THE RELATION OF SUNLIGHT TO DESERT SORES

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Type of Sore

In the series here described the sores took the form of annular subepithelial whitlows occurring on the exposed surfaces of the limbs, and varying in size from 1 to 3 cm. To lend certainty to the diagnosis of what is undoubtedly a distinct clinical entity, only patients presenting six or more of these lesions were included in the group of 50 cases studied. The cases arrived at an advanced dressing station during July and Aug., 1942. They represent roughly a cross-section of the cases occurring among certain armoured divisional formations during this period. When complications did not arise all were treated as out-patients. Many cases were seen at a very early stage of the disease.

Differential Diagnosis.—The group of sores which are peculiar to desert countries are, in my opinion, those lesions of the exposed surfaces which are commonly seen in the form of subepithelial whitlows, and which are characterized by slowness of healing. Furunculosis is frequently seen in the desert; its differentiation is easy, as the lesions are typical and bear no resemblance to desert sores. Chafing of the feet by ill-fitting boots may give rise to septic sores; these heal rapidly when the cause is removed. Epidermophytosis of the feet may sometimes be complicated by sepsis; a march usually reveals the characteristic erythema and vesiculation of this disease. Insect-bites which have become septic are usually brawny and have a necrotic core. They are not infrequently found on those areas of skin which are exposed only in the sleeping individual—e.g., in the region of the ankles and shin.

Relation of Trauma to Occurrence of Sores

As trauma is an accepted aetiological factor its relation to this series will be described first. It is of considerable interest that 21 out of the 50 patients were unable to account for the presence of the sores. They stated that they did not believe them to be due to injury. In the 29 other cases the majority thought that one or more sores were due to knocks or cuts, but were able to point out a number of sores the presence of which they did not believe to have been caused by trauma. In 6 cases only was the statement made that injury had occurred at the site of every sore.

In cases in which sores are multiple it would therefore seem that a large number appear without history of injury. Bearing this in mind, it is of interest that 19 patients volunteered the information that their sores first appeared as what they described as "water-blisters." Apurulent vesicles were present in only five of these cases when they were first seen by me. Failure to observe vesicles in the majority of instances in which they were described by patients is probably due to the fact that they are present only in the early progressive stages of the disease. In the apurulent stage they vary from 2 to 10 mm. in size. Twelve to twenty-four hours after they are first seen rupture occurs and the sores become purulent in most cases. They become spreading subepithelial whitlows which are resistant to treatment, two to three weeks commonly elapsing before they have healed completely. It is therefore the stage of subepithelial whitlow which is usually seen.

Certain features of the original clear vesicles are of interest. Itch may be experienced in the parent skin for several hours before they appear, but when the vesicles are fully developed they neither itch nor pain. The lack of pain is in marked contrast to the later stages of subepithelial whitlow. When the patient comes for treatment for sores which are fully developed, one or more of these small vesicles may be present of which he is quite unaware. The vesicles were multiple in two of the five cases in which they were observed in this series. I have often seen them on skin which has been reddened by the sun and on the back of the hand, sometimes on skin which

was shiny and even atrophic in appearance. Like the later stages in which whitlows have developed, there is no underlying palpable infiltration, nor is oedema of the dermis clinically apparent; marked inflammatory reaction is absent from the surrounding skin. They might thus be described as atrophic in appearance, and closely resemble the vesicles which arise from minute burns or scalds. 0.2 c.cm. of fluid from the vesicle of a colleague was introduced intradermally and aseptically into my own skin at a site corresponding to that of the vesicle of which use was made. No visible reaction occurred in the inoculated area. The vesicular fluid probably does not contain organisms which are markedly pathogenic.

It had to be borne in mind that these vesicles might have been caused by insect-bites. A common origin of this nature is, however, somewhat discounted in so far as they bore no noticeable resemblance to the usual reaction to insect-bite; oedematous papules and petechiae were not seen. Only one case of the series gave a history of having suffered mosquito-bites, and the clothes of the patients were free from lice and fleas. During the greater part of this period of two months the men were in areas in which mosquitoes and sandflies were not prevalent. On the other hand, for one period of three or four days some of these troops were in an area in which they were extensively bitten by mosquitoes, and oedematous papules appeared in large numbers during this short time. None of these papules were observed to develop into the vesicles which have been described, and no noticeable increase occurred in the incidence of desert sores. Insect-bites may occasionally be the cause of this vesiculation; it is unlikely that they are the causal factor in all instances. Similarly, where the vesicles may have resulted from insect-bites it is worth while bearing in mind that the lesion is atypical in the sore-bearing areas, papulation being absent and the lesion taking the form of a vesicle.

In one case which I have seen, though it was not included in the series, the sufferer was a regimental medical officer. Two vesicles were present on the knuckles, and a third had ruptured. He stated that he had definitely knocked the area. As he could be regarded as a reliable witness it is probable that some of these vesicles are the result of knocks that are insufficient to produce either bruising or scarification.

One may conclude that the subepithelial whitlows, or "desert sores," often made their appearance as the result of the skin having been abraded by minor injury. In the case of a large number, however, they first appeared as vesicles, which by their nature indicate intactness of the cuticle. The origin of the vesicles is uncertain. One case of the series had suffered mosquito-bites. A case is noted in which trauma had occurred at the site of the vesicles. In 18 cases, however, the cause was not apparent.

Complications

In this series two patients developed low-grade cellulitis and three adenitis. Lymphangitis was seen in one case of adenitis. There were no cases of diphtheritic palsy. In all five cases in which complications arose they appeared after the sores had been present for some days. They probably signified the contamination of the open sores by relatively virulent organisms.

Coincident Facial Impetigo

In 12 out of the 50 cases impetiginous lesions were present on the face, often in the neighbourhood of the mouth or ears. Thus facial impetigo was observed in one case out of every four. This must be regarded as an unduly high incidence, and leads one to believe that its occurrence is in some way related to the typical subepithelial whitlows of the limbs. In 4 cases impetiginous sores were present on the neck.

The Relation of Season

During the months of March, April, and May, 1942, I saw no cases of the disease, though during the same months a very large number of men were treated at morning sick parade. Cases reporting sick with minor illness were few during June on account of the circumstances of the battle. Case-taking disclosed that only one patient in the series claimed that he suffered from sores all the year round. One man stated that they first appeared in April. In 15 cases the onset occurred during the month of June, and of those claiming onset in July there were 26. Desert sore does not therefore seem to be

a disease of the late winter and spring, and cases only begin to appear in numbers in the early summer.

Of those who had not experienced a previous summer in the desert 1 had been in the desert three months, 4 for six months, 24 for eight months, and 1 for eleven months. It is significant that in these cases the sores chiefly made their appearance in either June or July rather than at times related to the duration of their stay in the desert. Only one of the patients spending their first summer in the Western Desert stated that he had previously suffered from desert sore. This turned out to have been in Afghanistan in similar country during 1939.

These cases suggest that the sores mainly appear during the summer. Confirmation of this was sought in the past histories of those patients of the series who had seen two or more desert summers. It was found that out of the 11 patients who had spent one previous summer in the desert 8 had suffered during that summer. The sores had appeared in typical form; they did not recur during the winter months. Of four who had had two previous summers in the desert, all had similar attacks during each of these summers. Only one patient had spent three previous summers in the desert, and he had suffered during all three. Significant statements volunteered by patients were: "They broke out about the same time last year, and the year before that"; and "They appear each year just when the sun gets hot."

In respect of season in the Western Desert, I was able to note the main changes in the weather. During the winter months of December, January, and February the weather is cold, and in 1941-2 cloudy days were numerous. In March, April, and May the cloudy days became less frequent and the weather warmer. By June the days had become relatively cloudless. In July the sun was noticeably hot day after day, and the sunlight relatively intense, giving rise to numerous cases of disturbance of vision. I myself tan deeply, and during July noticed a very marked increase in the laying down of pigment in the skin of my knees and forearms, to an extent greater than I had ever before experienced. The seasonal changes mainly resolve themselves into sunlight and heat factors. It was noticeable that the latter was always greatly modified by the desert wind. This enabled the individual to carry on activities which would otherwise have caused heat-stroke. No cases of heat-stroke were seen.

It would thus appear that, allowing a seasonal incidence of desert sore, the factor most likely to be of importance is sunlight. Bearing this in mind, it was decided to estimate, so far as was possible, the part played by the individual resistance to the sun's rays.

Relation of Orientation of the Individual to Sunlight

Differentiation of individuals resolves itself into two main groups. In the first, marked pigmentation of the skin occurs, and reddening and scaling are absent. In the second, in the extreme case, the exposed skin is unable to adapt itself, and erythematization is the chief reaction to exposure, attended in many instances by dryness of the skin and repeated scaling; the individual often points out that his skin is at this stage abraded by the least knock; he complains that he cannot "take the sun." While many persons fall between these two groups, it seemed from clinical study that it was among the second group that cases of desert sores were most frequently found. As might be expected, the majority of those in the first group also showed the natural evidences of pigment-forming powers; they were most often brown-haired and brown- or grey-eyed. Similarly, lack of pigment-forming power was most common among the fair-haired blue-eyed. The division is not a strict one: a small number of brown-haired, frequently blue-eyed individuals react badly, becoming florid rather than tanning, while a small proportion of the fair-haired develop quite a deep tan.

The percentage of fair-haired individuals occurring among the 50 cases of desert sores was compared with the percentage of fair-haired in a unit the personnel of which were drawn from all parts of Britain. Of the men with desert sores 70% were fair-haired, as opposed to 36% in the control group; and 76% were blue-eyed, as opposed to 28% in the control group. While these figures are drawn from a relatively small number of cases, the disparity is so marked as to indicate

that desert sores are much more common among the fair-haired and blue-eyed than among other groups, thus confirming the impression gained by clinical experience. Of the 15 brown-haired individuals who developed the condition 11 were noted to react badly to sunlight.

It may therefore be stated that desert sores tend to occur among those whose pigment formation is below average.

Distribution of Sores

The sores occurred on the surface skin which was exposed. Subepithelial whitlows, however, were seen only on the hands, fingers, arms, and legs. They did not occur on the face and neck, though it has been pointed out that impetiginous lesions were not uncommon in these areas.

Incidence in Susceptible Areas

	Hands	Forearms	Upper Arms	Legs
Incidence in susceptible areas (%)	96	68	4	26
Bilateral (%)	88	32	2	8
Unilateral (%)	8	36	2	18

In the above table sores on the fingers were included under the heading of "hands." As is shown, the hands are most commonly affected. Three factors may be of significance in this respect: (a) The hands are most liable to suffer trauma; (b) the surface hair is less well developed than on the forearms; (c) in the very fair-haired the skin of the back of the hands often becomes red and glazed as a result of frequent and prolonged exposures to sunlight.

In the two cases in which there were sores on the upper arms, sores were also present on the forearms. The sleeves of the shirt were in both cases worn very short, and the effects of exposure to sunlight were as obvious on the upper as on the lower arms. It was characteristic that no sores appeared on the ventral aspects of hands or fingers. They were seen on most of the exposed areas of the forearms. No sores were observed, however, on the area of the skin normally resting against the body in the standing individual. The same part of the skin of the forearm is apposed to the driving wheel, or in the sitting person to the desk or table. Even in deeply tanned individuals it remains free of pigment to a great extent; it appears to be always protected from the sun's rays by posture.

With regard to the knees the sores were more frequently unilateral. The sores occurred here in the areas exposed when wearing shorts and stockings. This area tans uniformly in front and behind. Sores often occurred posteriorly as well as anteriorly.

Four Typical Cases

Case 1.—Trooper A. This case was illustrative of the average mild one. The sores were typical subepithelial whitlows, and were present on the back of the hands and the back of the right wrist. None were present elsewhere. They had first appeared at the beginning of July. Some of the sores he believed to have been due to knocks, but he was unable to account for the presence of others. He states that in the case of one sore, "A big water-blister came up and burst." His hair was fair to ginger and his eyes blue. He volunteered the statement, "My skin sunburns easily"; and again, "If I knock my skin against anything it breaks."

Case 2.—Rifleman B. The sores were very numerous in this case, which was a severe one. Whitlows were present on the back of both hands and on both forearms. One sore was present on the left upper arm, and three on the right upper arm. The sleeves were worn very short. The lower halves of the upper arms were sun-reddened and peeling in the area in which the sores appeared. There were neither sores nor scars on the part of the forearm which rests against the body in the standing individual; they were seen only on the reddened and peeling areas. The sores had first appeared at the end of June. The patient believed that the sores were due to knocks in some cases, but not in all. He stated, "I sometimes wake up and look at my hands, and find they are festering." He had spent two previous summers in the desert, and during the second of these had had sores on the knees as well. He believed they had broken out about the same time in each of these summers. He was fair-haired and blue-eyed, reddened rather than tanned, and laid down no pigment in the exposed areas.

Case 3.—Driver C. This case is characteristic of the 19 who volunteered the information that their sores first appeared as "water-blisters." The sores were typical. They were present on the right forefinger, the back of the right hand, and on the right elbow. One was present on the left upper arm, one on the right knee, and one

on the left knee. They first appeared at the beginning of July. He had been in the desert for eight months and had had no previous attacks. He was dark-haired and blue-eyed. He was florid in type, and stated, "I keep getting red and peeling."

Case 4.—Sergeant D. This case is of interest in view of the past history. The sores when first seen were very numerous and were present on both hands and knees. They had first appeared in July. This soldier had been in the desert for 40 out of the preceding 48 months. In 1939, when he first came up to the desert, short-sleeved shirts were being issued. During the summer of that year he suffered desert sores on the forearms as well as on the hands. Long-sleeved shirts were issued at the end of the year, and he wore the sleeves down, as he had found that the least knock took off the skin of the forearms, and the site of the knock went septic. He also found that since he had worn his sleeves down desert sores had not occurred on his forearms. He believed that his sores appeared only during the summer months. He was of the opinion that none of the sores were due to injury. They had all come up as clear vesicles, which he described as "sweat-blisters." His hair was fair and he was blue-eyed; he was very susceptible to sunburn.

Discussion

It has been shown that the multiple desert sores of this series appeared only in the areas of the limbs which were exposed to sunlight. In two cases in which sores were present on the upper arms shirt-sleeves were worn very short. One patient had discovered during a previous summer that he was able to avoid sores on the forearms by wearing his sleeves down. The sores were found chiefly in individuals whose powers of adaptation to sunlight were below average. They appeared in almost epidemic fashion at the beginning of the desert summer, of which the main characteristics are increased duration and intensity of sunlight and rise in temperature; the latter factor is modified by the more or less constant desert wind.

It would thus seem that the effects of sunlight play an important part in the aetiology of the sores. It is well known that, in the fair-haired especially, marked changes occur in the exposed skin as a result of repeated and prolonged exposure. The skin becomes erythematous, and frequent scalings take place. Eventually it is found that the least knock takes off the skin. This factor would appear to be of importance in cases in which sores follow slight trauma.

On the other hand, a large group existed in which the individual either was unable to give any history of trauma or believed that the site of only one or two sores had been injured. In spite of this, these cases often showed as many as 10 to 15 sores in the exposed areas, numerous sores being present on the forearms, where minor injuries or "knocks" are not noticeably frequent. Similarly, in a large number of cases the sores were stated to have first appeared as "water-blisters" or vesicles, and in some instances these vesicles were observed. If trauma had given rise to the latter it could only have been minimal, as the fact that the lesions took the form of vesicles precluded rupture of the cuticle. The vesicles were most often found on the areas of skin which were most exposed to sunlight, and in a few cases this skin had become both erythematous and atrophic in appearance. For the reasons which have already been detailed, it is most unlikely that they all followed insect-bites. Only one out of 19 patients stated that he had been bitten by mosquitoes; one other case is described in which the vesicles followed minor trauma. The origin of the vesicles is therefore obscure in a large number of cases. Since many appeared on areas which had been chronically sunburned, it may be that they represent a delayed reaction to excessive sunlight, the vesicles developing either on damaged skin as a result of additional sunburn or from minor and unrecognized trauma, the threshold of the injury having been lowered as a result of the changes in the skin. It is of interest to note that the vesicles resembled small burns or scalds in their clinical characteristics. They were the precursors of many typical desert sores which arose as a result of secondary infection of the vesicles.

The desert soldier tends to suffer excessive exposure to sunlight, and the reasons for this are not obscure. In the forward areas shelter from the sun's rays is lacking. Tents are not pitched by combatant units, as they lessen mobility and are aids to observation from the air; they are also hindrances to effective dispersal. Even the shade provided by vehicles is denied to many by the nature of their duties—e.g., gun crews, Bren-gun-carrier personnel, tank and armoured-car com-

manders, drivers of open trucks. No shade is provided by Nature. Personnel are therefore subjected to repeated and prolonged exposure to sunlight, which in other circumstances they would avoid.

Sand may act as a foreign body and delay healing where contamination occurs, though it should be possible to avoid this if the sores are seen early and are effectively dressed. Flies may be of importance in transferring virulent organisms; in fly-infested regions they may cluster on the sores even while the dressing is being changed. While the possibility of vitamin deficiency cannot be discounted in an appraisal of the aetiology of these sores, the absence of any of the features of scurvy in cases of desert sores would appear to indicate that deficiency of vitamin C is not of major importance. Also, sores have been seen to develop in desert troops who were receiving an apparent sufficiency of fresh food (personal communication of Colonel Ardagh, N.Z.M.F.).

Notes on Preventive Treatment

The following measures have been adopted so far as is possible in cases which I have seen recently:

1. Patients have been instructed to wear their sleeves down. Where the sleeves showed signs of having shrunk the men were told to exchange their shirts for ones with longer sleeves. Protection of the forearm is thus provided against trauma, the effects of sunlight, and insect-bite. If the sleeves are long enough some degree of protection is also afforded to the hands.

2. For the same reasons the susceptible were also advised to wear long trousers.

3. The difficulty of adequately protecting the hands and fingers is apparent. A supply of vanishing cream or of oil, preferably containing a small amount of antiseptic, might be helpful. It would have to be applied to the hands each morning after washing, as washing would destroy the protective film. Only the susceptible of a unit, usually well known to the medical officer by reason of many visits to the M.I. room, would need to be so supplied.

It is of interest to note that some "desert rats" who had experienced previous summers in the desert, and who were susceptible, had obtained a supply of germolene and of elastoplast while on leave. They had found that these were the most useful proprietary medicaments for the occasions on which duties compelled them to spend periods at some distance from the nearest medical officer.

Summary

It has been shown that the desert sores of this series bore a marked relation to exposure to sunlight.

It has been emphasized that changes are observable in the exposed skin of those who are susceptible to sunlight. It was in the exposed areas that the sores appeared, sometimes following trauma; in other cases, however, a history of trauma was not obtainable.

Small clear vesicles, resembling minute burns or scalds, were observed to be the precursors of many of the sores. In one such case these vesicles may have resulted from insect-bites; in another they probably followed minor trauma. In the majority of instances no definite aetiological factor could be elicited; the possibility that sunburn contributed the final trauma cannot be discounted.

It has been observed that, in the desert, various factors contribute towards an abnormal degree of exposure to sunlight.

The annual general meeting of the Society for Relief of Widows and Orphans of Medical Men was held on May 12, with Dr. R. A. Young in the chair. By the death of Mr. Warren Low the society has sustained a great loss; he had been president for thirteen years and always took the greatest interest in the society and its work. Dr. R. A. Young was elected president in his place. The annual report for 1942 showed that 56 widows had been granted relief and £4,412 distributed. One of the widows died at the age of 95; she had been in receipt of grants for 46 years and had received from the society nearly £4,000. Relief is granted only to the necessitous widows and orphans of deceased members. Membership is open to any registered medical man who at the time of his election is residing within a twenty-mile radius of Charing Cross. Full particulars and terms of subscription may be obtained from the Secretary, 11, Chandos Street, Cavendish Square, W.1.