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Present-day concepts in the therapy of furunculosis

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SENIOR THESIS

1932

Paul N. Morrow

PRESENT-DAY CONCEPTS
IN THE
THERAPY OF FURUNCULOSIS

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PRESENT-DAY CONCEPTS
in the
THERAPY of FURUNCULOSIS

Much to the discredit of a noble profession in the eyes of a censorious public, there are several maladies, minor in degree but irritating in kind, upon which the last word in treatment has not been said. Furunculosis is one of these for which I desire your consideration in a survey of the present-day concepts of therapy. (13) Boils date in history from the time of Job and Hezekiah, but it is only in the past century that their true pathogeny has been understood and more specific principles of treatment practiced from this understanding. From the time of Job they have been more or less universal, and have long challenged the attention of all physicians and laity. Among the latter, all sorts of treatments and hopeful remedies have been suggested, many of them more disgusting than effective. For example (52) it is interesting that a more thorough acquaintance with the Staphylococcus established the layman's early conviction that there was within the body and in the blood a skin-erupting invader. One need not refer more than casually to the various spring tonics, including bromide and iodide salts, well qualified in themselves to produce skin eruptions and thus to convince even the most doubting subject, that he was full of "inward corruption." With the certainty established in the minds of many that these external abscesses were only the effort of

Nature to cast off this "inward corruption", it was not unnatural that a plan to "purify the blood" in some manner or other should have been the incentive and the therapeutic test.

As to a brief description of the condition with which we are dealing, (21) Heatzler and Chesky have well expressed it as thus. What appears as a small pimple with an undue amount of pain and area of swelling, continues until the typical "volcano of woe" is fully formed, which in unnamed multitudes was judged by Jehovah as best calculated to try the soul of man. There is just one man in history whom a crop of these did not incite to profanity. Let the practitioner when confronted by this disease, therefore, be duly impressed by its dignity. At the end of three to four days the pimple has objectively attained a diameter of two or three centimeters, but subjectively it is as though Vesuvius gone mad has been attached to the sufferer's body. Usually at the end of five to eight days there is an eruption of pus, which drains continuously, finally extruding a core of necrotic tissue which has separated from the living. With this occurrence the typical cone melts away leaving a small scar in memory of its eventful eruption. (13) While the process may begin and end in a single boil on an individual, in the great majority of cases, there is a succession of one or more boils which keep up what is called the process of furunculosis for an indefinite period of time.

To the physician, confronted not only with his patient desirous of immediate relief, but with his own knowledge as well of the necessity of preventing undesirable sequelae, the treat-

ment of boils is therefore of great and very practical importance. It is because of this fact that I have chosen to present the following paper, and hope that it may tend to correct some of our inferior methods of therapy in this condition, and also stimulate us for further knowledge on this unsettled question.

A survey of the recent literature which deals with the treatment of furuncles discloses a multiplicity of methods of treatment which reflects dissatisfaction with the usual methods and an active search for better ways. An appraisal of any system of treatment is difficult, especially when several therapeutic measures are usually used simultaneously, with considerable dissimilarities existing in the furuncles themselves. In view of this fact I have not attempted to evaluate the following, but merely to present the present-day concepts in the therapy of furunculosis.

II Prophylaxis

The prevention of furunculosis demands first of all good local hygiene of the skin. (30) Unclean skin or skin that has been irritated or traumatized is a fertile field for the development of boils. (36) Osborne and Fishbien say that the greatest preventative is constant cleanliness of the neck, axillae, gluteal, perineal and genital regions, which parts are most frequently affected by boils. More specifically (10) where pus has come in contact with the skin, as in the neighborhood of a discharging furuncle, the skin must be scrupulously cleansed. (30) Levin says that this should be done several times a day with water and neutral soap, the bordering areas being washed or dabbed with a boric acid solution or a dilute solution of alcohol. Before redressing, all dirt and old salves should be removed. If the skin shows inflammation, or evidence of inflammation, a soothing, drying lotion as powders plus ichthyol, phenol and glycerin should be applied. All epithelial defects or abrasions must be avoided. (30) Sources of irritation as tight rough clothing, stiff collars, dull razors and dirty occupations should be changed. (10) All abrasions and small wounds should be treated with antiseptics. Caution must be observed in the use of adhesive to fasten dressings to discharging wounds since furuncles may develop beneath it. (36) Care should be taken in not causing spread by direct traumatism by scratching with contaminated fingers. (51) Christopher believes that dietary precautions as well appear later, particularly those which may cause a lowering of the blood sugar, may be of value. Treatment with the Roentgen ray and with autogenous and polyvalent vaccines may be included under the head of prophylactic treatment

but will be given more detailed consideration later.

(36) Foci of infection in the nose, nasal sinuses tonsils, teeth and gums should be removed and all constitutional conditions cleared up.

Prophylactic measures in recently cured cases of furunculosis according to (30) Levin should include daily shower baths and complete change of underclothing and night-wear. Boiled towels and bed clothing. Fine linens and lingerie should be soaked in an antiseptic solution then washed in soap and water. He believes that strong antiseptics and irritating therapeutic lamps, which cause breaks in the epithelium, should be avoided.

III Local Treatment

(55) There are three therapeutic measures to which the ordinary practitioner clings with inexplicable obstinacy, in spite of the fact that experience and text books unite in condemning them, and have been so united for more than twenty years. One is the knife, another the poultice and third squeezing them.

(a) Mechanical.

Opinion is divided as to the wisdom of incising furuncles. (29) Lee and Downs believe that there are two indications in the treatment of all pyogenic infections--the relief of tension and the removal of dead tissue. The situation of the lesion is, of course, of importance. (32) Livingston advises immediate excision of the necrotic tissue, while (36) Hertzler and Chesky believe that once the interior has liquified, there is no objection to incision, and they suggest freezing the summit of the boil or anesthetizing the circumscribed area with a local anesthetic.

Objections to the incision of a furuncle include (11) the associated pain, the possibility of opening new channels of infection, the slow healing, the occasional use of a general anesthetic, and the disfiguring scar. (24) Junkermann regards surgery in furuncles as criminal except in cases with fluctuation. (30) Levin in his plea against incision gives this warning. Never traumatize boils. Traumatism causes pain, spreads infection, prolongs the life of the boil, and results in larger and more disfiguring scars. Do not reverse Nature's methods. (55) Williams says that to incise a boil at any stage of its

career is to lengthen its existence. That simple truth is in all the books, and on the tongue of every out-patient, physician, and surgeon in every teaching hospital. Nevertheless incision is the accepted treatment of every boil in every country town.

In furuncles of the upper lip the evidence is unfavorable to incision. (22) As is well known, the chief danger of furuncles on the face is cavernous sinus thrombosis and infection by way of the facial vein. Traumatism is believed to increase the risk of thrombophlebitis with the meningeal sequelae.

(10) Christopher quotes Kretzler and then Schule as advocating central cauterization of furuncles with a glowing hot needle, the ignipuncture. They describe this method as painful but astonishingly valuable. After cleansing the skin a glowing hot knitting needle is inserted from six to ten millimeters into the crater of the furuncle. This is believed to destroy the first foci of infection. He also quotes Dittrich who uses a toothpick dipped in phenol introducing it in the direction of the hairs into the white center of the boil. This method is entitled to favorable consideration, as its repeated use has accomplished very satisfactory results in the hands of many men. Some recommend the use of a sewing needle dipped eye-end into phenol and then inserted into the furuncle. (30) Levin condemns the practice of treating boils by the application and insertion of carbolic acid on a toothpick or applicator. He claims it produces excruciating pain, causes trauma, slows liquefaction with a resulting elevated, keloidal and disfiguring scar.

Long ago (15) Freeman advised the extraction of the

central hair or opening of the superficial pustule and the introduction of 95% carbolic acid. (39) Perret applies repeatedly one drop of phenol under slight pressure until it corrodes its way into the accumulation of pus.

Placing the site of the furuncle at rest is believed to be of first importance. Putting the patient to bed is often a wise procedure. (10) In cases of lip furuncles many men advise feeding the patient through a tube, prohibiting speech and mastication in order to keep the affected parts at rest and face from trauma. (55) The ugliest crime perpetrated on boils is the squeezing of them. Squeezing is painful in a very high degree, and harmful in a degree even higher. The tissues injured by the squeezing and crushing are reduced to complete impotence so far as resistance is concerned, so that the staphylococci are able to effect an unchallenged sortie from the boil and proceed to occupy the surrounding country, disseminating the painful inflammatory mischief with damnable profusion. And the stupidity of it all, the uselessness, the lack of imagination! Save in the very last stage when the pus is eager to escape, there is nothing in a boil which can be expelled by squeezing, there is certainly no pus there.

(b) Chemical.

Another therapeutic measure much beloved of many a practitioner is the poultice. (55) The warmth of a poultice is certainly greatful and comforting, but the damp and messy mass softens the surrounding parts and impairs their defensive cap-

acity, with the result that a crop of little acne-like pustules is liable to emerge, like satellites round the major constellation.

Innumerable salves have been devised as applications to furuncles. (11) These cataplasma or poultices, have been designed to relieve pain, to exert a bacteriocidal effect, to soften the skin and to accelerate the opening of the furuncle and the discharge of the central slough or "core". Gray salve (unguentum cinereum) a thirty-three per cent. mercury ointment has long been employed. It is best applied in a thick layer on gauze, spread from four to five centimeters beyond the infected zone and supplemented by hot alum-acetate compresses. A most useful proprietary remedy consists essentially of one percent. phenol, nine to ten percent. fluid extract of ergot, and five percent. zinc oxide plus a vehicle. (24) Junkermann applies mercurial ointment in a thick layer on a piece of linen, or if stomatitis or nephritis set in, a forty percent. sulphonated bitumen N.F. in hydraus wool fat. Flaxseed poultices are useful as softening agents, but are not aseptic.

A most interesting method of treatment is the application of salves containing the digestive ferments of the intestine. (10) The purpose of these ointments is to macerate and digest the skin in the center of the furuncle and thereby facilitate the discharge of the inner slough or pus.

(51) Toomey in his recent work states that the utility of local antiseptics has in the past been over-valued. In his opinion mild antiseptics are best, as resorcin two per-

cent. in half-saturated boric acid solution; a one percent. solution of picric acid, a two percent. solution of mercurochrome, or a one-half percent. phenol lotion are also generally acceptable.

(48) Stellwagen believes that frequent soap and water washings and the application of an antiseptic lotion to the boil and the entire affected region, night and morning, are measures of considerable value. Tincture of green soap is to be used in washing. He suggests the following for an antiseptic lotion.

Resorcini	gr. xv - xxx
Acidi Borici	dr. i ss
Alcoholis	oz. i
Aquae Dist.	oz. v

While the part is still wet with this lotion, a thick layer of boric acid powder should be applied and covered with a dressing. In the larger and maturing lesions, ichthyol salve or ten to fifteen percent. salicylic acid ointment is often valuable.

(36) Osborne and Fishbein recommend that if the boil is seen early when only a slight nodule, abortive treatment is advisable, particularly that mentioned before, of puncturing the white point on the skin with a toothpick dipped in liquid phenol. Or with a hypodermic needle, a drop or two of phenol being injected directly into the center of the hardened part. The surrounding tissue should be kept clean with liquid soap and water and wet dressings applied, best with boric acid solution, the gauze being kept constantly moist and warm. (21) Hertzler and Chesky also agree that hot wet dressings of a saturated solution of boracic acid are good, and in the interval between such com-

presses, the use of an ointment of salicylic acid of from fifteen to thirty grains to an ounce of vaseline, is beneficial. The acid macerates the skin, making earlier rupture easier, is in itself an anesthetic, and by its antiseptic properties tends to prevent the formation of new lesions.

(8) Canon saw no complications in his one-hundred twenty-nine cases of furuncles, including twenty-one on the face, treated only by rest in bed and dressings moistened with a solution of aluminum subacetate. (45) Shalek says that in the early indurated stage cold compresses moistened with a saturated solution of boric acid, or bichloride of mercury one to five-thousand or lysol one percent. are useful to allay the inflammation and to hasten the softening. He claims that hot applications are liable to cause spread of the infection.

When the infection is wide spread (30) Levin advises the patient to wash frequently, to take two showers daily, and to follow such baths with an application of a two percent. boric acid solution around the boils. Then the individual lesion is to be covered with bichloride phenol ointment.

(2) Babcock believes in abortive treatment before suppuration has started, by the injection of one to three minims of liquified phenol into the center of the furuncle, followed by the application of unguentum hydrargyri oxidum flavum. He believes that the local application of compound resin cerate facilitates liquefaction and softening. With the expulsion or removal of the separated core, healing usually rapidly follows under a dressing of ten percent. balsam of Peru in resin cerate.

When the boil is in a more advanced stage a strong ointment is advised by (30) Levin. He suggests the following:

Phenolis	min. xx
Bichloride of Hg.	gr. i
Diachylon Oint.	oz. i

in addition the constant application of wet dressings. If the boil has softened, liquified and fluctuates and still has not ruptured the skin, an excellent procedure consists in the application to the summit of the lesion of a twenty percent. salicylic acid plaster. The object of this is to melt away the restraining epidermis. The plaster should be worn all day, removed in the evening by softening the adhesive with benzine, and cleaning the skin with alcohol and benzine before a new piece is applied. When pus discharges, wet dressings are to be applied. If the boil does not yield to this treatment, apply the bichloride of mercury-phenol ointment over night. Five percent. salicylic acid added to this ointment hastens lysis of the epidermis.

(30) Levin directs his attention especially to boils which form on the upper lip. Because of their danger, his advice is to put the patient to bed, have him desist from talking eating and chewing, and forbid pressure of the tongue against the inside of the lip. Immobilization of the muscles of the lip by an application of collodion, is a good measure. He says that liquifaction may be encouraged by application of hot flaxseed poultices every two hours for one-half hour during the day. In the intervals wet dressings may be applied. The poultices should be discontinued when the pus discharges, and replaced with cool wet dressings. As the swelling subsides the application of phenol

ammoniate of mercury ointment around the lesion prevents re-infection. Promote free elimination through the bowels and insist upon drinking large quantities of water. Only liquid food should be taken, sipped slowly through a glass tube or fed by stomach tube. Absolute rest in bed under nursing care is of vital importance.

A method of aborting very early furuncles which is often successful according to (40) Pfahler, consists in painting the small red, indurated, painful area with full strength tincture of iodine. Three or four coats may often be used to advantage, the tincture being allowed to dry between applications. (30) Levin also feels that in the earliest stages of a boil, the development of the lesion may often be aborted by the local application of tincture of iodine to the infected area. The hair if present, should be removed from the follicle with sterile forceps. Again a minute amount of the iodine is applied, the boil is then covered with an ointment consisting of four percent. ammoniate of mercury, and one percent phenol. This application being both antiseptic and anesthetic in action may be used for twenty-four to forty-eight hours, when the lesion is usually under control. When there is more congestion with greater tension and more pain, this application is used when out-of-doors and at bedtime. Otherwise dressings saturated with ten percent. Burrow's Solution, or a dilute Alibour's Solution are employed. Under no conditions are dressings to be covered with impervious materials as gutta percha or rubber tissue. The value of wet dressings is that being fluid, they evaporate, remove heat and fluid from the skin, and cool and soothe the inflamed tissues.

The use of ichthyol was first advocated by Unna and has many proponents. (26) Kissmeyer recommends it as a specific remedy for furunculosis. His technic is as follows: Each furuncle is first cleaned with alcohol or iodine, and dried and then covered with pure ichthyol. Over the thick oil of the ichthyol, which soon dries, a thin layer of cotton is applied, and the little dressing sticks like collodion. The next day the dressing is removed with tepid water and the treatment is repeated. If suppuration is profuse, the dressings are renewed twice a day. One or two applications induce considerable improvement, and a nonperforated furuncle may disappear in a few days. Large furuncles should not be incised according to Kissmeyer, but treated simultaneously with the galvanocautery and ichthyol. (55) Williams states that he has received many expressions of gratitude for the prompt and complete relief from pain afforded by a combination of glycerin and ichthyol applied as a compress. He says that glycerin and carbolic is also very useful, few people seeming to remember that carbolic acid is a local anesthetic.

(c) Heat.

One of our chief agents in our present treatment of furuncles is heat, particularly in the form of hot fomentations. (10) It is important to give the nurse or attendant explicit directions as to the manner of applying the fomentations. The first requirement is that the dressings be massive so that an area considerably beyond the infected area will be treated. The second requirement is that the dressings be continuously warm and moist. A most convenient procedure consists in applying dressings wrung

out of whatever hot solution is employed, covering the dressings with a rubber sheet or oil cloth, and fastening an electric pad on top of all. By this method a continuous moist heat is produced and the solution may be added at the corner of the dressing as needed. As a substitute for the electric pad, a hot water bag or frequent changes of the hot dressings may be used. Heat is greatly appreciated by the patient as a rule. In the treatment of boils (22) Livingston uses dry heat after the first twenty-four hours.

(d) Irradiation, diathermy, etc.

(33) Mac Kee states that the x-rays are of distinct service in the treatment of recurrent boils in any given area. One suberythema dose will often prevent the development of new lesions. It is frequently necessary in order to effect a cure, to depilate the parts. If this is attempted in one treatment, erythema is likely to result. It is, of course, advisable to use other methods of treatment also, such as vaccines, tonics, local cleanliness, general hygiene, etc. (43) Stellwagen also believes that x-ray is a valuable adjunct, but not dependable alone. (11) Christopher quotes Potter who believes that the x-ray is useful in the treatment of furuncles in a three-fold way: First, in the form of a localized erythema dose, to abort incipient boils; second, in the form of local treatment to hasten the healing and to make well-developed furuncles less painful; third, in the form of a wide exposure, to act as a preventive and prophylactic. (51) Toomey in his recent work states that x-ray radiations are of decided use in helping to

further the cure of a furunculosis, though it would be rash to depend on them alone to effect a cure. They are of most benefit in chronic cases. The dose should be one-half to three-fourths of a skin unit, with perhaps very light filtration when there is deep boggyess. Treatments should be given at weekly intervals for two or three treatments, then less frequently. He states that he cannot recommend quartz light in erythema doses, as it aggravates boils and causes spreading and discomfort. (41) Pusey and (35) Ormsby consider roentgen therapy a very valuable method of treatment in recurrent furunculosis in circumscribed areas; however (30) Levin states that he does not believe that x-ray therapy is of any value, as a cure can be effected long before the x-rays could obtain relief.

Ultra violet light has been tried in furunculosis. The amount of penetrating effect is hard to estimate. (10) It is not unlikely that the generalized ultra violet radiations have a beneficial effect in raising the body's resistance to infection, and possibly in diminishing the likelihood of secondary furunculosis in the surrounding skin area. (56) Wilson believes that generalized ultraviolet radiations are of extreme value in any case, particularly in those that are chronic. Furunculosis is frequently a severe complication and often a terminal infection in young infants. (5) It necessitates serious time-consuming treatment. The ultra violet rays used both locally and generally in these cases is a valuable adjuvant to surgical drainage, and distinctly lessens the number of crops and number of new lesions. Nature's first attempt at cure in

furunculosis is the establishment of hyperemia. Ultra violet rays assist this process. The leukocytes are undoubtedly an active factor in these cases, and (6) Blatt states that the white cells can be increased and made more active by the positive chemotropic action of free calcium ions. Phosphates have the same property, except when combined with negative potassium ions. Ultra violet rays are now well known to stimulate and normalize the metabolism of calcium and phosphorous in the human body and to mobilize calcium in the blood. The use of these rays in treating furunculosis, especially in infants, he claims, rests upon these two sound scientific observations. (30) Levin says that exposure to ultraviolet light is beneficial and retards bacterial growth. However, he warns against long duration of treatment with subsequent dermatitis.

Where a furuncle is on the point of bursting, the obvious remedy is to incise it, but this should be delayed at least until ionization has been carried out. (34) Norrie uses a pack saturated with two percent. sodium salicylate under the ionization pad (positive terminal), with the negative terminal on one of the extremities. The dose is slowly increased up to five milliamperes and held ten to fifteen minutes, then carried on up to from ten to thirty milliamperes for two hours, then slowly reduced. He has used this mostly in the ear, and he states that the relief of pain is almost instantaneous, with the patient falling asleep during the treatment for the first time in three to five days, and drainage coming on in a short time. He states that this may be repeated if necessary, but the relief of pain and tenderness is so marked that repetition

is usually not necessary. (23) Hunter used tin electrodes, two by two, which were held tightly against the ears, and the "heat of toleration" produced for fifteen minutes. Almost instantly the pain was relieved, sleep, unknown for the previous nights, came on shortly, with spontaneous eruption. Treatment was continued at intervals for two months in chronic multiple cases with no recurrence. He concludes:

(a) By means of diathermy - heat produced within the tissues, any temperature can be procured, and retained without the least variation in degree.

(b) Heat is a most potent germicide.

(c) It can promptly relieve pain.

(d) It is a most valuable aid in restoring the physiological neurovascular functions.

(e) A potent agent in the re-establishment of physiological metabolism, constructive and destructive.

(f) Restoration of physiological sleep and appetite aids in acquiring and in maintaining immunity.

(e) Biological.

(10) Laewen began in 1923 the use of injections of the patients own blood. The whole blood was injected at the margins of induration in furuncles after simple crucial incisions. The results were favorable. In contradistinction to Laewen's autogenous blood injections with surgical incisions

(9) Carp made an extremely careful study of injections of autogenous blood without surgical incisions. He used a general anesthetic and a sterile needle for each of the three to six

intracutaneous and subcutaneous circuminjections, with no accessory measures such as incision, local heat, or narcotics. The amount of blood varied from ten to seventy cubic centimeters and averaged thirty-seven. Carp noted that: (1) The infection did not spread except in one case; (2) there was quick relief of the pain and constitutional symptoms; (3) there was no apparent reaction after the injection; (4) most of the slough liquefied; (5) the injected blood seemed to remain in the tissues, undergoing gradual modification for from several days to two weeks. (6) the time for cure was probably shorter than it would have been if a surgical procedure had been used, and (7) the patient showed a minimal scar at the time of discharge from the hospital. (31) Lenhart also has applied the method of injecting the patient's own blood in a circle around the furuncle. He injects from forty-five to eighty cubic centimeters of blood from the ulnar vein. The infections were checked and the patients recovered rapidly. (42) Ravaut and Huguenin believe in the injections of, respectively, five, ten and fifteen cubic centimeters within ten days, followed by three series of similar injections ten days apart.

A variation of the autogenous treatment of Laewen is that of Kuhn. He believes that Laewen's injections influence the area around the furuncle more than the furuncle itself. In order to distribute the blood more evenly Kuhn uses a vacuum cup with suction strong enough to produce hemorrhages in and around the furuncle. Narcosis often is necessary in his method. Beginning with a negative pressure of from one-hundred to two-hundred millimeters of mercury, the suction is increased to from

four hundred to six hundred millimeters of mercury. The suction cup is left on for from one-half to four hours. Some men have had good results in using a vacuum as high as one-half to one atmosphere. Because of pain, the vacuum must not be applied too rapidly. Hemorrhages are caused in and around the furuncles. (20) Hans has warned against the "maltreatment of furuncles with suction apparatus."

In furuncles of the face, (16) Freidmann, has applied Bier's stasis hyperemia - a constricting band around the neck for twenty-two hours daily - in twenty-four cases, and was much gratified with the rapid healing without disfigurement in the eighteen cases free from sepsis, including one with complicating thrombosis of the cavernous sinus. Of the six cases with grave sepsis when first seen, three recovered.

(10) Christopher quotes von Wassermann and Hofmann as using "histoplast", a preparation containing an extract of the live staphylococcus. This is applied locally to the furuncle. The inflamed focus absorbs the staphylococcus antigen, and after a fifteen to thirty minute reaction, there is a diminution of the pain. They feel that it exerts a more favorable influence upon early furuncles. (47) Gauze impregnated with antistaphylococcus vaccine has been applied to furuncles by Stagano and Hermaeche with excellent results. The processes are aborted in a few hours, or suppuration hastened and the cure of the furunculosis soon completed. They used cultures of Staphylococcus Aureus made from furuncle pus and killed with iodine or heat fifty-five degrees centigrade, with a concentration of about ten thousand million per cubic centimeter.

(4) Besredka, of Pasteur Institute, believes that one need not depend upon the production of antibodies in obtaining immunity. The immunization of the "receptive tissues" is more important than to attempt to increase the quantity of antibodies in the blood. He has shown that dressings soaked in a treated culture of staphylococcus and applied to the skin act as a vaccine. He used an eight-to-ten-day broth culture of staphylococcus, filtered it and obtained a clear broth-like liquid. "When applied by wet dressings to the infected tissues it produces an influx of leukocytes, leads to the disappearance of the pathogenic agent, and facilitates the elimination of those cellular elements which retard cicatrization. By vaccinating the neighboring healthy cells these filtered cultures succeed in surrounding the focus and so extinguish the inflammatory process." "This specific dressing, with filtered cultures, acts at the same time on the cells. It stops the multiplication of the former and activates the defensive properties of the latter."

Bacteriophage, used as a local dressing is gaining interest and comment throughout the country in medical literature. Discussion of this new and interesting phase in the therapy of furunculosis will be found under Systemic Treatment.

IV. Systemic Treatment

(a) Biological.

Vaccines have long been employed in the treatment of furunculosis. (11) They are of the autogenous and stock polyvalent varieties. (28) The use of autogenous vaccines has been a last resort in many stubborn cases. Again, while there are some who praise this particular method of treatment, physicians are frequently enough disappointed in the results obtained. (10) The autogenous vaccines are prepared from cultures made from the patient's furuncle and are useful in about fifty percent of the cases to prevent the development of other boils. (28) A rather prolonged series of injections are required, attended with unpleasant, and at times, dangerous reactions. (30) Practically all writers recommend the subcutaneous injection of vaccines, some using autogenous while others administer stock. (30) Levin has found one as good as another. As vaccines appear to have a good effect in preventing recurrences, they are best employed between attacks when patients apply for preventative treatment. It is difficult to state whether they exert much effect on lesions when local treatment is being applied. It may be said, however, that they do not produce any ill effects when not given in excessive doses. (19) Gruca reports excellent results in furunculosis from the use of vaccines containing staphylococcus, streptococcus, and pyocyaneus, injected intramuscularly. After twenty-four hours, in every case without exception there was a distinct retrogression of objective inflammatory symptoms. (55) That boils are due to a lessened resistance to staphylococcus is

now universally admitted, and it may safely be said that the most efficacious treatment of these unpleasant visitants when they do arrive is by a vaccine - autogenous or stock,- which supplies the necessary whip to the slumbering keepers of the house.

(54) Wrights vaccine therapy, that is, active anti-bacterial immunization by injection of killed staphylococci, is still extensively employed. It is not easy, however, to determine the effectiveness of treatment in a disease the course of which is so variable. (51) Toomey states that staphylococcus vaccine is unquestionably useful. It should be given in increasing doses at five day intervals, starting with one-half mil. and increasing by quarter-mil. increments until a slight reaction is produced. He says an autogenous vaccine may be preferable in acute cases. The vaccine, staphylococcic (mixed) with one hundred million bacteria to the mil. is the standard vaccine for boils. (48) Stællwagen believes that staphylococcic injections should be reserved for rebellious cases. (45) Schælek believes that vaccine therapy is very valuable in this condition. Either stock or autogenous preparations given at intervals of four days, beginning with an initial dose of two-hundred-fifty million and gradually increasing it to one billion. The statement of (36) Osborne and Fishbein seems representative of current opinion. Stock vaccines and more frequently autogenous vaccines have occasionally been found valuable. On the other hand, sometimes, vaccines fail utterly to prevent the recurrence of boils.

In 1924, (37) Parker described an exotoxin produced

by Staphylococcus Aureus, and later with (38) Banzaf prepared a more effective antitoxin in a horse. Neutralization of the toxin by anti-toxin occurred in multiple proportions, indicating its similarity to the exotoxins. The toxin is produced by growing suitable strains of staphylococci in broth about 5 days and passing the culture through a Berkefeld filter, producing a filtrate containing the ingredients of the culture mediums, and derivatives of the staphylococci. This is diluted with physiological saline solution to different strengths. The initial dose, used by (54) Weise, was five-tenths of a cubic centimeter of the one to twenty dilution, increasing in strength and amount in weekly injections and giving if possible at least ten injections. He reports on twenty-four cases, nineteen of which ceased to have furuncles and remained free for at least three months. In 1928 (13) Greenbaum and Harkins reported inconclusive results from the use of staphylococcus filtrates, but their filtrates were quite impotent.

The discovery by F. d'Herelle of the phenomenon of bacteriophagia in 1916, has been followed by extensive laboratory and clinical experimentation, until at the present time considerable comment has arisen in favor of its use in the treatment of furunculosis. (1) Bacteriophagia may be defined as the dissolution of bacterial cells brought about by a filter passing principle which multiplies at the expense of the attacked bacteria and is therefore capable of exerting its lytic action through an indefinite number of serial passages.

(28) When the possibilities of bacteriophage in the

realm of therapeutics were first visualized the "modus operandi" was assumed to be lysis of the infecting organisms. Since the bacteriophage could literally dissolve bacteria in the test tube and since its introduction into animal tissues was followed by no untoward symptoms, it was rightly concluded that certain types of infectious diseases might be benefited by its use. The proof that bacteriophagy essentially similar to that occurring in the test tube could go on in the body served to strengthen the theoretical basis for bacteriophage therapy.

The exact nature of bacteriophagia is not definitely settled, however observation shows that (23) bacteriophage renders innocuous a living virulent culture of bacteria. We do not know whether the bacteria are killed or whether they merely become invisible, filterable forms. The evidence favors the first assumption. Whatever happens, it is practically certain that proteolysis does not occur and it is well known that such dissolved cultures are antigenic. They produce antibodies in the same way, or at least in the same sense as do vaccines. The lysed cultures have the further property of greatly increasing the ability of white blood cells to ingest bacteria.

Bacteriophage is prepared (1) by suspending approximately two-hundred fifty million young bacteria in alkaline pH. 7.6) broth and adding a drop of lytic principle known to possess activity for the particular organism. Lysis is usually complete within twelve to twenty-four hours when the lysate is passed through a Chamberland L 3 candle (to insure sterility).

Highly virulent polyvalent phages have been found for staphylococcus, and may be effectively applied as therapeutic agents, for they have been shown to lyse practically all strains of staphylococci.

(17) Gratia first demonstrated a staphylococcus bacteriophage in 1921, and in 1922 he produced a poly virulent staphylococcus phage that was effective against all strains, albus, aureus, and citreus. He treated fifty cases with different staphylococcus infections and observed that the course was favorably influenced, with no recurrence in three months.

(3) Bozy tried this form of therapy in all types of localized pyogenic infections according to (1) Alderson. In some cases he injected the suspension directly into the lesions by a series of punctures encircling the sites of inflammation. In others, he injected it into some part of the body away from the lesions. He reported excellent results by both methods. To quote Bazy - "In all cases where the pathological condition involved only purely reactional phenomena, a rapid regression of the lesions and the 'restitutio ad integrum' was witnessed."

(43) Rice and Harvey reported a series of fifty cases in which autogenous bacteriophage preparations had been found highly effective against Staphylococcus aureus and albus. They felt that polyvirulent stock phages were also effective.

(28) Larkum of the Michigan State Department of Health recently reported favorable results from treatment with bacteriophage in sixty-six cases of furunculosis. In all but one of his cases the condition responded well to the treatment. He used a poly-

virulent strain of staphylo-bacteriophage which was found to produce lysis of one hundred-ten of one hundred-fifty strains of staphylococcus.

A brief review of the therapeutic results in various infections has been presented by (46) E. W. Shultz, professor of bacteriology at Stanford University. He states that bacteriophage, on account of its practical results, marks the most important epoch in the history of bacteriology. (25) Kahn states that in a personal communication with Lloyd Arnold of the University of Illinois, College of Medicine, Arnold says that bacteriophage filtrates have been used most widely and with the greatest success in acute staphylococic infections; and surely furunculosis is an acute infection. (1) Alderson reports ten cases, all showing improvement after the second injection. He stresses the typing of the phages used; that is, cultures made from the pus of the lesions should be tested with several races of staphylococcus phage, and the phage found to have the maximum lysing effect on the same is to be used therapeutically. His injections were given subcutaneously and at a place remote from the location of the lesions.

(25) Kahn presented twenty cases, in which stock bacteriophage was used, and he finds that:

(a) The treatment with bacteriophage seems to be a worthwhile contribution to the therapy of pyoderma.

(b) It is effective even in cases in which every other treatment has failed, or in which the patient apparently makes no progress.

(c) The results obtained with this therapy vary with

the patient, the type of infection, the potency of the bacteriophage used, and the thoroughness of its application.

(d) Some boils were aborted. If they were well developed their course was more rapid. The pus coming from them was liquid, and when it was evacuated, it left a clean, smooth crater with healthy granulation tissue. Lesions were promptly healed with little induration and no recurrences.

(e) Pain, as a rule, was promptly relieved, and the lesions showed diminished soreness within a few minutes to an hour after the injection or the local application of the bacteriophage.

The bacteriophage used by Kahn is a stock product manufactured by the Swan Meyers Company of Indianapolis. It is polyvalent and sterilized by the Berkefeld filtration.

The following recommendations are made by d'Herelle for the proper carrying out of bacteriophage treatments.

First one should use a polyvirulent suspension which should be filtered and never heated.

For furunculosis and folliculitis, the dose is one cubic centimeter subcutaneously (preferably under the skin of the abdomen.) The injection should be repeated only once after an interval of not longer than forty-eight hours.

For local abscesses, from one to two cubic centimeters are injected into the immediate vicinity of, and around the lesion. If it is possible to make the injection directly into the lesion, from twenty-five hundredths to five tenths of a cubic centimeter of the preparation should be used.

(25) Kahn states that the majority of his patients received an injection of two cubic centimeters of staphylococcus bacteriophage every third day. To those who showed a severe reaction, one cubic centimeter was given. If there was no reaction or only a slight reaction after the injection of two cubic centimeters, three cubic centimeters were given. He also suggests that the syringe to be used should be sterilized by boiling and cooled before using. Sterilization with alcohol may destroy the phage.

(12) Cipollaro and Sheplar reported sixty-two cases of furunculosis treated by bacteriophage, and all patients who continued the treatments were cured. There were no failures. They find bacteriophage of special value in the treatment for recurrent and multiple furunculosis and in furuncles situated in such locations as in the nose, upper lip, and ear. In these types, this agent in their opinion, cannot be surpassed, and they claim to have reason in believing that bacteriophage confers immunity. They have noted that when bacteriophage therapy is used:-

- (a) The existing furuncles become smaller and finally disappear.
- (b) That the pus liquifies and is easily expressed through a needlepoint opening.
- (c) That the pain subsides.
- (d) The toxemia is lessened.
- (e) The patient is usually well enough to pursue his work.
- (f) Recovery is more prompt than when incision and drain-

age are resorted to.

(g) Hospitalization and an operation with its attending dangers are avoided.

(h) The cosmetic results are better.

(i) And if new lesions form while the patient is undergoing treatment, they are apt to be small and undergo involution quickly.

Cipollaro and Sheplar present the following technic for their therapy:- When a patient presents himself for bacteriophage therapy, a culture is taken from the lesions to be treated. At the same time stock bacteriophage is administered by swabbing the lesions, by injections into the lesions or subcutaneous injections at a distant sight, or by a combination of these methods. The method of giving bacteriophage is determined by the type of lesions to be treated. The bacteria obtained from the lesions are identified in the laboratory, and their susceptibility to the stock bacteriophage ascertained. When the culture is completely lysed and has remained perfectly clear for twenty-four hours, the bacteriophage is considered satisfactory for use. In particular cases the potency of the phage is exalted by serial filtration of lysed cultures of the autogenous bacterial strain. By the time the laboratory reports are ready, the patients have received two treatments. If the laboratory reports are favorable, they continue, but if the infection is due to staphylococci not fully susceptible to the phage, they advise some other form of therapy. For furunculosis they give a series of from three to ten subcutaneous injections of two

cubic centimeters each at daily intervals, coupled with wet dressings of bacteriophage.

All in all, it would appear, that bacteriophage as far as it has been developed, is more uniformly successful than any other therapeutic measure in furunculosis. Astonishing results have been obtained from its use, and many (56) dermatologists throughout the country feel that it is the "coming thing."

A hopeful aspect of furunculosis is the possible relation of the condition to an excess of carbohydrates, (10) The severity of furunculosis in the presence of diabetes is well known, but even when the urine is sugar free, it is possible that a high normal blood-sugar may increase the liability to furunculosis. On the basis of self-experience (40) Pfahler immediately reduces the carbohydrate diet to a minimum on the appearance of a boil. (30) Levin says that in his patients showing a high normal sugar content of the blood, small doses of insulin are injected. When diabetes is shown to be present, a systematized anti-diabetic regime is instituted. (49) Bieber, who investigated the blood-sugar in furunculosis, has used two units of insulin daily for four days, and says that in four days the furuncles disappeared.

(10) The ingestion of beer yeast was thought to exert a favorable influence on furunculosis, but this method of treatment has fallen into disfavor, however cooking or bread-yeast is still used by many in their therapeutic regime.

(7) Bruce has found remarkable success in the intramuscular injection of whole blood. Five cubic centimeters of

blood are withdrawn from a vein at the elbow and immediately injected into the muscles of the buttocks. He claims, from a wide experience in India where furunculosis is common in hot weather, that existing boils dry up within twenty-four hours as a rule and the formation of further boils is prevented.

(b) Pharmaceutical.

The internal remedies which have been alleged to be useful in furunculosis are sulfur, tin, manganese, turpentine, alkalies, strychnine, iron, arsenic, quinine, ichthyol and the syrup of hypophosph^hites.

In 1925 (10) Bier reported the successful treatment of twenty-eight out of thirty-five cases of furunculosis by homeopathic doses of sulphur administered internally. He recommended one tablet containing one-tenth milligram of sulphur iodide three times daily, one-half hour before meals.

(51) Toomey says that sulphur is often of value.

Of considerable interest is the treatment of staphylococcus infections with tin and its compounds. (11) Gregoire and Frasier produced in stannoxyl a compound composed essentially of metallic tin and tin oxide. They state that they used it successfully in fifty cases of furunculosis and believe that it has a specific action upon the staphylococcus. Other clinical reports are not lacking. The dose of stannoxyl is five-tenths to one gram (four to eight tablets) daily.

(30) Levin says that in his experience, tin and its compounds have not proved of any value.

Of all the internal remedies suggested, (51) Toomey feels that manganese is probably the greatest of value. It may be given by mouth in an iron preparation, but seems to have best effect when injected intramuscularly as a one percent. solution of manganese butyrate in doses of one-half to two cubic centimeters. Toomey prefers a similar dose of manganese linal-eate, as it is not so painful. Injections should be given at five to seven day intervals. (30) Touhy has been using hyper-dermic injections of a one percent. solution of manganese butyrate, in doses of one to one and five-tenths cubic centimeters given at four to five day intervals. Seventy to eighty percent of his patients responded very favorably, particularly if the blood sugars were not high and the patients had no other obvious constitutional handicaps. He finds that seldomly more than two injections are needed, and that the patient's comfort is immediately promoted, and for the most part incisions and drainage are not needed. (55) Williams says that the intramuscular injection of colloidal manganese has shown favorable results, also emetine hydrochloride. (30) Levin feels that when colloidal manganese is administered intramuscularly, the inflammatory reaction to the furuncle seemed to be reduced.

When fever is present (30) the intramuscular injection of one-half to one centimeter of a sterile ten percent. solution of the rectified spirits of turpentine will often produce a reduction in temperature, and hasten the resolution when generalized furunculosis tends to chronicity.

Alkalies are given to most patients in an attempt to maintain the normal alkali reserve of the blood. (30) Where nervous instability, vasomotor phenomena, urticaria or pruritis is present, then calcium usually in the colloidal form is indicated.

When the patient exhibits anemia or where a general tonic is necessary as in cases of undernourished individuals who are underweight, (30) Levin believes that iron and arsenic should be prescribed. (51) Babcock believes that full doses of tincture of chloride of iron internally, and sodium cacodylate subcutaneously are very beneficial; also frequent tub baths, containing thirty grams of chloride of lime and sixty grams of carbonate of soda to each one-hundred liters of water to disinfect the skin and prevent dissemination. Oliver advises (10) Christopher that he uses one capsule containing three grains of bisulphate of quinine three times daily for two days, and then two capsules for two days, three capsules for two days, four capsules for two days, and finally five and six capsules each for two days. (51) Toomey says that ichthyol in capsules is often of some value.

(c) Dietetic Measures, Laxatives, Fluids, Rest, etc.

As to general treatment anything that makes for appetite, good digestion, proper movement of the bowels and nutrition, works for a successful fight against furunculosis.

(55)"It would be interesting to know who originated the fantastic heresy that boils are due to 'poverty of blood.'

It is not on the thin, anaemic person that one expects to find a boil, but on the florid, many-creased, bullneck of your gluttonous, bibulous plutocrat, the colour of whose face itself suggests beer and a boil." Because of this fact, it is felt that the diet in case of patients suffering from furunculosis is very important.

The diet generally recommended consists essentially of foods that are bland, low in carbohydrate content and free of all indigestible materials. Water should be imbued freely and frequently according to (30) Levin. Here it is to be noted that water should be taken between meals. None should accompany the food. The physician should insist in his treatment of a patient with boils that proper and regular habits to promote good digestion of food are of prime importance in reaching a cure. (51) Toomey states that the debilitated constitution of many patients affected with boils often indicates clearly the need for removal of foci of infection and a reconstructing regimen, including a generous diet of milk, cream, eggs and fresh meats. Wines and malt liquors may at times be added with advantage. Change of climate of diet, of cooks, and of habits of life are most serviceable in cases of persistent furunculosis. Rest and the copious drinking of alkaline or sulphurated waters at a health resort are useful for hastening a cure. If the soil is gouty or seborrhoeic, muscular exercise will help tremendously according to (55) Williams. Alcoholic drinks must be discontinued, also tobacco smoking. A rich vitamin diet with little meat and sugar aids sub-

stantially.

(30) Levin says that when patients appear sluggish and exhibit multiple, chronic, soft, boggy lesions, then liver is to be prescribed. (50) Sutton presents twenty-seven cases of furunculosis treated by liver therapy, with extremely pleasing results. He states that this causes an increase in hemoglobin, white count, and general resistance of the patient. He has used two preparations, both being found efficient and dependable. One a powdered extract of young pig liver, representative of one of the fractions isolated by the Harvard investigators. Supplied in hermetically sealed vials, each representing six and five-tenths grams of fresh raw liver, soluble in water and administered in water, orange juice, or better in bouillon, with the noon diet and repeated with the supper diet. The total quantity of the extract injected varied from twenty-four to seventy-two doses, an amount of the preparation equaling one-fourth pound of liver being taken twice daily for twelve days. This was followed by a rest period of one or two weeks and then, if necessary the procedure was repeated.

If constipation is found, vigorous treatment is indicated. (30) Levin states that all his patients receive an initial dose of calomel and bicarbonate of soda followed by a saline purgative. Subsequently the various forms of vegetable cathartics, mineral oil, colonic irrigations and enemas are employed as indicated. For those patients who show putrefactive intestinal contents, cultures of acidophilus bacilli and colonic irrigations are indicated. (51) Toomey feels that yeast may be used

to advantage in changing the bacterial content of the intestines, and in toning up the musculature. He states that the so-called concentrated yeast vitamin, marketed in tablet form does not offer any increased effectiveness over fresh baker's yeast, though it is more pleasant to take, and consequently acceptable. Still better is a powdered brewer's yeast, which should be taken in doses of a heaping teaspoonful twice a day.

During the acute stage of the infections, (30) Levin says that exercise is interdicted, for the reason that every precaution should be taken to prevent dissemination, and spread of the infection. In general, health suggestions as, fresh air, sunlight, combined with sufficient rest and relaxation are strongly advised. The general resistance of the body should be built up and any thing that will improve and assist Nature's own powers is to be recommended for the patient to use.

V. Presentation of Case Reports.

Case I

A young male, 18 years old, entered the University Hospital, complaining of an infection on the lateral surface of the right wrist, tender and painful nodules at elbow and in axilla, and pain in motion of right arm. One week before a pimple had appeared on the lateral aspect of the right wrist. Two days later he squeezed it and expelled a small amount of pus. The pimple became worse and continued to develop. The day before entrance he squeezed it again and obtained some bloody material; this was followed by the appearance of the swollen glands at the elbow and in the axilla. Nodule is firm, reddened, infiltrated about two centimeters in diameter, no fluctuation. Red lines extend up anterior aspect of forearm to swollen lymph glands at elbow.

Diagnosis: Furuncle at right wrist with Lymph angitis and lymphadenitis.

Progress:

The arm was elevated, and hot magnesium sulphate packs applied continuously for six hours.

Moist dressings of four percent. boric acid solution applied continuously to arm, and mercurial ointment fifteen percent. to infected area at the wrist.

Arm improved rapidly; enlarged glands and lymphangitis disappeared on second day. Furuncle ruptured itself and necrotic mass expressed on fourth day. Symptoms rapidly subsided. Patient dismissed on fifth day.

Case II.

A young male, seven years old, entered the University Hospital complaining of pain and aching in right ear for one week. Some swelling back of ear. Just recovered from a cold and mumps. Area behind ear is reddened and edematous, drum not seen on account of swelling in external auditory canal. Traction on auricle causes pain, as does pressure on tragus.

Diagnosis: Furuncle in external auditory canal.

Progress:

Sterile gauze pack inserted into ear, and hot magnesium sulphate packs applied continuously.

Furuncle in right ear canal opened on second day pus obtained. Gauze wick saturated with Bilroth's solution inserted. Hot magnesium sulphate packs continued. Bilroth's solution drops three in right ear every four hours.

Furuncle reopened on fourth day and clean sterile gauze wick inserted, saturated with Bilroth's solution. Continue hot magnesium sulphate packs, and Bilroth's solution drops three in ear every four hours.

Dismissed on ninth day.

Case III.

R. K. a male, sixty-three years old, presented several furuncles on the back of the neck which were very painful. As he failed to improve under ordinary treatment on April nineteenth, two cubic centimeters of staphylococcus bacteriophage was injected into his right arm. Bacteriophage **Staph** was used locally as wet dressings continuously applied. On the evening of the injection, a marked reaction developed at the site of the injection but the intense soreness of the lesions was greatly decreased. Examination on April twenty-first showed that the furuncles were drying up and were less inflamed. A second injection of two cubic centimeters of the bacteriophage was administered into the left arm, and the same local treatment was continued. There was some reaction. When on April twenty-third two cubic centimeters of the staphylococcus bacteriophage was again injected into the right arm, the lesions were practically gone. On April twenty-sixth the patient was clinically cured of furunculosis for there had been no recurrence of the lesions up to that time. The case was dismissed and has had no return for six months.

Case IV

A male, fifty years old, entered the University Hospital complaining of painful, discharging right ear, for three weeks. Slight prominence anterior to right ear canal with adenitis below ear. Discharge thick and purulent. Tenderness anterior to right ear. Canal almost swollen shut, filled with pus, seeming to exude from multiple swollen points on anterior ear canal.

Diagnosis: Furunculosis of right ear canal.

Progress:

Irrigate right ear with boric acid solution and hydrogen peroxide equal parts four times a day and follow with merthiolate drops three. Acidⁱacetyl salicyli, grains five, Acetphenitidinum, grains three, and Caffien α , grains one, every two hours.

Ear swabbed with fifty percent. silver nitrate and a phenol five percent. in glycerin wick inserted on second day. Irrigations discontinued. Cold boric acid compress to right ear for one-half hour every two hours. Continuous ice bag to ear. Quartz lamp to ear.

A.P.C. powders discontinued fourth day. Discharge much less.

Furunculosis entirely cleared on seventh day.
Dismissed.

Cipollaro - Sheplar

Case V.

A. H. a male, thirty-eight years old, had been suffering from recurrent and multiple furuncles for the past six years. He had many furuncular lesions scattered over both arms. A culture of the pus revealed pure *Staphylococcus aureus*, which was readily susceptible to our bacteriophage.

He received a total of twenty-three injections of phage at daily intervals. These were given into the arm in one cubic centimeter doses. Locally the furuncles were given applications of wet dressings of bacteriophage and normal saline solution. One fourth cubic centimeter of bacteriophage was injected into some of the larger lesions. This patient was entirely cured, and no recurrence was reported almost a year later.

Kahn.

Case VI.

B. H. a male, thirty-two years old presented eight fairly large, deep boils on both forearms. On June third, two cubic centimeters of staphylococcus bacteriophage was injected into his left arm. Locally, the following ointment was applied: phenol, four minims; mild mercurous chloride, twenty grains; sulphonated bitumen, N. F. one-half drachm, and resin cerate, sufficient to make one ounce. The site of the injection became very painful and inflamed. On June fifth, the lesions appeared to have dried up. A second injection of two cubic centimeters of staphylococcus bacteriophage was administered into his right arm, and the same local medication was continued. The reaction was fairly moderate. On June seventh, two cubic centimeters of the bacteriophage was again injected into the left arm, the lesions were rapidly disappearing. When last seen, on June fourteenth the patient was entirely cured.

VI. Discussion of Case Reports.

Case I.

This shows the value of conservative treatment, rest, and saturated magnesium sulphate packs. Also mild applications of boric acid solution and fifteen percent. mercurial ointment.

Case II.

Furunculosis of the external ear canal has always been more or less a difficult problem for the practitioner. However, this case shows that conservative treatment again sufficed to produce a cure. Hot magnesium sulphate packs and a gauze wick saturated with Biltroth's solution inserted seemed easily to have caused healing.

Case III.

Bacteriophage therapy comes to the front, producing as a rule astonishing results.

Case IV.

Silver nitrate swabbings of the ear with a five percent. phenol and glycerin wick inserted in the ear canal, and cold boric acid compresses seem to have easily produced a cure.

Cases V and VI.

These cases give additional evidence of the success which bacteriophage therapy has encountered. Numerous cases of this type are proving this method far superior to those that have preceded it.

VII Conclusion

Having collected published reports of a wide variety of therapy in furunculosis, and presented them with no thought of evaluation in the various methods described, the following considerations seem to be justifiable.

Each furuncle is a problem in itself, and there are no inelastic rules governing the treatment of this type of infection. (51) Christopher remarks, that in but few surgical ailments is a like amount of judgment and experience required to make an accurate diagnosis of the type of the lesion, its state of progress, and the most appropriate form of treatment. In the majority of instances the consensus of opinion seems to be that most furuncles are best treated by conservative measures, that is, hot moist dressings, softening ingredients, carbolization, etcetera, until they discharge spontaneously or until fluctuation indicates incision and drainage. Many of the newer methods proposed are well worth study, but have not yet been used in a sufficient number of cases to prove their value.

Above all the practitioner must keep in mind the risk of the patient, the amount of pain, and the duration and expense of the treatment. In our present state of knowledge the safest treatment is that which best brings about localization of the infection, if possible, effective drainage, and rapid healing.

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