An Address ON RINGWORM AND ITS TREATMENT.

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BY

J. M. H. MACLEOD, M.D., F.R.C.P.,

PHYSICIAN FOR DISEASES OF THE SKIN, CHARING CROSS HOSPITAL;
CONSULTANT PHYSICIAN FOR DISEASES OF THE SKIN,
METROPOLITAN ASYLUMS BOARD.

INTRODUCTORY.

In selecting ringworm as the subject for this lecture, which your Division has so greatly honoured me by asking me to deliver, I have been guided in my choice by experience that the recognition of ringworm is liable to prove a stumbling block to the practitioner, and that the difficulties of its successful treatment are apt to be so great as to render it almost a subject of reproach by the laity.

Ringworm is a common affection of the skin, due to a group of mould fungi, which may attack the glabrous skin, hairs, nails, and in rare instances, by extension, the mucous membranes, the clinical appearances of which differ according to the variety of fungus responsible, the site of the lesions, and the individual peculiarities of the skin affected.

RINGWORM FUNGI.

The fungi, or hyphomycetes, of ringworm constitute an interesting group, which has been placed provisionally in the order of the Ascomycetes, and in the family of the Gymnosaceae. In the skin they grow anaerobically in the form of a network of mycelial threads or "hyphae," which constitute the vegetative part of the fungus. The hyphae break up into small sections, to which the name "spores" has been applied, which in turn become elongated into new hyphae, and so perpetuate the fungus. Other methods of reproduction occur if the fungus be grown anaerobically away from the skin. In culture, for example, reproduction takes place by chlamydospores, while in hanging drop preparations it takes place by endoconidia. Its true method of reproduction, however, is aerobic, when it proliferates by means of aerial hyphae with terminal and lateral buds.

For many years it has been known that ringworm is due to a number of different fungi, which are so closely allied and so similar in their microscopical appearances as to be almost indistinguishable, but are capable of differentiation by cultivation on certain artificial media. Certain of them are found only on the human skin, while a considerable number occur in lower animals, and in birds, from which they are transmissible to man. The fungi are transmitted directly by contact, or indirectly by infected combs, brushes, caps, clothes, bath mats, etc. It is even possible that the infection may take place by spores blown about in the atmosphere, as dried spores have been shown to be viable for more than a year, and might easily remain about rooms where infected persons had been.

Pathogenic Action.

The fungi of ringworm have a double action on the skin: (1) a corrosive action on the epidermis, hairs, and nails, owing to the elimination by the fungus of a keratolytic ferment; and (2) an irritant action from their rapid growth and the toxic influence of the ferment, which results in inflammatory reactions, varying in degree from mild erythema to vesico-pustular or even granulomatous lesions. The degree of inflammation is dependent on the variety of the fungus—those of animal origin being specially virulent—and the susceptibility of the individual skin, which may be a natural peculiarity, or acquired as the result of some constitutional disturbance. As an example of the latter happening, I recently had a case of ringworm of the scalp in a child, in which the lesions were of the dry, scaly, slightly inflamed type; an attack of measles supervened, and the patches of ringworm became acutely inflamed, raised, and dotted over with vesico-pustules.

Varieties of Fungi.

There are two main groups of ringworm fungi, known respectively as the Microspora and the Trichophyta.

1. *Microspora*.—In Great Britain there are four varieties of microspora which are of practical importance—namely, the *M. audouini* (Gruby, Sabouraud), *M. equinum* (Bodin), *M. caninum vel lanosum* (Bodin, Sabouraud), *M. felineum* (Colcott Fox and Blaxall). Of these the *M. audouini* is by far the most common, and is responsible for at least 90 per cent. of all cases of ringworm of the scalp, and for a large number of those of the glabrous skin. It is a human ringworm, while the other three, as their names indicate, are of animal origin. It attacks the scalp in children, but rarely the adult scalp, as at puberty, for some reason so far unexplained, the scalp becomes an unsuitable soil for its growth, and, consequently, scalp ringworm in children, due to this fungus, tends to disappear spontaneously about the age of 14 years.

2. *Trichophyta*.—There are two main varieties of trichophyta which attack the human skin—namely (a) the *T. endothricae*, which are of human origin, and (b) the *T. ecto-endothricae*, which are transmitted from animals.

(a) In this country there are three principal varieties of *T. endothrix*, which are distinguished by presenting distinctive colours when grown on proof agar in the dark—namely: (1) *T. crateriforme*, a cream-coloured culture; (2) *T. sulphureum*, a yellow crateriform culture; and (3) *T. acuminatum*, a greyish-yellow acuminate culture.

(b) The *T. ecto-endothricae* form the largest group of the ringworm fungi, and most of them are of animal origin. They are responsible for the majority of cases of ringworm in adults. Of these the most common are: the *T. niveum* of cats and dogs; *T. equinum* of horses, sometimes found in the beard in man; *T. rosaceum* of fowls, in which it gives rise to the disease known as "white crest"; and *T. violaceum*, which has been recovered from suppurative ringworm of the beard, face, and scalp.

In addition there are several varieties of trichophyta of human origin, to which the name Epidermophyta has been given, such as the *E. inguinale* (Sabouraud) and *E. rubrum* (Castellani). These are mainly responsible for ringworm of the crutch and axillae, and the eczematoid ringworm of the feet and hands.

CLINICAL APPEARANCES.

Glabrous Skin.

Any part of the glabrous skin may be attacked by ringworm, the lesions varying according to the fungus responsible and the type of skin affected. They may be scaly macules, irregular, ringed, or gyrate in shape, vesico-pustular patches, or occasionally granulomatous nodules, the more virulent lesions being usually of animal origin.

The intertriginous regions—namely, the crutch, axillae, beneath the breasts in stout women, and the interdigital spaces between the fingers and toes—may be the sites of a special variety of ringworm, which has been known variously as *tinea cruris*, *dhobie's itch*, or eczematoid ringworm. This variety, which came originally from the East, has increased enormously since the great war, as large numbers of the troops campaigning in the East were infected with it, brought it home, and spread it among the civil population. Its exact manner of transmission is uncertain, but it is probably most often conveyed indirectly by walking barefoot on infected floors, by bath mats, water-closet seats, etc. It is possible that in some cases the strong belief in India that the *dhobie*, or washerman, is responsible for its spread, by washing clothes in pools of stagnant, infected water, may not be ill founded. The objectionable habit of wearing trousers next the skin is a likely way of keeping up the infection, and in public schools it has been traced to boys wearing promiscuously one another's football shorts, or other garments.

In the crutch and axillae it gives rise to irregular patches with a well-defined, sometimes festooned, border, which may be scaly, or raised and dotted over with oozing papules or vesico-pustules—hence its old name "*eczema marginatum*" (Hebra).

On the feet and hands it occurs in three main types. (1) An acute vesico-bullous type, generally known as

"eczematoid ringworm of the extremities," which attacks the interdigital clefts, and may spread on to the dorsum of the foot or the back of the hand in erythematous patches, which may be scaly, or dotted over with vesicopustules, or may present a sharp edge, with detached, undermined skin. This type is often mistaken for acute eczema, and many cases formerly labelled dysidrosis belong to this category. (2) A chronic type, which may succeed the acute type, characterized by indefinite, scaly patches. (3) A thick scaly type, affecting the palms and soles, in which the horny layer is not only thickened but fissured. These patches are irregular in shape, with detached edges, beyond which may be an erythematous areola, and small vesicopustules. Between the toes, especially between the fourth and fifth toes, the skin is apt to become white and sodden, like suède leather, and fissured in the folds. The nails may also be implicated, becoming discoloured, thickened, brittle, and raised up at the free border, owing to a thickening of the nail-bed. Subjective symptoms are not infrequent in connexion with it—such as itching, discomfort, and even pain from fissures, which may be so great as to interfere with walking.

The diagnosis of eczematoid ringworm may present great difficulty. In the extremities it has to be distinguished from "dysidrotic eczema," or even in some cases from a late syphilide, and cases are not infrequent which have been treated as eczema for years before their true nature was recognized. In doubtful cases a microscopical examination should always be made. With this object a scale should be detached at the growing edge of the lesion, or a covering of a vesicle removed, and placed with the deep side uppermost on a microscopic slide. A drop of liquor potassae should be added, a cover-slip applied, and the specimen examined with a high power. It may be necessary to make several preparations before a positive result is obtained, when the fungus can be detected as a network of mycelial threads among the epidermal cells.

Scalp.

The clinical appearances of ringworm of the scalp may be conveniently considered under three headings: (1) suppurative ringworm; (2) microsporon ringworm; and (3) endothrix ringworm.

1. *Suppurative Ringworm*.—Suppurative ringworms of the scalp are known as kerions, and are generally due to trichophyta of animal origin, though occasionally in children they may be caused by microspora. They may occur at any age, and constitute the majority of ringworms of the adult scalp. The lesions are boggy, phlegmonous raised patches, with a shiny, angry-looking surface, and a well-defined border, and are usually dotted over with small peri-follicular abscesses, from which ooze beads of sero-pus, and in the centre of which a loose stump may often be detected. On palpation they have a peculiar soft, fluctuating feeling, which leads the inexperienced to incise them in the expectation of finding pus, instead of which only a few drops of blood or serum exude. The suppuration is due to the inflammatory reaction of the scalp to the fungus itself, and not to a secondary infection with pus-cocci.

2. *Microsporon Ringworm*.—The microsporon is responsible for the familiar, mildly inflamed, scaly patches in children, in which the hairs are broken off short and form the characteristic ringworm stumps. In the infant, where the hairs are delicate, the patches may be definitely ringed, but in older children they are usually irregular in shape. The stumps are easily recognized, being thicker than the healthy hairs, and presenting a dirty white, opaque, or frosted appearance, due to a sheath of fungus around them. Recently a useful aid to the diagnosis has been furnished by the ultra-violet rays through a Woods's glass screen, as ringworm stumps become fluorescent under this light, and by this means not only patches of ringworm, but isolated infected hairs can be detected. As a rule the inflammation in this type of ringworm is mild, but occasionally, owing to some peculiarity of the scalp, on account of which it reacts more powerfully to the fungus, it may be so severe as to go on to suppuration. Should this happen, it is to the advantage of the patient, as the ringworm becomes self-curative.

3. *Endothrix Ringworm*.—Endothrix fungi are responsible for about 5 per cent. of the cases of scalp ringworm. The characteristic lesions produced by them are small, scaly, roundish patches, irregularly distributed over the scalp. In certain cases short stumps are present, but more often the affected hairs are broken off at the orifices of the follicles, forming plugs like comedones; hence the name "black-dot ringworm." These plugs are difficult to remove, except by a comedo expressor, or by detaching a scale covering an affected follicle, when the plug appears as a small spike on the under surface. Endothrix ringworm is generally of human origin. It is difficult to diagnose on account of the smallness of the patches and the shortness of the stumps, and is exceedingly persistent, as the fungus has no tendency to die out spontaneously at puberty.

TREATMENT.

Ringworm, being a local affection, is not amenable to any form of internal treatment. A number of experiments have been performed in connexion with the production of immunity to it in man and animals by the injection of vaccines, but these have only been partially successful in the case of suppurative ringworm of animal origin, and have not helped materially in the treatment of the disease.

Glabrous Skin.

The treatment of ringworm of the glabrous skin is as a rule a simple matter compared with that of the scalp. When the lesions are dry, scaly patches, or ringed lesions, the scales should be removed by scraping or by washing with soap and water, and the patches painted daily with liniment of iodine, or with tincture of iodine, to which 10 per cent. acetic acid has been added. After about a week the iodine has usually destroyed the fungus. The cure may then be completed by rubbing the patches for a few days with a 2 per cent. salicylic acid and sulphur ointment. In delicate skins iodine may prove too irritating, and in such cases 3 to 6 per cent. benzoic and salicylic acid ointment may be substituted.

In *suppurative ringworm* painting with iodine, followed by the application, after a week, of a 4 per cent. ammoniated mercury ointment, will generally effect a cure in about ten days.

In ringworm of the *crutch* and *axillae* more active remedies are necessary. The affected parts should be scrubbed daily, or oftener, with hot water and soft soap to remove the crusts, scales, and discharges, and an ointment rubbed in containing either 5 per cent. oxidized pyrogallol acid, which, though effective, has the disadvantage of being dirty, or a 3 to 5 per cent. benzoic and salicylic acid ointment, a valuable combination which was suggested by Whitfield. When painful fissures are present about the inguinal regions they may be healed by painting with a 3 per cent. solution of silver nitrate in spirit, or with friar's balsam. By this treatment a cure is generally effected in two or three weeks, but, to prevent recurrences, it is advisable that the parts should be painted daily for about a fortnight with a 10 per cent. solution of tincture of iodine in 60 per cent. spirit. It is important also that the underclothing which has been worn previous to the cure of the disease should be destroyed or thoroughly disinfected.

The treatment of eczematoid ringworm of the extremities, especially of the feet, requires even greater energy to effect a cure. Before applying the above remedies any vesicles should be opened and scales and loose epidermis removed, and when the lesions are acutely inflamed and purulent the inflammation should first be reduced by boric compresses, or by soaking the feet in boric baths or in a solution of potassium permanganate. The most intractable type of all is the *interdigital variety*, with white, thickened skin between the toes. In such cases the feet should be soaked daily in salt water—wading in the sea in summer being a valuable substitute—to macerate the thickened skin and allow the remedies to penetrate. Of these the most useful are the salicylic and benzoic ointment, a saturated solution of salicylic acid in spirit, the continuous application between the toes of 4 per cent. salicylic plaster, or daily painting with a 3 per cent. silver nitrate solution. The socks should be of white or natural coloured

wool, and changed at least once daily, and an antiseptic powder dusted into the feet before they are put on. After the socks have been worn they should be soaked in a solution of lysol, or stoved. The boots also should be disinfected by occasionally swabbing out the inside with a 1 in 20 solution of lysol, as it is possible for the fungus to remain growing on the sodden leather inside the boot, and to work its way through the sock and reinfect the foot.

Scalp.

The ease with which ringworm of the scalp is spread necessitates the isolation of cases as soon as they are recognized. As a preliminary to treatment the hair should be cut short with clippers, such as are used by barbers. This is preferable to shaving the scalp, as, when it is shaved, it is more difficult to distinguish the healthy from the diseased hairs. The scalp should then be covered with a closely fitting cap made of cotton or other light material, which should be continuously worn.

The treatment of ringworm of the scalp may be considered under the two headings of suppurative and non-suppurative ringworm.

(a) *Suppurative Ringworm*.—Pustular ringworm of the scalp is much more easily cured than the dry types, as the condition is self-curative, the suppuration leading to a destruction of the fungus. The treatment consists of keeping the scalp clean by the application of boric compresses or of mild antiseptic ointments containing boric acid, salicylic acid, or ammoniated mercury. When the swelling and inflammation subside a red bald patch is left. As a rule the hair grows over it in about six months, and only in rare instances, where superficial ulceration has supervened, does permanent baldness result.

(b) *Non-suppurative Ringworm*.—The dry, scaly forms of ringworm of the scalp are the most intractable. The difficulty of curing them is a mechanical one and due to the impossibility of reaching the fungus in the depths of the follicle by medicaments applied to the surface. As an illustration of this I may cite a case of microsporon ringworm in which I had the head kept shaved and the patches painted daily with liniment of iodine until blistering occurred. When this was healed, hairs were epilated, planted on proof agar plates, and cultures obtained. This procedure was repeated three times in six months, and always with the same result. To cure these cases it is necessary that the diseased hairs should be completely shed. Unfortunately, epilation by forceps is useless, since, however carefully it may be done, certain of the stumps are bound to be broken off and part of the infected root left behind. By far the most effective and rapid method of getting rid of the diseased hairs is by the x rays, and it is the method generally adopted. Occasionally scalps are met with that react so strongly to almost any irritant application that the x rays may be unnecessary, or the scalp may be so sensitive that the fungus itself causes so much disturbance that the ringworm becomes cured spontaneously by the hairs falling out, leaving temporary bald patches, suggesting alopecia areata, but differing from the latter in that the patches are generally inflamed and present no typical "point-of-exclamation" hairs. In infants under a year old the use of the x rays is inadvisable, and a cure can generally be effected by suitable parasiticide applications, such as ointments of salicylic and benzoic acid, iodide of sulphur, etc., as the scalp and hairs in the infant are more delicate. About puberty also, in the case of microsporon infections, the employment of the x rays is unnecessary, and parasiticides will suffice to hasten the spontaneous cure which occurs at that time.

Parasiticide Treatment.

When the x rays are not available, or their use is undesirable, it is necessary to resort to some parasiticide application, of which there is a large choice. It may be said that the value of a parasiticide is directly dependent not so much on its caustic action, or its power of killing the fungus directly, as on the amount of inflammatory reaction, short of ulceration, it is capable of setting up. Of the numerous irritants and parasiticides which have

been employed the two which I have found to be most useful are croton oil and sodium chloride, both of which act indirectly by the acute reaction to which they give rise.

X-ray Treatment.

The x -ray treatment is more rapid than any other method, and has the advantage of being painless. In competent hands it can be done, as a rule, with absolute safety, not only as far as the skin is concerned, but without any deleterious effect on the health and growth of the child; and the fear which was at one time engendered in the public mind with regard to harmful effects of the treatment on the brain is without foundation. It is an operation, however, which is by no means easy, and necessitates not only a suitable x -ray system for the purpose, and a working knowledge of the mensuration and application of the x rays, but an intimate acquaintance with the disease and its management. Without this it is a highly dangerous procedure, and may lead not only to severe dermatitis, but to permanent baldness. The casual fashion in which it has so often been undertaken in the past by those either lacking in technical skill or in knowledge of the disease has led to the most disastrous results, and has too often brought a valuable treatment into disrepute.

The x rays act simply as a depilatory. They do not destroy the fungus, and a culture of ringworm may be made from hairs which have fallen out as a result of exposure to them.

I shall not attempt here to describe in detail the x -ray technique nor the apparatus most suitable for the purpose; these can best be demonstrated in the operating room. The procedure is, briefly, to expose the whole of the scalp once to what is known as a pastille dose of x rays, which is the maximum dose the skin can stand without harmful effect, and which is sufficient to cause the hair to fall out without so injuring the papillae and follicles as to prevent regrowth. To expose the whole scalp uniformly it is necessary to divide it up into five areas, which are irradiated seriatim by what is known as the Kienböck-Adamson method. The time occupied in exposing the entire scalp varies according to the apparatus and the methods of the operator. At Charing Cross Hospital our average time is about three-quarters of an hour, and this includes not only the time taken in exposing the various areas, but also that occupied in placing the child in the different positions, and carefully fixing the head at the required distance from the anti-cathode of the tube. During the exposure it is essential that the head be kept still. As it is dangerous for the nurse or operator to attempt any form of restraint it may be necessary, when very young or restless children have to be rayed, to employ a special couch on which the child can be strapped, and the head fixed in the required position.

The x rays have no apparent effect on the scalp at the time of the exposure, nor are any marked sensory symptoms produced by them. Young children are sometimes frightened by the noise; on the other hand, they may as readily go to sleep during the exposure. A few hours after the exposure, especially since the introduction of powerful Coolidge tubes, the child may be a little out of sorts and sick, but the indisposition is transient, and there are no after-effects. About fourteen days after the exposure a slight erythema may appear, associated with itching, and in the next few days the hair begins to fall out, the defluvium generally being complete by the twenty-first day. Eight weeks later the hair begins to grow again as a fine down, and regrowth is complete in about six months. As a rule, it is advisable to irradiate the entire scalp, even when the disease appears to be confined to one or two areas, as it saves time in the end, for the infection is almost certain to spread to other parts in the interval between the exposure and the fall of the hair, necessitating a further exposure, which may be difficult to do without overlapping.

The chief risk of the treatment is the danger of over-exposure, followed by dermatitis and incomplete regrowth of the hair. With proper care and modern technique, however, this should be a rare occurrence.

At one time it was believed to be inadvisable to x -ray children under 3 years of age, before the fontanelles had closed. Further experience has shown that, provided the child can be kept still by the use of a specially designed

couch, on which the child is strapped, younger children, and even infants of twelve months, may be treated safely by the rays.

Before exposure to the x rays the hair should be cut short with clippers and the scalp washed. Should any acute inflammatory disturbance be present, such as impetigo from scratching or irritation from previous treatment with parasitocides, especially iodine, it should be dealt with previous to exposure to the rays. If this precaution be neglected and the exposure be made on an inflamed scalp, the irritation and itching present may lead to scratching, secondary inoculation of pus-cocci, and more or less severe impetigo. After the exposure a cotton cap should be fitted to the scalp and worn continuously, and every day a 1 per cent. ammoniated mercury ointment should be gently rubbed over the scalp. On the fourteenth day the scalp should be washed with a non-irritating soap, such as Castile soap, and the washing repeated daily until the hair has fallen out. When the defluvium is complete, about the twenty-first day, the child ceases to be infectious, and may return to school, a small brown skull-cap being worn until the hair grows. The after-treatment of the scalp, until the hair returns, consists in washing and massaging it daily with almond oil or weak boric ointment, to stimulate the circulation and so encourage the hair growth.

Depilation by Thallium Acetate.

The most recent method of depilating the scalp is by pure thallium acetate. Thirty years ago Sabouraud

attempted to produce a depilation of the scalp by injecting a solution of thallium acetate, but the treatment was so unsuccessful that it was abandoned. Recently, as the result of the experiments of Buschke and others, its use has been revived. It is given by the mouth, in a dose of 8 to 8.5 mg. per kilogram of body weight, the drug being dissolved in sugar water, and given on an empty stomach. About ten days after its ingestion the hair begins to fall out, and the depilation is more or less complete by the nineteenth day. The infected stumps do not fall so readily as the healthy hairs, so that the epilation may have to be completed by extracting them with forceps, or by applying strips of adhesive plaster. During the time in which the defluvium is taking place the scalp should be painted daily with 5 per cent. tincture of iodine, and a 6 per cent. sulphur ointment rubbed in.

As the thallium acetate acts through the sympathetic nervous system, and may cause severe general disturbance in the child, associated with drowsiness, irritability, pains in the joints, and weakness in the legs—symptoms which develop about the eighth day—it is advisable that the child should be kept in bed.

This treatment is only suitable in the case of young children up to 4 or 5 years of age, as in older children the dose necessary to cause the depilation is too great for safety. The treatment is less satisfactory than the x rays, and, owing to the dangerous general symptoms associated with it, should be employed with the greatest caution.

THE USES AND SOME ABUSES OF HYDROTHERAPY.

BY

R. G. GORDON, M.D., D.Sc., F.R.C.P.Ed.,
PHYSICIAN TO THE ROYAL MINERAL WATER HOSPITAL, BATH.

THERE is apt to be some mystification amongst practitioners as to the method which may underlie the madness which leads spa physicians to persuade their patients to be boiled, baked, or beaten, and induces these unfortunates to submit to these afflictions. Probably everyone is agreed that when a patient comes to a spa he benefits from the fact that he enjoys a change to a different climate, to a different environment, to different food, while he leaves his business and home worries behind him. Also he comes with the idea of having treatment, and therefore will do what he is told as to diet, exercise, and rest.

Hydrotherapy an Adjuvant in the Cure of Disease.

With all these factors I do not propose to deal. My subject is, What do the waters do? Now at once we must admit that they do not do what they once were said to do. For example, it is recorded that at one time ladies came in large crowds for the cure at the bath in order to be relieved of the distressing malady of sterility. Nowadays, alas! this is no longer the case. Indeed, it was whispered not long ago that a sweet young thing had approached a most austere physician, and asked demurely whether the ladies' douche was a suitable cure for the opposite condition. In those days spas were famous for the cure of the scurvy, the scrofula, and the gout—diseases which no doubt are still with us, but neither so common nor so picturesque in these degenerate days, when vitamins and soapsuds have displaced the baron of beef and the strong waters.

Nevertheless, even to-day, if the credulous practitioner consults the guide to any spa and observes the table of contents, he finds two headings—indications for treatment, and contraindications for the same. The first occupies several pages, the second probably two lines—those with acute fevers who might infect the inhabitants, and those in the last stages of heart disease who might die, thereby adversely affecting the vital statistics of the famous health resort. The practitioner wonders how he still retains his livelihood, since a ticket costing a few shillings will bring practically all his patients within reach of cure, and yet we sometimes hear the spa physician complaining that he

cannot pay for the upkeep of his third Rolls-Royce. Naturally the practitioner knows that all these diseases are not cured by hydrotherapy, and is apt to class spas and all connected with them as quacks and know-alls, whose professions are closely in correlation with their ignorance. Yet this is not by any means fair to spas, and leads to a neglect of what can be done by physical means of treatment.

The confusion all arises from the pernicious habit, introduced by no less a person than Galen, of thinking in terms of diseases. Any really honest physician—I cannot here speak for surgeons—knows he never cured a disease in his life by this or that special means of treatment. On the other hand, he does know that by his general management of the patient, both from the physical and mental standpoint, he so improved the latter's power of adaptation to his environment that he recovered from the various subjective symptoms and objective disabilities which for the sake of convenience the medical profession have agreed to call this or that disease. Let us therefore get rid of the first great abuse of hydrotherapy, the idea that it cures any disease. We must realize that in its proper sphere it may be a useful adjuvant to promoting the recovery of certain patients in virtue of what it does. If we wish to summarize this action we may include the effects of hydrotherapy under four heads: washing the patient within or without as the case may be; waste elimination—and if anyone should desire to change the spelling of waste I for one do not complain; alteration in the capillary circulation; and, fourthly, reflex effects from stimulation of the superficial nerve endings.

External Hydrotherapy.

Hydrotherapy may be administered externally or internally. Let us first consider the external application. In all seriousness I wish to lay stress on the word "wash." As we shall see in a moment, it is by elimination through the skin that hydrotherapists seek to bring about a large part of their results, and unless and until the skin is really clean adequate sweating cannot take place. It is doubtful if too much stress can be laid on the importance of the skin as an organ of elimination, and a very short experience of the maladies of middle life will convince anyone of the frequency with which the function of the skin is upset in one way or another. It is not so very long ago that every patient who came to a spa expected to be told that he was gouty, and what people expect they frequently get. Hence the old-time spa physician set up