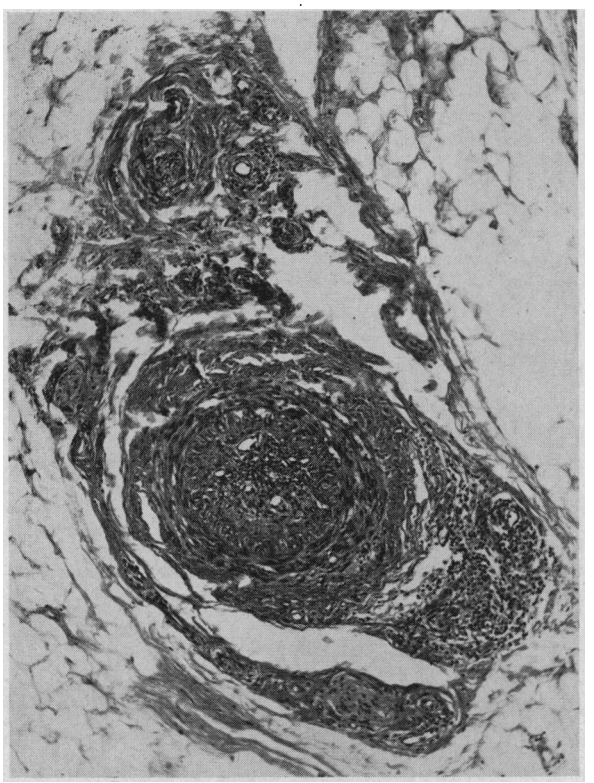

Figure 2.—Low power view (x 90) from section where Figure 1 was obtained.

but pulsations in the ulnar and dorsalis pedis arteries could not be felt. The patient, who had continued to smoke, was reexamined ten months later. The amputation sites were healed. The fingers and toes remained painful on exposure to cold, with color changes in the fingers, and there was still complaint of mild intermittent claudication in both calves on walking two to three blocks at a normal pace. The fingers were cold and dry, as were the feet. There were no postural changes. Palpable peripheral pulsations were as follows: The right dorsalis pedis was faintly palpable, but the left dorsalis pedis and both posterior tibials could not be felt. The popliteals and radials were normal and the ulnar arteries were not palpable.

COMMENT

The early diagnosis of Raynaud's disease in this case is understandable. The early symptoms were of a vasospastic character and resembled those of Raynaud's syndrome. Thromboangiitis obliterans was apparently not considered due to the lack of signs and symptoms of organic arterial occlusion. The subsequent course of events led to the correct diagnosis. Practically all the diagnostic criteria were present in this case, even the factor of smoking. The trauma which initiated the gangrenous process was unusual and open to controversy. As there were no strands in the telephone cable in question, the possibility of perforation of the skin by fine strands of wire was eliminated. It was found that 0.70 to 0.71 amperes at 24 volts direct current was periodically present about the telephone plugs and a mild shocking current could be felt, especially if the subject had moist hands. It is felt that a sufficient electrical current was present to cause cellular damage. Although the trauma that such a current might cause to normal tissues would be practically unnoticed, ischemic tissues, such as those present in this case, frequently respond poorly even to trivial trauma. This may have been a significant factor in this case.

CONCLUSIONS

A case of proven thromboangiitis obliterans in a white woman is reported.

An electric charge of 0.70 to 0.71 amperes at 24 volts direct current may have been the traumatizing agent in this case. Apparently sufficient damage was done to the ischemic tissues to precipitate a gangrenous process.

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The Use of BAL in Generalized Argyria

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HEAVY metal poisonings, especially the toxic effects resulting from gold,[2, 10] arsenic,[2] and mercury,[1, 4] have been successfully treated with BAL (British Anti-Lewisite, 2, 3-dimercaptopropanol). This drug was also discovered to be efficacious as an antidote in cadmium,[9] zinc,[13] copper,[6, 7] lead,[12] antimony, bismuth, chromium, and nickel poisonings.[1] No previous publication has been noted concerning the use of BAL in clinical argyria. The successful management of silver poisoning, whether local or generalized, has always remained a therapeutic problem. With the efficacy of BAL in other heavy metal toxicities a trial with this drug appeared indicated in a case of long-standing generalized argyria.

Arsenic, gold, and mercury, in particular, produce their toxic effects by combining with the sulfhydryl groups of tissue proteins of cellular enzymes to form mercaptides, thereby disrupting certain vital physiological processes. The sulfhydryl radical in dithiol BAL competes with the dithiol protein-metal compounds, thereby separating the offending metal from tissue union. To be effective, BAL must be administered soon after a heavy metal combines with the sulfhydryl group, otherwise the effect of the metal becomes irreversible.[10]

The distribution and metallic retention of silver in the body is very different from that of gold, arsenic, and mercury in the tissues. There is specific affinity of silver granules for the connective tissue framework and vascular system. In cases of argyria the reticulo-endothelial system is the site of the initial deposition, following which the majority of body structures contain silver deposits.[5] Silver, which is deposited as a colorless substance, is uniformly distributed in the corium and darkens as the result of light influence.[11] This metal so deposited remains chemically unchanged or is oxidized as silver oxide or silver sulfide, depending on the loca-

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tion. Gaul noted the distribution and agglomeration of silver particles as reciprocal to that of the capillary network with the metal lying free in the connective tissue.[3]

The treatment of argyria has always been disappointing. Potassium iodide injections, methenamine, oral sodium thiosulfate, and local injections of 6 per cent sodium thiosulfate and 1 per cent potassium ferricyanide have been therapeutic failures. A substance which would combine with metallic silver in the tissues, leading to its consequent excretion, or one which would effectively but harmlessly cause its chemical reduction and have no disturbing side reactions would be a desirable therapeutic agent for patients with argyria. Olcott, using a limited number of experimental animals, discovered that BAL, even in large doses, was incapable of mobilizing silver.[8] However, a clinical trial with BAL appeared indicated in the following case of silver poisoning, even though the chronicity of argyria, and doubt as to whether silver is combined in the tissues with sulfhydryl groups of protein fractions of cellular enzymes, permitted little hope of success.

CASE REPORT

A white American male, 45 years of age, had had generalized argyria since 1932, resulting from intranasal administrations of 10 per cent silver nitrate or argyrol solutions for treatment of chronic vasomotor rhinitis. Medication was constantly employed by the patient for 17 years before the diagnosis was established, the average weekly dosage being an ounce. A bluish hue gradually developed over the upper part of the body so that the patient was suspected of having cyanosis from a cardiac disorder. By 1935, despite cessation of colloidal silver therapy, the skin of the patient had assumed a metallic silver color on the entire head and a slate gray color from the neck down to the mid-thorax together with localized areas on the dorsum of both hands and wrists. He had visited several eastern medical centers for treatment but met with no success, although the regimen of 6 per cent sodium thiosulfate and 1 per cent potassium ferricyanide was employed by local injections.

Physical examination of the patient on August 5, 1947, disclosed a well developed, well nourished male in no acute distress. He possessed a metallic silver pigmentation over the entire head and a slate gray color from the neck down to the xiphoid and on the wrists and dorsum of both hands. The buccal cavity and pharynx were also slate gray, and the tongue darkly shaded. Both ocular conjunctivae were slightly bluish-gray. A small area of herpes zoster was observed over the left subcostal region.

Erythrocytes numbered 5,100,000 with a hemoglobin value of 15.5 gm. per 100 cc. Leukocytes numbered 8,600 with 60 per cent neutrophils and 40 per cent lymphocytes. There was slight anisocytosis and poikilocytosis. The Kahn determination was negative. Results of a complete urinalysis were normal. Lack of facilities prevented determination of argyremia levels.

On September 2, 1947, BAL 10 per cent in 20 per cent benzyl benzoate in peanut oil was administered intramuscularly in especially large doses: 3.6 cc. six times daily for two days, then 3.6 cc. twice daily for ten days. Ephedrine sulfate in the amount of 25 mgm. was taken orally before each injection to suppress the disturbing side reactions like burning of the buccal cavity, increased lacrimation, nausea, epigastric distress, malaise, and pain over the injection site. Following this treatment schedule there was no change in the appearance of the patient. A similar course was given beginning November 18, 1947, except that 50 mgm. of oral pyribenzamine was employed to control the side effects of BAL. In a three-month follow-up the patient's condition re-

arsenic, and mercury poisonings.

SUMMARY

The case reported is one of generalized argyria which did not respond to intensive BAL therapy.

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