An Inaugural Address

ON

BIER'S HYPERAEMIC TREATMENT.

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BY

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[AFTER a reference to the address he gave three years ago to the South Midland Branch of the British Medical Association, published in the *BRITISH MEDICAL JOURNAL* of July 18th, 1908, under the title of "Professor Bier's Treatment by Means of Induced Hyperaemia," Mr. Waterhouse said that before giving the results of his three years' further experience of the method, it seemed desirable to give a brief epitome of the discussion of the theory of Bier's treatment previously published.]

THEORY.

Professor Bier's treatment by means of artificially produced hyperaemia was introduced nearly twenty years ago. Its object is to produce a hyperaemic state of the morbid area, or to increase the hyperaemia in the inflamed part, in the expectation that the increased blood supply will assist the tissues in their contest with the invading microbes, owing to the well-known antimicrobial action of the blood. I will avoid any attempt to reconcile this with the generally accepted teaching of the physiology and pathology of inflammation, for such an attempt would be profitless, since most of the so-called explanations appear to me quite unsatisfactory. Professor Bier's suggestions were iconoclastic. They were diametrically opposed to the teachings of physiology and pathology, and were therefore received at first with scorn and derision. The originator of the treatment is now Professor of Surgery in the great University of Berlin, and is one of the most honoured surgeons on the Continent. In homely language, the proof of the pudding is in the eating of it. Bier's treatment has only to be tried in suitable cases to convince even the sceptic of its efficacy. I confess that I cannot properly understand its *modus operandi*, though I am convinced that it is one of the greatest surgical discoveries of the latter part of the nineteenth century. Bier has certainly taught us that we have greatly underestimated the antimicrobial potency of the circulating blood. It is of prime importance that the blood in the diseased area continue to circulate. Stasis of the blood stream is the thing to avoid with especial care, as it is certain to be harmful. Any arrest of the circulation through the diseased part must diminish the power of resistance of the tissues, and this, in a chronic inflammatory condition, would be the exact opposite to the effect we desire to produce, whilst in an inflammation which is acute and virulent it might easily cause gangrene. I beg you, therefore, to bear constantly in mind, in carrying out the hyperaemic treatment, the essential axiom that *during the whole duration of the application of the method it is of supreme importance that the blood continue to circulate freely through the diseased area, and that any tendency to stasis of the blood current must be carefully avoided.*

Stasis must mean lowering of the resisting power of the damaged tissues, and may readily result in their necrosis. Bier's hyperaemic treatment may do harm, and, owing to unscientific application, has often been productive of serious damage. This danger, however, is no argument against its employment by those who have studied its principles and carry them out in practice. It is, however, a warning to those who, without even a superficial knowledge of the treatment, apply it in acute cases. Necessary as it is in all cases, it is especially so in acute inflammations involving the more distal parts of the body that the surgeon must satisfy himself that during the whole course of the treatment the blood continue to circulate freely in the diseased area. If the surgeon cannot make arrangements so as to satisfy himself on this vital point, he had better,

certainly in acute inflammatory conditions, give up any attempt to carry out the hyperaemic treatment. I speak strongly on this matter, as I have seen numerous examples of serious damage caused by improper application of the treatment. Let me give one instance only. A medical friend, only a few weeks ago, wrote me that, in spite of my advocacy of the method, he was convinced that Bier's treatment was "an utterly unscientific one"! On making inquiry I learned that a patient, a shorthand reporter, suffering from a thecal whitlow, had consulted his medical attendant one evening. An elastic bandage was applied firmly above the elbow, and the next morning the greater part of the index finger was gangrenous. I had a bad half-hour with the patient, who appeared to think that his index finger was lost entirely owing to my having recommended a faulty and unscientific treatment. It would be difficult to conceive a case treated in more direct opposition to Professor Bier's instructions, and I think I may fairly claim to mine in the article before mentioned. Two very grave errors were made in this case: (1) The bandage was applied too firmly, with the result that the circulation in the damaged part was arrested; and (2) the pus present in the thecal sheath was not evacuated prior to the induction of the hyperaemia. I could only draw my friend's attention to the fact that he had entirely failed to appreciate the teaching of the article, in that (1) he had made no attempt to assure himself that the blood continued to circulate in the damaged finger; and (2) that he had disregarded the point, repeatedly insisted upon, that in suppurative lesions it was essential that, prior to the application of the treatment, vent must be given to the pus by timely incision. I beg you, therefore, in justice to a method of treatment which is still on its trial in England, to grasp its elementary principles before you put it into practice, as otherwise disaster, rather than benefit, will result. Let it be your first duty, especially in cases of acute inflammation in which the rubber bandage is employed, to satisfy yourself that the circulation of blood continue in the part distal to the constricting bandage. This can, at the commencement of the treatment, be readily assured by feeling the pulse in the part thus rendered hyperaemic. Soon, however, especially in acute inflammatory conditions, this becomes difficult or impossible owing to oedema of the hyperaemic part, but, fortunately, we have a reliable guide in the sensations of the patient. If the treatment be painless, or if, after a short trial, the pain which was present prior to its employment is sensibly mitigated, I am confident that all is well. If, however, the treatment excite pain which was previously absent or increase an already existing pain, then I know that I have wrongly applied it, and I immediately take steps to correct my mistake. Thus, in the different methods, I (1) loosen a too tight bandage; (2) diminish the suction of the cupping glass; or (3) lower the temperature of the hot air.

Be guided, therefore, in your employment of Bier's hyperaemic treatment by two rules which must never be broken:

1. Be careful that throughout the whole course of the treatment the blood continue to circulate freely throughout the part subject to treatment.
2. Assure yourself that the treatment be painless, or at least that it mitigate any already existing pain.

Provided that you keep the two above principles continually in mind, you need have no fear of doing harm by the employment of the hyperaemic treatment. Properly carried out, the treatment is not only painless, but its repetition is anticipated with satisfaction by an intelligent patient.

As students we were taught that there were five cardinal signs of inflammation—heat, redness, swelling, pain, and impaired function. Let us pause for a moment to consider how these are affected by Bier's treatment. Shortly stated, it may be said that it causes an increase in the heat, redness, and swelling, and a diminution in the pain and impaired function.

Were I to be asked what are the chief aims of Bier's treatment my answer would be:

1. The arrest of an infective process, or at least its mitigation.
2. Prevention of suppuration in many cases in which this is threatened.
3. Relief from, or at least mitigation of, pain.

4. Avoidance of operative treatment in many cases, or, where this is not possible, the employment of a less severe and less mutilating operation than would otherwise be necessary—thus the required incisions may be few and small instead of many and extensive.

5. Saving of time owing to hastening the eliminating processes in cases in which suppuration and necrosis are unavoidable, as in carbuncle.

6. Increase in the antimicrobial power of the circulating blood, due in large degree to the greater quantity of blood circulating in the diseased part.

7. Stimulation of the process of repair, as in cases of delayed union of fractures.

METHODS EMPLOYED IN PRACTICE.

In carrying out Bier's hyperaemic treatment three different agents are made use of:

1. Elastic constriction.
2. Suction by means of a cupping glass.
3. Hot air.

While I have no intention of attempting to discuss the physiology of each of these three methods I may state briefly, and I trust with sufficient accuracy, that:

1. Elastic constriction gives rise to a purely venous, that is a passive, hyperaemia.
2. Suction by means of cupping glasses produces a hyperaemia which is at first arterial or active, but soon becomes venous or passive.
3. Hot air occasions a hyperaemia which is purely arterial, that is, an active hyperaemia.

Were I to ask you which form of treatment would be likely to render the greatest service in the treatment of disease, you would, I think, answer without hesitation the third method, namely, that by means of hot air. In this case, however, as in many others, theory and practice do not run hand in hand. Of the three methods of treatment I have found hot air, which occasions the purely arterial hyperaemia, the least satisfactory, as judged by the results obtained, and elastic constriction, which causes a purely venous hyperaemia, the most valuable and efficient. I make no attempt to give any explanation of this; I simply give the results of my experience of the hyperaemic treatment.

I have had far greater experience of the effects of Bier's hyperaemic treatment by the employment of elastic constriction than of the two other methods, and my chief object is to recommend this application of the treatment. Elastic constriction is the method which deserves special attention at the commencement of your employment of the hyperaemic treatment, for the reason that it yields the best results, is the simplest to apply, and demands merely the purchase of an elastic bandage at a trivial cost.

The second method, in which suction by cupping glasses is employed to produce hyperaemia, necessitates the purchase of several cupping glasses of different sizes, and of rubber balls or air-exhausting syringes of varying degrees of force. It is obvious that a tiny furuncle and a large carbuncle require glasses and suction force very different in size and amount. The method, in spite of this disadvantage, will always remain one of real value, as it can be applied to the trunk, where elastic constriction is inapplicable.

Hot air I have employed infrequently in comparison to the two former methods. The reason for this is obvious. Except in the case of the hot-air douche, a separate apparatus is required for each patient—thus one for the ankle cannot be used for the knee-joint. Expense, therefore, has to be considered, and more than this, owing to the risk of damage that it entails, the method demands the personal supervision of the practitioner far more urgently than do the two former means of producing hyperaemia. It will therefore, in my opinion, have the smallest sphere of usefulness of the three.

1. Elastic Constriction.

This is the oldest of Bier's methods, and it is, in my experience, by far the most valuable.

I commonly employ a Martin's bandage, 1½ in. in breadth for application to the upper limb, and 2 in. for the lower limb. I invariably apply the constricting bandage to the upper arm in affections of or below the elbow, and to the lower part of the thigh for those of or below the knee-joint. In affections of the head, neck, penis, testicle, and scrotum ordinary garter elastic is amply sufficient. The

constricting bandage is made to encircle the root of the part proximal to the seat of the affection. It is a matter of regret that to the above-mentioned parts alone can elastic constriction be satisfactorily applied. I have never succeeded in the case of the hip-joint, and have obtained only a limited amount of satisfaction in the treatment of affections of the shoulder-joint, where I have made use of a bandage applied over the mid-point of the clavicle and under a firm pad placed in the axilla.

The employment of the elastic constricting bandage may appear a very simple matter. Times without number I have explained the method to my medical friends, and have noticed that my somewhat minute instructions have wearied them. Some have appeared to take them as a reflection on their ability to apply a bandage. My experience has frequently been that the man who is cocksure at the consultation in the afternoon is far from confident when in the evening he comes, bandage in hand, to apply the constricting agent to the part above the affection, particularly in cases of acute inflammation. He then begins to ask himself if the application of the constricting bandage is as simple a matter as he had considered it to be, and I have frequently known the practitioner who rather resented instruction regarding the application of the bandage, request, on the telephone, more detailed information. Unfortunately it is impossible to give exact directions as to the amount of constricting force to apply. Each case seems to be a law unto itself. An amount of constriction which in Case A. may be readily borne and produce the desired effect, may, in Case B., cause intolerable pain, and, unless relaxed in good time, work irreparable damage. Yet the two cases may appear similar, and to demand equal treatment. In every case it is the bounden duty of the practitioner to wait a considerable time after the application of the constricting bandage to assure himself that it has not been too tightly applied. In acute cases half an hour is the minimum.

I would urge the importance of the practitioner, prior to leaving the patient, satisfying himself upon these three points:

1. That pain is abolished or at any rate diminished in the affected area.
2. That the pulse can be felt distal to the bandage.
3. That the hyperaemic part is of a dark congested bluish colour, with a slightly reddish tinge. Whilst in subacute or chronic cases this is the normal, in acute cases redness and oedema frequently rapidly extend up to the lower limit of the bandage. Such an occurrence is very alarming to the patient, but need occasion no anxiety, and may be regarded as satisfactory rather than the reverse. Provided that indications 1 and 2 are fulfilled the medical attendant may leave the patient with a quiet conscience.

You will next desire to know for what period should the bandage be applied and what interval should be allowed between the removal of the bandage and its reapplication.

Here, again, I regret that even after an experience of many hundreds of cases I can give no dogmatic rule. I can only state that in chronic cases I usually aim at nine hours "on" and three hours "off." Even in chronic cases in young children, at the commencement of the treatment, the period of the application of the bandage should be less than that given above, four to five hours being regarded as the limit. In all cases when the constricting bandage is removed it is a wise precaution to elevate the congested, oedematous part, and to sponge the skin compressed by the bandage with rectified or methylated spirit. In acute inflammatory conditions no rule can be stated as to the period of constriction permissible. In such, whilst the practitioner will, by the exercise of due care and supervision, obtain results of extraordinary value, he must ever keep before him the danger of doing harm instead of good. In cases of acute inflammation the faulty application of Bier's method may induce gangrene, and in cases of doubt we must underdo rather than overdo the treatment, but, if we are guided by the patient's sensations, we shall not fall into error. The rule that guides me in acute cases is to continue the treatment, in spite of rapid spread of the redness and oedema, provided that the patient assure me that the treatment is painless or that a previously existing pain is mitigated. Under the guidance of this rule I have experienced no mishap. I therefore

commend it to you with all confidence. I have found it beneficial to diffuse the constriction over a relatively large area, and generally cover with the elastic bandage at least four inches of the arm and five of the thigh. It may at first sight appear absurd in inflammatory conditions of the tip of a finger or of a toe to apply the bandage to the upper arm and thigh respectively. The anatomical reason for this is that, were the bandage applied to the forearm or leg, the interosseous veins might easily escape the constriction and thus nullify our efforts.

Bier's treatment is also able to afford marked assistance towards recovery, even though, when the case first come under treatment, suppuration is already established. A large number of cases also first come under observation in which it is doubtful whether or no suppuration has occurred in the affected part. Such cases bring to notice another phase of Bier's treatment, and furnish us with the vast majority of instances in which Bier's treatment, because of faulty employment, has done harm. Neither Bier nor any of his followers has ever claimed that the treatment can cause the absorption of pus. What we maintain is that Bier's treatment, judiciously applied, will, in a large number of cases, prevent the occurrence of suppuration in instances in which it would, under any other treatment, almost inevitably have occurred; but we freely admit that when pus formation has taken place Bier's treatment is powerless to effect its absorption, and if persisted in, without giving vent to the pus, is more likely to prove harmful than beneficial. Firm adherent as I am of Bier's treatment, I know its limitations, and I beg to emphasize the rule that *in every case in which pus is present it is absolutely necessary that, prior to the commencement of Bier's treatment, the pus be evacuated.*

All abscesses, acute and chronic, demand similar treatment, namely, incision. No exception to this obligatory rule can for a moment be allowed. I need hardly state that the necessity for its due observance is far more stringent in the case of acute abscess; but even in chronic abscess it holds good. It may be asked, What, in a case of acute abscess—for example, a thecal whitlow—is the advantage of Bier's treatment? I need only mention two of its merits: (1) That in no case is a free incision requisite—a tiny incision, hardly more than a mere puncture, just sufficient to give exit to the pus, is all that is necessary; and (2) so soon as the puncture has been made the application of the constricting bandage rapidly, and far more certainly than any other method, gives rise to a ready discharge of pus and an improvement, painless and satisfactory, of the inflammatory process. I have chosen the example of thecal whitlow as it is one of prime importance. Consider the possible effects of a thecal whitlow of the right index finger to you or me, to the artist or the musician. Even if we limit them to the finger itself they assume a position of grave weight. I have no hesitation in saying that since I learned to treat such cases after preliminary puncture-incision by means of Bier's hyperaemic treatment, I have obtained results far surpassing those yielded by the usual surgical procedures. In this connexion I wish to draw attention to the diagnostic value of Bier's constricting bandage. A patient with a whitlow consults you. The finger is tender and painful. Surgical instinct says even if there be not pus present there is tension, and it is your duty to make a free incision. The patient says: "Don't cut my finger unless you are certain that pus is present." What are you to do in this difficulty? Apply the constricting bandage round the upper arm. One of two things will happen: (1) The patient will, after five or ten minutes—even if the redness and oedema rapidly extend upwards—complain of no additional pain, and will even state that the finger is less painful than prior to the application of the bandage. Under these circumstances, you may rest assured that pus formation has not taken place, and will advise the continuance of the treatment by means of hyperaemia. Or (2) within a minute or two the patient complains that the pain in his finger has become an intolerable agony, and he insists that the constricting bandage be at once removed. In this case you may be certain that pus formation has already taken place. A small incision is made into the centre of the painful area, a few drops of pus are evacuated, the hyperaemic treatment is resumed, and now the patient bears the constricting

bandage with entire satisfaction. I have had very numerous examples of the two conditions above described, and I can safely assert that I know no more certain test in the whole realm of surgery of the absence or presence of pus.

I will not attempt to enumerate every case in which I have employed, usually with satisfaction both to the patient and myself, Bier's constricting bandage for the production of hyperaemia. I have made use of it with very excellent results in the treatment of tuberculous disease of or below the elbow and knee, particularly in children. In all such cases the hyperaemic treatment has been used in combination with the injection into the tuberculous area of a sterilized 10 per cent. emulsion of iodoform in glycerine. The results have been such as to convince me that this method of treatment is infinitely superior to any other, and that it offers by far the best chance of cure in surgical tuberculosis. I need hardly emphasize the fact that the earlier the case comes under treatment the better the chance of recovery. Bier's treatment can do wonders in the initial stages of tuberculous infection. It is far less potent for good in the later stages, in which necrosis and caseation with, perhaps, suppuration have occurred. In many such instances it may only be able to act beneficially after the dead tissue has been removed by the surgeon. Nowadays, fortunately, we have the means of diagnosing the tuberculous nature of the case in the earlier stages by several methods, of which I greatly prefer the injection of old tuberculin. This enables us to commence Bier's treatment in the early, that is curable, stages of tuberculosis.

I have for many years past made use of the constricting bandage in almost every case of microbic infection situated in a part amenable to the application of the treatment that has come under my care. My reason for so doing has been the knowledge that in the diseased part there is in progress a contest between the invading microbes and the blood and tissues of the patient, and that Bier's treatment is the best method known to science of aiding the tissues in their fight with the invading microbes. The more equal the strife the more urgent is the call for the hyperaemic treatment, and it is in those cases in which, in a fairly balanced contest, victory is inclining to the side of the microbes that the hyperaemic treatment achieves its greatest triumphs by turning the tide of battle and giving the tissues the upper hand. In a small proportion of cases of extreme potency of the microbes even Bier's treatment is of no avail. In others it may appear to be unnecessary as the tissues are able rapidly to overwhelm the invading organisms. In the great majority, however, there is a more or less equal struggle in which it is of supreme importance to render all possible aid to the tissues, and in which, therefore, the hyperaemic treatment must be employed.

The most frequent indications for the employment of Bier's constricting bandage will be:

1. Whitlows; but in the majority, that is, where pus is present, a tiny incision is required, prior to the application of the bandage, to give vent to pus.
2. Suppurative arthritis of the joints of both upper and lower limbs after incision into the articulation.
3. All varieties of pyogenic infections of the limbs, including cellulitis, osteomyelitis, and lymphangitis.
4. Teno-synovitis of tuberculous, pyogenic, or gonorrhoeal origin.
5. Gonorrhoeal arthritis, so frequent in the knee-joint in the male and the wrist-joint in the female.
6. Ununited fractures, or rather delayed union of fractures, in order to expedite the process of repair.
7. Crushing injuries of hand and foot, where the hyperaemic treatment has a marked influence in preventing suppuration in cases in which this is anticipated.
8. Chilblains, in which the hyperaemic treatment often acts as a charm.

The above is by no means an exhaustive list. It merely indicates what I have found the most frequent indications for the employment of the hyperaemic treatment in my practice, but in the majority of affections of the limbs the hyperaemic treatment will prove of real assistance and benefit.

In comparison with the limbs, the hyperaemic treatment in the other parts to which it may be applied has been

comparatively disappointing. I have, however, found distinct benefit result from the employment of a collar of garter elastic applied round the root of the neck in many cases of erysipelas of the scalp, face and neck, of boils and carbuncles, and of suppurative cellulitis. In tuberculous disease of the cervical glands, I regret that my results have been more or less disappointing. The constricting elastic garter has, in general, proved satisfactory in affections of the skin and subcutaneous tissues, but has failed to influence beneficially structures situated beneath the deep cervical fascia. In testicular and scrotal affections the value of the treatment has in certain cases been good, in others disappointing. Many instances of tuberculous and gonorrhoeal epididymitis have been benefited, but in general the results have not been striking. Superficial infections of the scrotum have invariably responded satisfactorily.

Before I leave the subject of the hyperaemia-producing bandage I desire, at the risk of repetition, to give a list of "don'ts."

1. Don't be alarmed at the rapid increase of redness and swelling, even up to the bandage, in cases of acute inflammation, as such a condition is usually the forerunner of a good result.

2. Don't hesitate to make an incision, which need never be more than a small puncture, in any case in which the bandage, properly applied, causes a marked increase in the pain, as this always indicates the presence of pus which urgently demands evacuation.

3. Don't hurry away from a patient suffering from an acute inflammatory affection, especially a whitlow, until you are convinced that all is well. Remember that the treatment, great as is its power of doing good, is capable of causing gangrene in such a case.

4. Don't, should gangrene of the finger unfortunately result, blame the treatment, but rather blame yourself for having misapplied it.

5. Don't forget that the measurement of the degree of constriction is a difficult matter to estimate, and that your muscular sense may mislead you. Remember that the object is to achieve venous congestion without arrest of the arterial blood flow; and therefore

6. Don't forget to feel the pulse distal to the constricting bandage.

7. Don't, finally, forget that you have in the patient's sensations the only safe measurement of the constricting force applied. If the patient inform you that the pain is mitigated or abolished, you may rest assured that all is well, even though increase in the redness and oedema appear ominous. If, on the contrary, the patient declare that the pain is rapidly increasing in intensity, you must conclude either that your bandage is too tightly applied or that pus is present and demands instant evacuation.

2. Cupping Glasses.

My experience of the second of Professor Bier's methods of treatment, namely, suction by means of cupping glasses, or the partial vacuum method, has been large, but nothing comparable to that of the first method. One reason for this is, I think, that the cases suitable for this partial vacuum treatment are not such as are, as a rule, sent to the surgeon. The method is employed chiefly for affections situated on the trunk in which the constricting bandage cannot be applied. Whilst I freely grant that for certain, and particularly for cutaneous and subcutaneous pyogenic affections, this method of treatment is of extreme value, I must admit that the results obtained from its employment are far less striking and convincing than those afforded by the hyperaemia-producing bandage. As indicated above, the more superficial the affection the greater, as a rule, will be the benefit derived from the partial vacuum-producing suction glass. The more deeply placed the affection the less will it be influenced by the treatment. Herein lies the measure of the efficiency of the suction treatment.

A further reason for the inferiority of the method is that its employment can only be of short duration. It is to be measured in minutes rather than hours, as in the case of the constricting bandage. Its effects can therefore not be expected to be so far-reaching. For example, in the case of tuberculous disease of the wrist-joint the bandage may be applied for sixteen to eighteen hours daily. In that of a carbuncle situated on the back, the suction glass will

rarely be applied for more than one hour daily, and even in this case with frequent intervals, during which the suction is removed. There exists an infinite variety of suction glasses, varying from one suitable for a small boil and provided with a small rubber ball, to one that can be applied to encircle a huge carbuncle, or to receive in its interior the entire breast and provided with a suction pump to produce the partial vacuum. Doubtless this question of the necessity of providing a suction glass suitable for all sorts and conditions of affections has militated against the more general employment of the method. This difficulty, however, is far less than appears on first consideration. If the practitioner obtain a small suction glass suitable for a furuncle and a medium sized one which can be employed in the treatment of an ordinary carbuncle, a special apparatus can be obtained from any instrument maker suitable for a large carbuncle, or the entire breast in case of need. With the two smaller glasses 'a can deal satisfactorily with a large majority of the cases demanding the suction treatment. In certain instances it is difficult to make the suction glass adhere to the skin; but this difficulty may be readily obviated by smearing the margin of the glass with eucalyptus vaseline.

In this as in the former method, the patient's sensations furnish our best guide to the amount of suction force to employ. Again I repeat, *No pain must be caused by the partial vacuum treatment.* As in the case of the constricting bandage, the tendency is towards doing too much rather than too little. Judgement is required, otherwise the treatment will do harm rather than good. Two other "don'ts" are in this place applicable: (1) Don't overdo the suction; (2) don't cause pain. Should the skin in the interior of the suction glass assume a white appearance, it is clear that it is anaemic, and that therefore the suction is too powerful. The skin should be of a congested bluish appearance, with in it a more distinct suggestion of red than in the case of the constricting bandage. This is as accurate a description as I can give you, though I admit that in cases subjected to suitable treatment either the blue or the red colour may predominate.

In this as in the former method, emphasis must be laid on the statement that Bier's treatment makes no pretence to be able to effect the absorption of pus. The universal rule of surgery holds true here as elsewhere: Where there is pus it must be evacuated. The incision in this case again need only be a tiny puncture except where a large slough has to be expelled before healing can occur. In every case this puncture incision must be made before the suction is applied, otherwise the suction will cause increase of pain, and will be harmful rather than beneficial. I rarely employ the suction treatment for more than one hour daily. The application of the suction glass for five minutes at a time is usually sufficient, especially in cases of acute inflammation. At the expiration of this period the suction glass is removed for at least five minutes, in order to allow the oedema to subside. Should the practitioner apply the treatment twice daily, as in the case of a carbuncle after incision, he will find it convenient to apply suction for five minutes, remove it for five minutes, and then reapply it for five minutes, and so on for one hour at each visit. This, however, makes an inordinate demand upon his time, and requires his attendance upon the patient for two hours daily. If a nurse be available, or if the patient be intelligent, I consider the better plan is to apply the suction for five minutes and to remove it for fifty-five minutes of every hour during the whole time the patient is awake. In many instances it will appear to the practitioner that he has to treat a case in which suppuration has not as yet occurred, and in which, therefore, it may be aborted. He applies the suction glass, and even though he decrease the suction force two or three times, the patient complains that the pain in the part is considerably increased by the treatment. Here once again we have an example of what I may term the diagnostic value of Bier's treatment. Pus is assuredly present; an incision is made, pus—it may be only in minute quantity—is evacuated, the suction is reapplied, and the patient, who strenuously objected to the treatment prior to the puncture incision, is now a converted believer in Bier's treatment. After the puncture incision the suction treatment causes, as would be anticipated, a very free escape of blood and bloody serum. This discharge, however, soon ceases, and

healing is rapid and satisfactory, though frequently delayed until a slough has been expelled.

In addition to the suction glasses above mentioned, the partial vacuum treatment has been otherwise employed by Bier for the treatment of affections of the limbs, particularly of the joints. Large suction glass vessels furnished with a rubber cuff to grasp the limb proximal to the segment contained in the glass vessel and provided with strong suction pumps to produce the partial vacuum are employed. Such forms of apparatus I cannot recommend. A separate one is required for each joint, and one suitable for a big man will not do for a small child. Expense here becomes important. My chief reason, however, for not recommending this form of apparatus is that, in my experience, even an apparatus made specially for an individual patient has yielded results rather inferior to those attainable by the employment of the constricting bandage.

I have made use of the ordinary suction glass treatment, with great satisfaction, chiefly in the following cases:

1. Furuncles and carbuncles, usually after a puncture incision, but occasionally, as in blind boils, without this preliminary. In such instances the treatment has afforded results that have been uniformly excellent.
2. In acute and chronic abscess after incision.
3. In sinuses persisting after evacuation of a chronic abscess.
4. In mastitis, whether acute or chronic; in the former occasionally after an incision has been made.

In every case in the above list I think I may claim that the suction treatment has been beneficial. Boils and carbuncles have extruded their sloughs and healed readily; blind boils have aborted; abscesses have run a rapid course towards recovery; sinuses of long duration have closed within days or weeks, and many cases of mastitis, both acute and chronic, have quickly improved. In all the above—and I think I may state in every case—recovery has occurred considerably sooner than would have been anticipated under any other method of treatment.

The method has also been frequently employed in otitis media suppurativa, after incision or rupture of the membrana tympani, with a fair measure of success. In lupus of the face, and in the treatment of post-operative keloid cicatrices, I think I have noticed benefit, but the results have been by no means striking. Quite recently I have employed the suction treatment after evacuation of the pus in cases of empyema, with, I think, encouraging results.

3. Heated Air.

On theoretical grounds it would appear probable that this, the third method of Bier, should yield the best results, as it causes a purely arterial, as opposed to a venous, hyperaemia. It has, however, in my hands proved vastly inferior as a therapeutic agent to the two former methods.

Heated air is employed by Bier in two ways: (1) the heated air chamber, and (2) the heated air douche. It is absolutely essential that the heated air be dry, as otherwise scalds may cause harm.

1. The heated air chamber, in its most modest form, is a wooden box with certain orifices. The first opening provides a cuff to encircle the entering limb. The cuff may be made of felt rendered non-inflammable, and should be furnished with a cord or elastic band to ensure its fitting accurately the limb segment.

The other openings in the box provide for the entrance and the exit of the hot air, and for the thermometer, which must have its stem outside the box. It matters little from what source the heat is derived. A spirit, gas, or oil lamp suffices, but an electric heater is preferable when obtainable. This last is placed inside the box; in the case of the three former the lamp must be outside the box, and the opening into the latter for the entrance of the heated air must be furnished with an inverted metal funnel, the narrow end of which enters the chamber while the wide end is placed above the source of heat. I have found such an apparatus, which can be made for a few shillings by a village carpenter, fulfil all desiderata. This removes one objection to the heated air chamber, but it is by no means entirely safe in careless hands. It demands constant attention and frequent observation of the thermometer. Burns have proved not infrequent; they may be due to the wood not being sufficiently seasoned, and thus allowing resin to sweat out

and drop on the patient's skin, or to too high a temperature being employed. Both these causes are easily avoidable. In many cases the patient's sensations furnish a guide to the degree of heat employable, but I have learned by painful experience that, in some instances, the intensity of the heat annuls the patient's sensibility, and would therefore insist on the invariable employment of a thermometer and the avoidance of a temperature exceeding 250° F. I always impress upon the patient the statement that not only must the treatment be painless, but that the part subject to treatment must not feel uncomfortably hot.

I am well aware that higher degrees of heat have been employed, but I urge the path of caution. We should be satisfied in general with 230° F., and never exceed 250°. Gangrene of fingers, toes, and the skin of the dorsum of the hand and foot has occurred in certain cases. The more peripheral the part and the higher the temperature employed, the greater the danger. I generally employ a temperature of 230° F., and leave the part subject to this temperature for half an hour once a day.

It is in every case desirable that the temperature should be gradually raised and gradually reduced. This form of treatment is applicable only to the extremities, and is chiefly of value in chronic arthritic and osteitic affections in hastening the absorption of adhesions and exudations and in the alleviation of neuralgic pains. Here again the simple elastic bandage will in general prove equally efficient.

2. The hot air douche has but a limited field of usefulness. In its simplest form it consists of a lamp which is placed under an inverted metal funnel, to the narrow upper end of which a copper tube is attached by means of a universal joint. The tube is encased with asbestos or grasped by the hand provided with an asbestos glove. The temperature is regulated by measuring the distance between the lamp and the wide end of the funnel. The hot air douche is applied for a quarter of an hour twice daily. In certain cases—for example, sciatica and occipital neuralgia—it acts like a charm, and the same can be stated regarding cases of chronic osteitis, whether of syphilitic or of pyogenic origin, involving superficially-placed bones—for example, the tibia and mastoid process.

I have no time to refer to cases illustrative of the value of Professor Bier's treatment. In the *BRITISH MEDICAL JOURNAL* of July 18th, 1908, will be found 20 cases recorded by me illustrating Bier's treatment. Should, as I hope may be the case, some of you desire to further study this fascinating subject, I would recommend the excellent textbook, *Bier's Hyperaemic Treatment*, by Meyer and Schmieden.

UNDER the will of the late Mr. Charles Wardlaw of Sheffield the Royal Hospital in that town receives a bequest of £500, and the Royal Infirmary and the Jessop Hospital for Women each £300.

DR. HALLIDAY SUTHERLAND, Medical Officer, St. Marylebone Tuberculosis Dispensary, London, on December 9th gave a lecture on the prevention and cure of consumption in the Synod Hall, one of the largest halls in Edinburgh, which was quite filled. Dr. R. W. Philip presided. The lecturer said that, of all preventable diseases, tuberculosis was the most deadly, and yet in some ways it was the most easily prevented, because there was a very long period of latency between the date of infection and the objective manifestation of the disease. The disease could be aborted by rendering the environment of the individual healthy. The open-air treatment had now spread all over the world, and in this connexion he emphasized the great value of the very effective pioneer work which had been done in Edinburgh by Dr. Philip and his co-workers. There, thanks to the enlightened policy of the local public health authority, provision had been made for advanced and hopeless cases, but in practically no English town had any such provision been made. In the last stages of this appalling disease there was no salvation but that offered by the Poor Law and the workhouse. No one could defend that. It was absolutely unjust. People who were taking an interest in this whole question were looking to Edinburgh as the place where the fullest and most complete scheme for dealing with tuberculosis was in operation. Edinburgh had led the world. Looking forward, he saw a time when tuberculosis would have ceased to be. At the close of the lecture an exhibition of cinematograph films, illustrating the work done by the Royal Victoria Hospital and its allied agencies, was given.