyperemic spots."

Dr. Abel of Bergen, Norway, used red light in 23 cases of smallpox, 8 of which were "very severe." All the patients recovered; suppuration did not occur at all, except in one case admitted late. "Even in the patient admitted with full suppuration the favorable effect of the treatment was immediately visible. From the next day the fever diminished and the irritation of the pustules lessened."

As to scars, Dr. Abel thinks that he has not been so successful as other observers. A relatively great number of his patients presented superficial cutaneous changes, especially on the forehead and nose; the scars, however, did not in any way resemble those which are commonly observed. They looked rather as if they had been produced by scratching or some accidental cause.⁴

Dr. Backman treated "62 severe" cases at the fever hospital of Koliikomaki; of this number "three adults died, all of pneumonia, and four children" on the third, fifth and tenth day after admission. "Generally the suppurative period passed off quickly and easily, the vesicles dried up sooner than usual and left no scar at all."

This author has also employed this method of treatment in scarlet fever and measles and has "found the method active, the course of the disease becoming milder and shorter."

Finsen in summing up these cases says that out of a total of 140 to 150 cases of smallpox in one case only (that of Dr. Benckert) was the method inefficacious.

Juhel-Renoy of Paris has not obtained such favorable results as the above quoted physicians. He believes that suppuration and scarring are not prevented but lessened by this procedure.

PERSONAL EXPERIENCE WITH THE RED LIGHT.

During the winter of 1902 Dr. Wm. M. Welch, physician in charge of the Municipal Hospital, and myself fitted up a room for the red-light treatment of smallpox. We regret that we can not recite such results as are quoted above. Although our experience is limited to but two cases, the results were such as to destroy any confidence in this measure that we might have possessed. Our red room was complete in its appointments. The window panes were of a ruby red color, the gas jet at night was surrounded by a red globe, the walls of the room were painted deep red, and a red curtain covered the inner of two doors so as to completely exclude the light of day. Two unvaccinated young men (one 16 years of age and the other 20), who started with profuse eruptions, were placed in this room about the third day of the eruption, before the lesions had become frankly vesicular. The course which the disease pursued in both cases was in no wise different from that seen in patients treated in the regular wards. The pustules filled up and became confluent, the secondary fever was high and protracted, and the patients markedly delirious. One of the young men, who was a private case and had a special nurse day and night with every possible attention, succumbed to the disease. The other recovered, but with most disfiguring scars. Owing to the discouraging results obtained in these two cases, and to the fact that the location of the red-light room made the nursing inconvenient, this method of treatment was abandoned.

It will be urged, and with apparent justice, that an experience with two cases should not be cited to offset the results of treatment in 150 cases. It must be remembered, however, that the red-light method failed absolutely to exercise any modifying influence on the disease in these two cases under appropriate conditions. In the 150 patients, nearly all of whom did well, other factors may be accountable for the good showing. What some physicians regard as severe smallpox, others look on as cases of average or moderate severity. Photograph 3 represents a patient treated at the Municipal Hospital in 1899. Many physicians would regard such a case as one of great severity; yet the eruption was

4. Quoted from Finsen, *Phototherapy*, p. 32.

superficially situated, the patient was never dangerously ill, and, indeed, made a good recovery without any permanent pitting.

Several photographs of patients treated with red light, who recovered with no scarring or only insignificant scars, published in Finsen's book, represent what we in this country would regard as mild and favorable cases, the eruption being on the skin rather than in it.

It must be remembered that Denmark, Sweden and Norway are, with the exception of Germany, the best vaccinated countries of Europe. It is illogical and misleading to definitely attribute favorable results to certain measures employed in the treatment of smallpox in persons once vaccinated. The vast majority of such patients recover without scarring under any treatment and even without any treatment. Again, in the absence of severe epidemics, and there have been no severe epidemics in the past decade, young children with variola (who are, of course, unvaccinated) usually escape without permanent scarring.

The character of the prevailing form of smallpox, whether mild or severe, is a matter of great importance in determining both mortality and disfigurement. Dur-



Fig. 3.—Example of a case of smallpox with a semi-confuent but superficial eruption in an unvaccinated mulatto, which was not followed by any permanent scarring.

ing the year ending June 30, 1902, there were in the United States 55,857 cases of smallpox with 1,852 deaths (a mortality rate of 3.31 per cent.), and in the year previous 38,506 cases and 689 deaths (a mortality rate of 1.79 per cent.). What would the verdict have been if red light had been used in these cases?

In the February (1903) number of a popular monthly magazine there appeared several articles on "Niels Finsen and His Healing Rays." Among other unwarranted statements concerning the red-light treatment of smallpox appeared the following: "All the world might now have smallpox without fear of disfigurement."

No one would for a moment endeavor to detract from the hard-earned and well-deserved reputation of Finsen, but in the interests of truth such statements as that just quoted should be challenged.

AUTOMOBILE CONJUNCTIVITIS.—Ophthalmologists report many cases of conjunctivitis caused by rapid riding in automobiles without any protection to the eyes. Davis, in the *Postgraduate*, says it is traumatic, due to friction of the wind and chilling of the eyeball. The treatment is to remove the cause, apply 15 minute cold compresses thrice daily and mild astringent washes by an eye cup twice daily.

THREE ESSENTIAL POINTS IN THE OPERATION FOR CICATRICIAL ECTROPIUM.

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Some one once said that blepharoplastic operations look very pretty—on paper—but in reality the results are anything but pleasing and satisfactory. The operations for cicatricial ectropium are not excepted from this criticism. The restored lids often look hideous, and still oftener are again everted after a few weeks or months. But we can overcome these drawbacks if we pay strict attention to the following points:

1. The proper division and fixation of the skin flaps.
2. The selection of the most suitable material for covering the lids.
3. The shortening of the overstretched lid border.

THE PROPER DIVISION AND FIXATION OF THE SKIN FLAPS.

The greatest difficulty we have to contend with in the operations for cicatricial ectropium is the tendency of the shrinking skin flaps to evert the lids again. As all transplanted flaps will undergo more or less shrinkage and as the lid border is least capable of offering any resistance to the traction of the shrinking flap, a re-eversion of some degree is almost inevitable as long as the transplanted flap is attached to the non-resisting lid border on the one side and to the non-yielding skin of the forehead or cheek on the other side, because the lid border is then exposed to the full traction force of the shrinking flap. It is evidently much easier for this flap to pull the lower lid down than to draw the skin of the cheek up, and therefore re-eversion is an especially common occurrence after the operation for ectropium of the lower lid.

It is plain, then, that to prevent the reoccurrence of ectropium we must place the lid border beyond the reach of this traction force. And this can be accomplished if instead of covering the whole wound with one skin flap we make use of two flaps, a small one, which is to cover the lid surface only and which we will call the lid flap, and a large one, which is to be spread over the remaining wound area; and furthermore, if we make provision that the contraction of the larger flap can have no effect on the lid flap.

In ectropium of the upper lid this point is gained if the upper edge of the lid flap (Fig. 1 ba) is firmly attached to the upper border *a* of the tarsus, while its lower edge *b* is united with the free margin. The lid flap is thus anchored above and below to the tarsus and its contraction can not turn the lid over because to do so the traction force must have a fixed point of purchase outside of the lid. The shrinkage of the other skin flap *ac*, which has its point of purchase *c* outside of the lid, however, can not disturb the position of the lid margin, because its pulling force is expended entirely on the upper tarsal border *a*; for, thanks to its firm union with this border, the lid flap can not be stretched or drawn upward by the contraction of the other flap, and as long as the lid flap can not be drawn up the lid border is effectually guarded against re-eversion.

In ectropium of the lower lid, the same principle is adopted for the protection of the lid against the vicious traction of the shrinking skin flap. But we must bear in mind that the tarsus of the lower lid is very small and narrow and that normally the lid skin reaches farther down than the lower border of the tarsus, to a slight furrow a little above the infraorbital margin (Arlt's tarso-malar furrow) where the integument passes from the upright plane of the lid into the sloping surface of