DR. FRED STAUFFER, Salt Lake City: I would like to ask whether Dr. Welty selects his cases for this operation, and, if so, what kind of cases he selects. In our part of the country we have a great many cases of cholesteatoma, in which the dura and lateral sinus are often exposed, and in removing the diseased bone we often find that the facial nerve is exposed. In such cases the method Dr. Welty uses, of employing hydrogen peroxid and hot solutions, would cause paralysis of the facial nerve. It seems to me it would be difficult in some of these cases to make a skin-graft. I would like to know how he would treat such patients. I do not think his method would be applicable to all cases requiring operation.

DR. E. C. SEWALL, San Francisco: Before I heard Dr. Welty's communication before the San Francisco eye, ear, nose and throat surgeons some months ago, I had been using primary skin-grafts for a considerable length of time. At that meeting Dr. Welty made the statements he has made here, except that at that time he was doing his skin-grafting secondarily, and insisted that it should be done on the fourth day and never on the third or fifth. That evening I criticized his paper, because I felt that the readministration of an anesthetic is not desirable if it can be avoided. Since then Dr. Welty has adopted the primary skin-grafting. I have used the small pledgets which he recommends. He says that they should be counted and that is very necessary, but it is difficult to remove them by count, because they stick together and it is often difficult to know whether you have removed one, two or three of them. I have sometimes left some of those plugs and removed them later, to my chagrin. I found once after the third day a beginning facial paralysis. There was no paralysis immediately following the operation. It developed on the third day and was almost complete. On searching the cavity and removing some hidden pledgets, the paralysis gradually cleared up. There are certain objections to the applications of the grafts. I consider it absolutely unsurgical to do what Dr. Welty says, namely, to cover the exposed dura with skin-grafts. We all know that safety, after exposure of the dura, depends on the completeness of the exposure. If we make a puncture here we make a larger opening for safety. I am quite in sympathy with Dr. Barnhill's entire speech, in regard to facial paralysis, and more in sympathy with the point of view that there is danger in operating on a chronic suppurating middle ear. We will all get deaths if we operate often enough. The use of the cotton pledget is a difficulty. It is the best we have, but it seems to me it would be better if we had something else to use in applying the skin-grafts. I have even thought of something along the line of bismuth paste.

DR. C. F. WELTY, San Francisco: Of course, it is easy to find objections, but I have considered the various points brought up to-day and no doubt shall be able to answer the criticisms, if not in accordance with your notions, at least in accordance with my own. The only thing I have considered is the oiled dressing. In quite an extensive article Alexander and Mackenzie showed that all their patients have diminished hearing after one year. Now, the two series that I have shown here comprise thirty patients operated on in the last year, and in my report next year I expect to analyze the cases. I have patients who hear a whispered word 25 feet after more than a year. When I say that such results are better than anything before presented, you can readily understand my enthusiasm in this improved technic. The hearing is one of the important reasons that I present this particular improved technic. And the reason the hearing is good is that the cochlea is covered with a delicate epidermis. In the other process it is covered with cicatricial tissue from one-sixteenth to one-half inch thick. You can imagine what would result. In a series of thirty cases of this particular procedure the patients are all well. There have been relapses from the accumulation of debris, etc., and in that way pus may form and require care. A patient may require care once in a month, another once in two months and another once in a year. Much depends on the personality of the patient. In passing I will give you something that in my practice has worked very well. After clearing the ear of epidermis and

débris, provided there is no pus, mop the cavity out with oil. I have seen patients treated that way, after six or eight months, without the formation of new epidermis. In regard to facial paralysis I have had now eight cases of facial paralysis prior to operation, one in an acute case and seven in chronic cases. Of those patients six recovered and the patient who did not recover was unconscious forty-eight hours before he was operated on and died. I have had no case of facial paralysis following an acute or radical ear operation, except a case of temporary facial paralysis due to pressure, which disappeared in ten days. The after-treatment is concise and precise. You must dry your cavity and you must do it in a delicate way and not put in the gauze in a reckless manner. You will possibly spend more time in the after-treatment than in the after-treatment of the other class of cases. But your time is well spent, for in a few weeks your patient is well. Dr. Sewall said occasionally your patients will die. But remember what I said: If the labyrinth is intact you can do pretty much as you please and the patients will not die.

THE RATIONAL TREATMENT OF FURUNCLES *

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While the treatment of furuncles seemingly may be summed up in two words—incision and drainage—yet I apprehend that a thorough, complete and permanent cure involves a broad survey of many principles, based on a brief consideration of their cause and pathology.

A furuncle, as described by Da Costa, is "an acute and circumscribed inflammation of the deep layer of the true skin and the subcutaneous tissue following bacterial infection of a hair-follicle or a sebaceous gland." The exciting cause is usually *Staphylococcus aureus*. Burrowing down into the hair-follicle and invading the adjacent sebaceous gland, the bacteria excite the surrounding subcutaneous tissue to inflammatory defensive reaction. The blood-vessels dilate and become engorged, resulting in active hyperemia. Leukocytes transmigrate and serum exudes into the zone of defense resulting in a little tumor which is hard, painful and tender. In the center of this little tumor, corresponding to the position of the hair-follicle, is a pinhead-sized vesicle containing clear or slightly turbid serum and projecting hair-shaft. The little tumor grows for three days until it becomes a relatively formidable looking object, harder, more painful and more tender. Regional lymph-nodes become acutely hypertrophied and equally hard, painful and tender. This unwelcome state of affairs causes the patient no little discomfort and a varying degree of septicemia brings on fever and malaise. On the fourth day, strangled by the great pressure of the acute tissue hyperplasia, the hair-follicle and sebaceous gland begin to ulcerate, and liquefaction necrosis sets in. The skin immediately around the hair is slowly dissolved. Liquefaction now proceeds more rapidly and the tumor, from being hard, becomes softened in its center, and fluctuation is palpated. The furuncle, while less hard, is still painful and tender. Left to itself the softened center projects more and more and on about the seventh day bursts, and seropus escapes, affording the patient some relief. Shortly a white slough composed of the destroyed hair-follicle and sebaceous gland and bacteria is loosened and expelled from the central cavity of the furuncle. It

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is followed by the escape of serum which soon becomes tinged with blood. There is now seen a little red pit exuding serum and blood and surrounded by granulations. The lymphadenitis subsides and the patient is comfortable. Granulations soon fill the pit and regeneration of epithelium completes the resolution of the furuncle.

Predisposing causes are diabetes and other constitutional maladies, but more commonly violation of simple rules of hygiene. The established routine of "boils—look for sugar" is rarely fruitful. It will usually be found, however, that the patient is a little underweight, perhaps from overwork and insufficient or excessive or poorly selected food, and that he has become a little careless in the care of the surface of the body. He may be an athlete who thoughtlessly dons a suit soiled and sweaty from previous exercise, or a person who for sake of economy is equally careless about change of underclothing. He may wear frayed linen collars, whose edges grind bacteria-laden dust into the nape of the neck.

Prophylactic treatment, then, requires attention to nutrition and to hygiene of skin. Proper nutrition is maintained by sufficient plain, wholesome food taken at stated intervals and well masticated, and by daily evacuation of bowels to prevent absorption of intestinal toxins. A tonic of iron, quinin and strychnin, and free draughts of water, often from a quassia cup, are desirable. Hygiene of entire skin requires antiseptic baths and fresh undergarments, preferably of linen mesh, daily. Local hygiene of nape of neck is important, and requires cropping of hair every fortnight, daily shampoo, and bathing with witch hazel or cologne water, and the wearing of clean, smooth and preferably soft collars. Scissors should be used on the nape of the neck instead of clippers.

The treatment of furuncles is divided into that of the furuncle itself and that of the low opsonic index of the blood. The immediate treatment of the furuncle itself varies according to whether it is in the stage of formation, the stage of ulceration and liquefaction necrosis, or the stage of resolution. When seen early in the stage of formation, the furuncle, if superficial, may often be decisively aborted in the following manner: Take a wooden applicator or matchstick and whittle to a fine point. Dip in liquefied phenol (carbolic acid). Shake off excess. Bore the point of this phenol-stick firmly and deeply into the vesicle in the center of the furuncle. Withdraw. In the wake of the stick there is seen a pit surrounded by a white eschar, aseptic because the active bacteria have been destroyed. A trace of blood may well up into the pit. The initial pain is quickly relieved by the anesthetic action of the liquefied phenol. If the furuncle is still in the early stage, but rather deep, a method recommended to me in a personal communication from Dr. George H. Simmons—that of injecting by the hypodermic syringe several drops of liquefied phenol right at the base of the furuncle—is effective. There is momentarily a sharp, excruciating pain, but after that, analgesia is established, and the patient freed from his previous tension-pain.

When seen late in the first stage it is common practice to make an incision. I believe this is wrong, for a furuncle, whether incised or not, completes its seven-day course as surely as night follows day. The furuncle still remains painful and hard. The incision in this case is futile because not in accord with the pathology of the lesion. A furuncle is a self-limiting process, always. The serum and leukocytes assemble to wage war against the bacteria. They seek to strangle and cast out the

infected hair-follicle and sebaceous gland. This they eventually and invariably accomplish, on the principle of the sacrifice of one for the good of many. The knife, on the other hand, divides the infected hair-follicle and sebaceous gland and invades the demesne of those allies of health and foes of disease—serum and leukocytes. It shortens the process in no way, benefits the patient in no way, and leaves an entirely unnecessary scar. If healing takes place rapidly after incision, it is because the furuncle was well advanced, for in such case the slough will be found to be loose.

Given a furuncle late in the first stage, what is the most rational method of treatment? It would seem to be to establish an outlet, not for the beneficent serum and leukocytes, but for the products of liquefaction necrosis which are formed by Nature according to her best judgment, *secundum artem*. With the scalpel scratch off the little central vesicle. This causes no pain. A drop of discarded seropus follows and the ulcerating hair-follicle and sebaceous gland are exposed. Apply a Bier cup¹ and suck out as much as possible of the exhausted serum and blood. In the wake of the latter from nearby tissues comes fresh blood, with fresh serum and fresh, vigorous leukocytes. It is these that are going to cure the furuncle, and not the surgeon's knife. The knife inflicts unnecessary trauma, and gives the tissues two lesions to deal with instead of one. Often the vesicle does not even have to be scratched, in which case the cuticle is thin enough to be readily ruptured by the cup alone. Apply a dressing of plain sterile gauze wrung short of saturation from a solution of normal saline with sodium citrate. An important consideration in this method of treatment is that of drainage. If a gauze drain is inserted, it plays the rôle of a cork in a bottle. If left alone and allowed to dry, the lymph coagulates, thus plugging the furuncle. In keeping with modern pathologic conceptions what is desired is free bathing of the bacteria with fresh serum from the blood, with its highly antitrophic power. Sodium citrate, 1 per cent. solution, precipitates the calcium salts in the lymph and ensures a comparatively free outlet of the lymph discharge. By osmosis, the sodium chlorid sets up a flow of lymph through the walls of the furuncle, the citrate maintaining the fluidity of the serum. Thus, there is brought about a continuous flow of lymph of high antitrophic power from the congested blood-vessels through the wall of the furuncle and out through the wound. A bit of rubber dam may in addition be inserted if there is much tension on the outlet. The citrate is required for only about three days, and during its use the surrounding skin should be protected from pustulation by an ointment. The patient may make up his own solution for home use by adding a teaspoonful of sodium citrate and two and one-half teaspoonfuls of table salt to a glass of hot boiled water. Over this aseptic drain-poultice apply a piece of waxed paper or oiled silk, then a compress of non-absorbent cotton or wool and a cotton bandage. If the patient is going to lay up, leave the dressing open, instructing him to renew the drain-poultice frequently. The solution prevents the vesicle crusting over and the gauze absorbs the products of disintegration as Nature dispenses them. Sodium citrate should also be administered internally, 15 gr. three times daily after meals, both for its alkaline action on the blood, and for its diuretic action on the kidneys. The cupping and dressing may be repeated and renewed frequently

1. While Sir Almoth Wright objects to the Bier cup on the same grounds that I object to squeezing, yet practically harmful traumatic effects are not apparent, and in any case are far overbalanced by the benefit that ensues.

(every four hours) until the slough is loose, when this may readily be removed by a pair of small dressing forceps. After this, no matter how the resolving furuncle is treated, resolution proceeds rapidly and uninterruptedly, and the resulting scar is always the smallest obtainable in proportion to the size of the furuncle. In most cases it is invisible.

In some cases the granulations, instead of being firm, red and rapidly growing, are flabby, bluish and sluggish. The trouble here I believe is due to relaxation of the tissues and mobility of the part. These conditions may be overcome by strapping the edges of the wound with adhesive strips which compress the granulations and immobilize the skin. Then the granulations are dried, mopped with tincture of iodine, and dusted with Bier's powdered nitrate of silver. Exuberant granulations should be snipped off with scissors; for, as Colles long ago pointed out in his lectures, the silver stick does not "burn down" granulations, as it is commonly supposed, but stimulates them. To promote epithelial regeneration—which, in this method, has a very limited area to cover—8 per cent. scarlet red ointment or amido-azotoluol may be employed.

I object to flaxseed poultices on the ground that, while they may soothe the patient, yet they devitalize the edge of the furuncle, prolong the period of resolution, and leave a legacy of an unsightly depressed scar. I object strongly to the bichlorid of mercury on the ground that it is a corrosive poison, that it devitalizes the vigorous leukocytes and disintegrates the beneficent serum; that it destroys feeble bacteria on the skin but does not reach the more active bacteria in the depths of the wound, and that on tender skin it causes pustules to spring up anew. I am unalterably opposed to incision for the reasons given above. If incise you will, then excise the furuncle entirely; otherwise withhold the knife.

How is auto-inoculation of adjacent hair-follicles to be prevented? By shaving the area of skin wide of the furuncle and disinfecting it with 70 per cent. alcohol, tincture of iodine with benzin, a dilution of liquor formaldehydi or of aluminum acetate. Local disinfection should be repeated at each dressing, benzin being an excellent medium thoroughly to cleanse the skin of wound discharges, effete products, and remnants of adhesive plaster.

Of course, if a patient presents himself for the first time with a furuncle well advanced in the second stage, where there is marked softening and fluctuation, in fact, merely a subcuticular abscess, a small incision through the thinned skin is indicated on the surgical principle of *ubi pus ibi evacuo*. This principle is in no way applicable to a furuncle in the first stage, because there is no pus to be evacuated. I strongly object to squeezing a furuncle in any stage. Squeezing is unsurgical in that it causes acute suffering quite needlessly, traumatizes the furuncle, breaking the barrier of protecting leukocytes, and provokes hemorrhage which interferes with drainage. Make the drain, aided by the Bier cup, remove the pus. It is less painful and at least equally efficient. To hasten the subsidence of the enlarged lymph-nodes and of the acute hyperplasia about the furuncle, thiosinamin may be given by mouth in $1\frac{1}{2}$ gr. doses three times daily after meals.

Immunization against furuncles, when carefully and judiciously supervised, plays an important and efficient rôle. It is either passive or active. Passive immunization is indicated in the active stage of furunculosis, when a furuncle is present on the body, and consists in injecting antistaphylococcic serum, rich in antitoxins,

near the infected area, twice a week. Active immunization is indicated in the passive or resting stage of furunculosis, to prevent subsequent appearance of furuncles. It is also efficient in the presence of a furuncle, the course of which is often considerably shortened. In bacteremia, on the other hand, bacterins are contra-indicated, because here they would add to the toxins with which the body is already surcharged. Bacterin therapy consists in injecting subcutaneously killed staphylococci—which act by virtue of their bacterins (bacterial toxins)—in ascending doses, the body cells thus producing more and more antitoxins until the opsonic index is restored to normal. With this accomplished, the patient is not only immune to staphylococcic invasion, but his serum, now rich in antitoxins, could be used passively to immunize another patient with active furunculosis, but the potency of such serum is difficult to determine.

Most efficient are the autogenous bacterins. These are prepared by identifying and isolating the organism from a furuncle, scraping loopfuls from an agar slant, suspending in saline solution and killing by heat. At the University Hospital we suspend approximately 400 million killed bacteria in 1 c.c. of saline. Starting with an initial dose of 0.25 c.c., we increase by weekly injections to 2.5 c.c., the size of the increasing doses depending on the degree of reaction as shown by headache, malaise and possibly fever. While control by clinical symptoms is usually sufficient, yet to perpetuate the cure the patient's opsonic index should be taken at weekly intervals, to anticipate a change from a positive to a negative stage. The waning of the attacks of furunculosis is often indicated by the appearance of abortive furuncles.

The next best treatment of recurrent furunculosis is by yeast (*Saccharomyces albicans*), which stimulates phagocytosis and liberates carbonic acid, thus recalling John Hunter's recommendation of carbonate of sodium for boils. While brewer's yeast (*Oberhefe*) is inelegant pharmaceutically, is a nauseating substance and is hard to keep and to handle, yet it has strong advocates. I have seen furunculosis checked by the use of nuclein in the assimilable form of compressed tablets.

This method of treatment, then, commends itself because it is gentle, simple, painless, rational and effectual. Where, as sometimes happens, the furuncle is exceptionally large and severe—the carbuncular furuncle of some writers—I employ a little operation which seems to meet the indications very well. I fill a hypodermic syringe with a 3 per cent. solution of novocain, enter the needle through the sound tissue at the margin of the furuncle and plunge it under the base of the tumor. After waiting five minutes until the furuncle is completely anesthetized, I take a small curet and remove the core from the center of the tumor. This method is also applicable to furuncles on the face where, because of the wide-spread infiltration from the laxity of the tissues, there is danger of sinus thrombosis by way of the facial and ophthalmic veins. In case the supposed furuncle develops into a full-fledged carbuncle—and it is often impossible to say whether we will have to deal with a furuncle or a carbuncle except with the lapse of time—the safest and surest treatment is excision of the entire carbuncular area, hemorrhage being controlled by the Paquelin cautery and firm compresses, and pure liquefied phenol being applied. Thus will the progress of septicemia and of its effect, cloudy swelling—particularly of the kidneys—be checked, and often the life of the patient saved.

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