RESULTS OF TREATMENT OF CHRONIC INDOLENT WOUNDS WITH AZOCHLORAMID

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Wounds involving the skin and the subcutaneous tissues are readily attacked by pyogenic organisms. In the majority of cases the superficial nature of the wound, which permits adequate drainage, results in satisfactory healing. A certain percentage of such wounds, however, become chronically infected because of some complicating factor, such as diabetes, a circulatory disturbance or trauma resulting in devitalization of the surrounding tissues. The protracted course of infected wounds in diabetic patients despite adequate diabetic therapy, the tenacious infections in wounds following the excision of carbuncles and the chronic sloughing wounds following subcutaneous trauma often discourage both patients and surgeons. The use of compresses wet with hot saline solution is beneficial in such cases, but the method is laborious and sometimes fails to clean up the infection. The present study was undertaken to determine whether a simpler and more effective method of treatment could be found, which would result in reducing the time and effort required to promote primary healing or to prepare such a wound for secondary surgical closure or grafting.

My attention was attracted to azochloramid, a new complex chlorine compound which liberates small amounts of chlorine gradually over a long period. This is in contrast with the rapid liberation of chlorine from Dakin's solution, which requires frequent changes of dressing and precautions against irritation.

In the present series of cases a stable oily solution, azochloramid in triacetin (1:500) was used in the following manner: Sterile sponges were soaked in this solution and applied directly to the wound. The saturated sponge was overlaid by a pad of abdominal gauze, and a sheet of rubberized silk or other impervious material was placed over this. Retention of the oily azochloramid solution on the wound surface was thus insured, and the dressing separated easily from the tender granulations. The dressings were changed twice daily by the nurse, who used a technic similar to that employed with hot sterile saline compresses. In the presence of spreading infections for which heat also is indicated, hot

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sterile saline compresses are placed over the azochloramid sponges and the sheet of rubberized silk placed over the compresses.

While azochloramid may be of value as a dressing for several types of cutaneous wounds, it seems of special value in the treatment of large necrotic lesions. The best results have been obtained in cleaning up large granulating wounds and promoting growth of healthy granulation tissue either for secondary closure or for skin grafting. It is important to emphasize that this antiseptic does not take the place of careful surgical procedures and hot saline compresses when heat is indicated, as for an acute infection which is not localized.

In several cases of chronic infection which did not respond satisfactorily to other therapy, the application of azochloramid rapidly brought about improvement and shortened the time necessary before skin grafting or secondary closure.

The cases to be reported have been divided into three groups. Group 1 consists of 3 cases of chronic infection which did not respond satisfactorily to other forms of therapy; group 2 consists of 3 cases in which large, necrotic granulating wounds remained after excision of carbuncles, and group 3 consists of 2 cases of severe cutaneous flesh wounds with subsequent necrosis of the skin and superficial muscles in children. All of the cases have been followed carefully in the hospital, with pictures, cultures and frequent examinations to note the course.

GROUP 1

CASE 1.—A white man aged 58, of Italian descent, was admitted to the hospital on Feb. 17, 1938, with varicose veins and a large, foul ulcer of the leg. He had been coming to this hospital for fourteen years because of a chronic ulcer of the left leg. Ligations and injections of numerous veins and various types of dressings had been employed during this period, but the ulcer had persisted and had become larger. The patient had persistently refused to cooperate by keeping off his feet and had once refused admission to the City Hospital after all arrangements had been made. On the present admission he did not appear ill, but a large, very foul ulceration covered a large area of the lower part of the left leg, from the ankle to the knee, on the anterior and medial aspects. The edges of the ulcer were rolled up and bluish. The surrounding skin was scarred and brown. The ankle and foot distal to the ulcer showed a thickened scar encircling the ankle. There was considerable peripheral edema. Proximally there were fairly extensive varicose veins, with a few smaller ones on the right leg (fig. 1).

The patient was kept in bed with the leg elevated. Hot sterile saline compresses, changed regularly (every two hours by day and every four hours by night), were applied to the ulceration. Roentgenograms revealed some evidence of osteomyelitis and extensive periostitis of the tibia and fibula of the left leg. The nonprotein nitrogen content and the sugar content of the blood were normal. There was little response to this therapy, the wound remaining necrotic, with poor granulations. The odor was so foul that the patient was isolated in a private room. A 1:500 solution of azochloramid in triacetin was then applied four times a day, soaked in
Fig. 1.—Indolent ulcer of the leg of many years' duration in a white man aged 58. He had had varicose veins for fourteen years. The Wassermann reaction was negative. Note the necrotic granulation tissue and the edema of the surrounding skin.

Fig. 2.—Same wound as in figure 1, twenty-four days later, after débridement and skin grafting.
sterile sponges. Within three days the odor had practically disappeared, and the granulations were cleaner. Within a week there was improvement in the cleanliness of the wound, although there was no regeneration of epithelium. In twelve days the cultures, which had shown a heavy growth of Bacillus proteus before azochloramid therapy was started, were sterile. The use of azochloramid was continued over a total period of twenty-one days. During this time the entire ulceration (15 by 15 cm.) acquired red, healthy granulation tissue, but there was little epithelization. The surrounding indolent skin was then debrided, and hot sterile saline compresses were applied for several days, after which a series of pinch grafts were applied at several subsequent operations, the majority of the grafts “taking” nicely (fig. 2).

Fig. 3.—Infected amputation wound of the left thigh in a 72 year old white woman with diabetes, arteriosclerosis and gangrene of the left foot. Little response was shown to daily washing with alcohol, to dry dressings or to adhesive traction.

Case 2.—A 72 year old white woman had had diabetes for fifteen years. She was admitted to the hospital on Feb. 22, 1937, because of gangrene of the left great toe of six months’ duration. The Wassermann reaction was negative. Despite all conservative measures there was no improvement in the gangrene, which progressed slowly and produced more pain. A Gritti-Stokes amputation at the knee was performed. Healing was satisfactory for one week, but infection of the stump developed, and on the tenth postoperative day the wound broke open, with wide gaping of the edges of the skin. There was no response to the use of alcohol and daily dressings with adhesive skin traction. Azochloramid in triacetin (1:500) was started, and the dressings were changed twice daily. Healthy granulation tissue soon developed, and after thirteen days the wound was clean. A secondary closure was then successfully performed (fig. 3).

Case 3.—A white woman aged 41 was admitted to the hospital on March 2, 1938, because of a tremendous ventral hernia with ulceration of the overlying skin (fig. 4). The hernia had been present for seven years, starting as a small umbilical hernia and increasing rapidly in size since her eighth pregnancy, with
ulceration of the skin two months before the present admission. Hot saline compresses were applied to the ulcerations to clean them up before a hernia repair could be performed. There was little improvement in the ulcerations after one week of continuous treatment, so a 1:500 solution of azochloramid in triacetin was tried. There was prompt improvement in the chronic ulcerations, which decreased in diameter from 2 to 3 cm. to 1 cm. during the eight days in which azochloramid was applied. The ulcerations were exposed to the air after the azochloramid was discontinued, and scarlet red was applied to stimulate epithelial growth. The ulcerations were completely healed at the end of ten days. Herniorrhaphy was then successfully performed, the wound healing by first intention.

Fig. 4.—Large ventral hernia with ulcerations of the skin in a 41 year old white woman. The ulcerations did not respond to hot sterile compresses.

GROUP 2

CASE 1.—A white man aged 59 was admitted to the hospital April 15, 1937. He was acutely ill, with signs of severe diabetes and a large carbuncle with a surrounding area of cellulitis involving the left shoulder. The sugar content of the blood on admission was 393 mg. per hundred cubic centimeters, and a test for acetone in the urine gave a 4 plus reaction. The Wassermann reaction was negative. Culture of the blood yielded bacteria, numerous colonies of Staphylococcus aureus being obtained. The patient received active treatment for the diabetes and septicemia. The shoulder was compressed with hot saline compresses for five days, after which the carbuncle was excised (fig. 5). Cultures revealed Staph. aureus from the carbuncle. Azochloramid in triacetin (1:500) was applied to the crater twice daily, hot sterile saline compresses being applied over the azochloramid sponges. The wound at the onset of treatment was dirty and necrotic, but despite the stormy course (five cultures of the blood yielded staphylococci) the wound began to show healthy granulation tissue. The surrounding cellulitis subsided, and after twenty-five days of treatment with azochloramid secondary closure of the wound was successfully done. During this time frequent cultures were made of material from the wound, which showed progressive diminution in the number of colonies of Staph. aureus.
Fig. 5.—Necrotic wound after excision of a carbuncle of the left shoulder in a 59 year old white man who was acutely ill with staphylococcic septicemia and severe diabetes.

Fig. 6.—Condition in a white woman aged 52, with diabetes, after excision of a carbuncle of the right interscapular region. Note crusting and unhealthy appearance of the base of the wound after eight days' treatment with hot sterile saline compresses.
Case 2.—A white woman aged 52 was admitted to the hospital March 31, 1937, with a diagnosis of diabetes mellitus and a large carbuncle on her back. The diabetes was easily controlled, and hot saline compresses were applied to the carbuncle. After eight days the carbuncle was thought to be sufficiently localized for excision. This was done successfully, Staph. aureus being cultured from the wound. The crater was 7 cm. in diameter (fig. 6). Healing was delayed, and after eight days azochloramid in triacetin (1:500) was tried in an endeavor to speed up the healing of the wound. After four days of therapy with azochloramid and hot sterile saline compresses there was a marked improvement in the appearance of the wound. Red granulation tissue grew rapidly, decreasing the depth of the crater. Fourteen days after the azochloramid treatments were begun the wound was grafted with small pinch grafts, which “took” satisfactorily.

Fig. 7.—Large deep wound after excision of a carbuncle of the neck in a 54 year old white man. Spreading of this wound occurred, so that a second incision was necessary. Azochloramid was subsequently discontinued.

Case 3.—A white man aged 54 was admitted to the hospital March 5, 1938, with a large carbuncle on the back of his neck, of two weeks' duration. The carbuncle was compressed for two days before surgical excision was performed (fig. 7). Cultures revealed Staph. aureus. Azochloramid in triacetin (1:500) was applied on the second day after the operation. Hot sterile saline compresses were applied over the azochloramid sponges. The wound did not respond satisfactorily, for the carbuncle spread to the opposite side of the neck. Accordingly, a second excision of the area of spread was necessary one week later. The diameter of the crater was now 9 cm. and its depth 1.5 cm. Azochloramid was again applied, but after two days the patient complained of such pain and irrita-
tion of the wound when it was applied that the azochloramid was discontinued. At the time of writing the wound is healing slowly with hot sterile saline compresses.

GROUP 3

CASE 1.—A white boy aged 1½ years caught his left arm in a washing machine wringer, traumatizing the subcutaneous tissues. The skin and bones were not

Fig. 8.—Sloughing wound of the left forearm of a 1½ year old child whose arm was caught in a washing machine wringer. Note the surrounding inflammation of the skin.

Fig. 9.—Wound similar to that in figure 8 in a 3½ year old Negro boy. There was also a surrounding area of induration and inflammation, which caused this wound to respond better to hot sterile saline compresses than to azochloramid.

injured. The boy was admitted to the hospital for observation on Feb. 19, 1938, and several days later the subcutaneous tissues and skin in the antecubital fossa began to slough. A foul, necrotic sloughing area about 5 cm. in diameter developed
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(fig. 8). Culture revealed an alpha streptococcus. Azochloramid in triacetin (1:500) was applied on gauze sponges twice a day. The wound began to look more healthy, but repair was sluggish. After eight days, treatment with azochloramid was discontinued, and the use of hot sterile saline compresses was instituted, with slightly more rapid improvement. Grafts were applied to the area about a week later, but only approximately half of them "took"; hence secondary closure was necessary ten days later.

CASE 2.—A Negro boy aged 3½ years was admitted to the hospital on March 2, 1938, for observation, with an injury similar to that in the foregoing case. He had caught his arm in a washing machine wringer, injuring the soft parts but not the bone. While he was in the ward, an area about 5 cm. in diameter over the brachioradialis muscle began to slough. Application of hot sterile saline compresses were begun, but after two days it was discontinued and azochloramid in triacetin (1:500) started. The repair of the wound was slow, and after eight days' treatment the azochloramid was discontinued and the use of hot sterile saline compresses again started. The improvement under the latter therapy the second time was definite, which illustrates the point that azochloramid will not act as a substitute for local heat in the treatment of wound infections which are not sufficiently localized (fig. 9).

SUMMARY

Eight large, necrotic infected wounds have been treated with azochloramid in triacetin (1:500). The wounds selected have been indolent in character, most of them complicated by other factors, such as diabetes or vascular disease. Six of the 8 presented localized infection, 2 infections being in a less localized stage.

A satisfactory response was obtained in 5 of the 8 cases. The character of the granulation tissue changed after a few days from sluggish, gray granulations into a rapidly growing bed of red granulation tissue of healthy appearance.

In the sixth case there were signs of irritation on the second day, and the solution was discontinued.

In the other 2 cases the infections were not sufficiently localized, and hot saline compresses seemed of greater value.

In conclusion, it may be stated that azochloramid (1:500 solution in triacetin) is an antiseptic which appears to be of value in the treatment of chronic infections of the indolent type described. Sterile sponges soaked in this solution, changed twice or four times daily, exert a continuous antiseptic action and require a minimum of attention. The solution promoted development of healthy granulation tissue, or primary healing, in a group of infected wounds for which other types of therapy previously tried had offered little or no benefit.