Complications of Tattooing

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SUMMARY

Pathologic consequence of tattooing is relatively rare, but in light of the great number of persons in military service, where tattooing seems to be popular, consideration of the complications seems worth while.

Four unusual cases of patients with cutaneous lesions in tattoos are reported. One patient had Boeck's sarcoid, in which the cutaneous eruption was limited solely to the tattooed areas on the body and involved all the various colors of the tattoo. The cutaneous eruption was only a single manifestation of generalized sarcoidosis.

Another patient had secondary syphilis with the cutaneous lesions involving multicolored tattoos, including the red areas. These tattoos were applied in Hawaii, and presumably the red dye was not the usual cinnabar (mercuric sulfide). As a general rule, the cutaneous lesions of secondary syphilis do not involve the red areas because of the treponomicidal action of mercuric sulfide.

In the third case the characteristic eruption of discoid lupus erythematosus was present. It began over the red areas of a tattoo on the patient's forearm. It has been stated that mercuric sulfide is a photo-sensitizing agent, and it is believed that this explains the localization of the eruption in this case.

The fourth patient had eruption, caused by mercury sensitivity, in an area of tattoo. The eruption was noted soon after the tattooing was done, and it persisted for seven years.

APPARENTLY many a wearer of a military uniform considers it so drab that he seeks cutaneous adornment to complement it. At any rate, a fair percentage of soldiers, sailors and marines acquire tattoos. Many tattooed soldiers, when questioned, indicated that they were persuaded to the epidermal artwork during a period of alcoholic ingestion. Strangely, most of the men questioned were proud of their tattoos and did not wish to have them removed. However, whatever the psychologic aspects of tattooing, because of the accelerated frequency of war—and concomitantly a probable increase in this form of adornment—it behooves dermatologists to review the pathologic complications that may arise from it.

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No one knows exactly when or where tattooing was started, but in examination of Egyptian mummies of 1,300 B.C. blue tattoo marks beneath the skin were noted. Originally, tattooing consisted of multiple punctures of the skin in the pattern desired, with subsequent rubbing in of coloring matter so that the pattern would be indelibly fixed. In China, Borneo, India, and other parts of the Far East, tattooing has been prevalent, and from there tattooing was introduced into the European countries, chiefly by sailors.[2]

Nowadays tattooing is done with an instrument which consists of four or five needles in a row attached to an electric vibrator. The skin is shaved, washed with alcohol, and dried. Then a stencil pattern, dusted with fingerprint powder, is laid upon the skin as guide for piercing with the needles. After the pattern is removed, pigment, usually two to four colors, is implanted in the skin.

Many different kinds of pigments or dyes are used to produce the various colors in tattoos. The red color of the tattoo is usually produced by cinnabar (mercuric sulfide), but cadmium selenide (cadmium red) and sienna (ferric hydrate) also are used. The green color is produced by salts of chromium, such as chromium oxide, chromium sesquioxide, and hydrated chromium sesquioxide. Occasionally pthalocyanine dyes which contain copper salts, and sometimes coal tar dyes, are used to produce varying shades of green. Blue is cobaltous aluminate which is also known as azure blue and cobalt ultramarine. Black is finely dispersed carbon in an ammoniacal solution with phenol or occasionally iron oxide or extract of logwood used in substitution. Brown is a natural ferric hydrate and basic ferric sulfate; and for white, titanium oxide or zinc oxide is used. Yellow is produced by cadmium sulfide. Violet is a manganese salt called manganese violet, and flesh colors are produced by iron oxides of varying shades.[4]

The reactions observed in tattoos and the diseases directly attributable to the tattooing, fall into four general groups:

Group 1. Immediate response of the skin to the tattoo. This is a benign inflammatory response which is rarely accompanied or followed by secondary infection.[3] However, in rare instances keloid formation,[1] melanoma,[5] severe pyogenic infections leading to amputation and gangrene, and even death, have been reported as a direct consequence of the tattooing.[6]

Group 2. Sensitization or allergic reactions to the pigments used in tattooing can appear immediately following the tattooing process or at any time during the existence of the tattoo. The sensitization dermatitis may be confined entirely to the tattoo or may become generalized. The majority of the sensitization reactions are to the mercury ordinarily used in the red portion of the tattoo.[3] The mercurial compound causing the dermatitis is not always the cinnabar in the tattoo but may be in the form of any mercurial compound which is used on the skin or internally. Application of ammoniated mercury ointment or mercurial antiseptics to the skin, or the ingestion of mercurial compounds, can cause a localized sensitization eruption in the red areas of tattoos. Allergic reaction to the green coloring material in tattoos has been reported.[3]

Group 3. Local or systemic infections can be inoculated into the skin at the time of the tattooing. The manifestations of the disease injected may appear either immediately after the tattoo has been applied or some time later, depending on the incubation period of the disease. Infectious hepatitis,[8] leprosy, tuberculosis, syphilis, tetanus, erysipelas, and chancroid[3] have all been reported to have been contracted in this manner.

Group 4. The fourth and last group of reactions include local or systemic diseases which appear in the tattoos after they have become the site of lowered resistance. It has been demonstrated that tattooed skin is more sensitive to trauma of all types than is the surrounding normal skin. Because of this lowered resistance of tattooed areas, a number of skin diseases seem to have a specific predilection for tattooed skin. Among these are chronic discoid lupus erythematosus, psoriasis, lichen planus and the skin lesions of secondary syphilis. It has frequently been noted that the skin lesions of syphilis are accentuated in and around the tattoos, except in the red portion where the treponemicidal action of the mercuric sulfide prevents the appearance of the rash.

Following are reports of four cases of unusual cutaneous eruptions involving tattooed areas:

CASE REPORTS

CASE 1.—A 52-year-old white baker entered the Oakland Veterans Administration Hospital March 15, 1950, with a history of low grade fever with evening temperatures of 99.4° to 100° F. for seven weeks, of cough which was productive of about one-half cup of white non-bloody sputum daily, and of intermittent vomiting following coughing paroxysms. Continuous throbbing frontal and bitemporal headaches, and bilateral conjunctival injection without purulent discharge, developed concomitantly.

At the time of onset of these symptoms, the patient noticed elevation of certain parts of tattoos which were on the arms and chest, and he noted also that the skin overlying these areas was thickened and somewhat scaly. These elevated areas did not itch, but if they became irritated by scratching or the rubbing of clothing, "pins and needles" paresthesias were noted in the localized areas. The tattoos had been applied some 20 years before the skin lesions appeared. Antibiotic therapy prescribed by a physician before the patient was admitted to the hospital did not alleviate any of the symptoms. The day prior to admittance, sudden severe pain in the right hip developed. It was so intense the patient was unable to walk. The patient also noticed a moderate amount of swelling present about the right hip joint during the 24 hours before admittance.

Upon physical examination the patient was noted to be obese and perspiring and in obvious discomfort from severe pain in the right hip. Diffuse conjunctival injection was present. The pupils were irregular and reacted poorly to light and accommodation. In slit-lamp examination of both eyes a moderate number of leukocytes floating in the anterior chamber were observed. The retinal vessels and optic disks were normal. The posterior pharynx was injected. Chest expansion was symmetrical and there were numerous fine and medium, moist rales heard at both lung bases posteriorly. Blood pressure was 124 mm. of mercury systolic and 80 mm. diastolic. The heart was normal to physical examination. The spleen was not palpable. There was no superficial evidence of lymphadenopathy. No abnormalities of the deep tendon reflexes were noted. Tattoos were scattered over both arms and the chest. There was incomplete involvement of all tattoos by raised, scaly dermatitis. The red, blue and green colors of the tattoos were all involved. These cutaneous lesions were non-tender and felt somewhat indurated. The remaining skin, which was uninvolved by tattoo, was completely free of eruption.

In roentgen examination of the chest, pronounced and diffuse increase in the markings at both lung bases, especially behind the heart, was noted; and there was moderate hilar adenopathy. These conditions remained unchanged over a four-month period of observation. In roentgen examination of the right wrist, small cystic areas were observed in the proximal row of the carpal bones. There was a solitary cystic lesion in the distal phalanx of the right thumb. In the right hip there was a small amount of calcification about the greater trochanter of the right femur. This was interpreted as presumably inflammatory in origin.

Erythrocytes numbered 5.5 million per cu. mm. of blood, and the hemoglobin content was 17.5 gm. per 100 cc. Leukocytes numbered 5,700 with 61 per cent neutrophils, 28 per cent lymphocytes, 17 per cent monocytes and 4 per cent eosinophils. Results of spinal fluid studies and of urinalysis were normal; of serologic test for syphilis, negative. The erythrocyte sedimentation rate was 38 mm. in one hour. The antistreptolysin titre was 50 units per cc. No organisms grew on cultures of the blood. The total serum protein content was 6.12 gm.—albumin 4.08 gm. and globulin 2.04 gm. Tubercle bacilli were not noted in repeated examinations of sputum. There was negative reaction to a skin test with first strength tuberculin, and positive reaction when second strength material was used. The right supraclavicular lymph node was normal histologically. In biopsy of an elevated tattoo lesion, chronic granulomatous inflammation was observed and there were numerous epithelioid cells, and giant cells of Langhans' type. There was no necrosis in the granulomatous areas. The pathologist reported the lesion was probably sarcoid. This confirmed a clinical impression of Boeck's sarcoid.

The course in the hospital was characterized by low fever, the temperature ranging from 99° F. to 99.8° F. in the afternoons. Continuous migratory polyarthralgia developed. It involved the wrists, shoulders, both hips and knees. Although the joints were painful, there was no redness, swelling or limitation of motion. Soon after the patient was admitted to the hospital, the iritis became more severe and bilateral glaucoma developed. This was treated by giving typhoid vaccine intravenously, without appreciable benefit. Subsequently, bilateral iridectomy was done and the symptoms of glaucoma were relieved. However, there continued to be a large number of pus cells in the anterior chamber.

A three-week trial course of 1 gm. of streptomycin and 6 gm. of Promizole® daily resulted in only moderate clearing of the iritis. The vision remained blurred. Because of the persistence of the eye disase, the patient was transferred to another Veterans Administration hospital, where cortisone was available. When cortisone was given the iritis and the migratory polyarthralgia promptly subsided. At about the end of the first month of cortisone treatment, the skin lesions which involved the tattoos had completely disappeared and in a biopsy of the formerly affected skin only residual scar tissue was noted.

CASE 2.—A 24-year-old white automobile mechanic noted the onset of a reddish maculopapular skin eruption upon the left arm approximately three weeks before admittance to the Oakland Veterans Administration Hospital. Shortly after the onset of the eruption the patient was given local medication in the form of ointment, but the eruption spread and became generalized. During the two weeks before admittance, headache and sore throat developed. The patient denied taking any medication before the onset of the rash, and there was no history of chancre. A reddish maculopapular eruption involved the entire body and the face. There were no lesions on the palms or soles. The lesions were firm to palpation and were all of the same size and appearance. There were multi-colored tattoos on the upper extremities, and all the colors in them, including red, were involved by the eruption. These tattoos had been applied in Hawaii several years previously. (It has been stated that the red dye used in Hawaii does not contain mercury.)

Erythrocytes numbered 5,240,000 and the hemoglobin content was 15.1 gm. per 100 cc. of blood. Leukocytes numbered 6,300—54 per cent polymorphonuclear cells, 40 per cent lymphocytes, 3 per cent monocytes and 3 per cent eosinophils. Results of urinalysis were normal. No organisms grew on a culture of the blood. Results of Kahn and Kolmer tests of the blood were strongly positive for syphilis. No abnormalities were observed in studies of the spinal fluid.

The patient received a course of 10 million units of penicillin plus five injections of Mapharsen® of 0.03 gr. each. The skin eruption disappeared in three weeks.

CASE 3.—A 30-year-old white man had a tattoo, which had been present for about 12 years, on the right forearm. About six months before he was first observed, discoid lupus erythematosus of the butterfly area of the face developed. After the condition had been present for about five months, the patient went to an osteopath, who applied ultraviolet radiation to the face. Within one day the eruption on the face became much more severe, and soon afterward an eruption appeared on the forearm, involving the red-dyed areas of the tattoo. When the patient was examined the lesions on the forearm were observed to be typical of discoid lupus erythematosus—sharp margination, erythema, follicular plugging and telangiectasia. The rest of the tattoo and of the forearm were not affected by the dermatosis.

CASE 4.*—The patient was a 24-year-old white male who was tattooed on the right forearm seven years prior to examination. He said that the red areas had been swollen from the time the tattooing was done and that the swelling had gradually become more severe, without remission.

It was noted in the record of the patient that in December of 1950 a biopsy specimen was taken from the area of eruption, and, in histologic examination, acute, non-specific dermatitis was noted. Following this, the patient had received one x-ray treatment to the tattooed area.

When the patient was observed for the first time on January 8, 1951, five discrete, nodular, raised, red and crusted areas were present in the areas of red tattoo. There was also a similar area in a blue central portion of the tattoo.

Results of Kahn and Kolmer tests were negative for syphilis. Patch tests with 1:1000 mercury bichloride and with 4 per cent ammoniated mercury in zinc oxide ointment were carried out, and there was a four plus reaction to both in 24 hours.

As this sensitivity dermatitis had been treated, according to the case record, with a number of ointments, as well as x-ray, and had been refractory to all medications, surgical removal of the tattoos was carried out.

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DISCUSSION

Considering the widespread use of tattooing, relatively few complications arise. Furthermore, it is surprising how infrequently the tattoo acts as a focus of lowered resistance for the localization of cutaneous disease. Sensitization to the dyes is also rare, despite the often expressed belief that mercury is a common skin sensitizer. However, it is obvious from this brief discussion that the complications can be serious, bizarre or interesting. The induction of large numbers of men into the armed forces again may result in an increased frequency of tattooing. For this reason, this brief report has been offered.

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