degree of vital action, which is unable to maintain the permanence of that healing when the limb is restored to use. Similarly, when we have to treat a weak joint, the principle ought to flash upon us with unerring instinct; here is a case, we should say, for applying firm pressure and allowing moderate exercise. For the *ankle*, there is nothing better than an India-rubber bandage, put on from the base of the toes to the upper part of the leg. The bandage is far better than a so-called elastic anklet, because it supports all the muscles which move the ankle; it should make a gentle uniform pressure, without any sensation of squeezing, each fold slightly overlapping the previous one all the way up the limb. The *knee* should be enclosed during the daytime in an elastic support, *which should always be laced*, and which need not cost more than four or five shillings. The lacing allows the degree of support to be varied, according to the feelings of the patient and the amount of exercise he has to undergo. Equipped with this simple apparatus, the lower limb enjoys, as far as the upper part of the knee, a gentle and uniform pressure, which permits useful locomotion within restraining and salutary conditions.

The application of this principle to the *upper limb* is not difficult. A hand and wrist, when embraced by an elastic glove extending a little way up the arm, is competent to perform various feats of dexterous workmanship, which would otherwise soon cause aching and powerlessness. But what need is there for illustrating further such an obvious point of practice? If to be at work is the part which a healthy organ has to play, it is clear that too much rest cannot contribute to the perfection of that work, either in quantity or quality. That special condition which is called the "hysterical joint" is peculiarly amenable to the vigorous and helpful treatment of douching and pressure. For the douching, the use of the Bath waters is much to be commended, as the dynamic stimulus of their heat maintains an after-glow, which is a sign of more vital energy. And hysteria, if it mean anything, means a lack of this energy—a crippled volition, a sluggish blood-stream, and a general under-tone of life. The combination of firm pressure and moderate exercise fulfils, in this case, exactly what we ought to aim at: support to the mechanical apparatus of locomotion, and arousing and sustaining of vital function.

I heartily agree with what Mr. Roth has written about the importance of muscle-rubbing in infantile paralysis.* He insists that the superficial and deeper layers of muscles should be acted upon successively: firm circular friction is made on the same spot with the ball of the thumb, from left to right and from right to left, about ten times each way; pressure should be used at the same time with the thumb—the thumb being helped, if necessary, with the other hand. The fact is, however, that we ought to vary our manipulations according to the age and sensitiveness of the patient, and the duration of his malady. Thus, we use in one case stroking (*effleurage*), and in another kneading (*pétrissage*); sometimes percussion (*tapotement*) is most beneficial; and, now and then, it is best to trust to passive motion. The last three methods are particularly adapted to chronic inflammations. Hard kneadings crush and break up old hyperplastic tissue, and the detritus is passed into the lymph-stream; vascular congestions are emptied, and the vaso-motor nerves are mildly irritated. The friction of medicated substances may be an occasional aid, and among the best are mild iodine ointment and the liniment of iodide of potassium.

Rest and movement are, therefore, complementary to each other, both in physiology and in therapeutics. The analogy is as close as possible. Alternation of work and rest is the law of the human organism in health, and health could not be preserved without it. Disease may call for a prolongation of the element of rest; but it is a note of clinical insight to discover when the disease ends, or when sufficient health returns to justify the usual alternate rest and work. Continued work without rest could not be; rest continued too long is not only conceivable, but it is the object of this paper to illustrate it as one of the present dangers of therapeutic surgery.

THE TREATMENT OF GUINEA-WORM.

By FORBES DICK, M.D.,
Surgeon-Major Army Medical Department.

AT a time when the existence of filariæ in the blood and tissues is being laid before us as a possible cause of, or at least frequently associated with, elephantiasis, beriberi, and many tropical cachectic and local diseased conditions of the body, and when a discussion on the treatment of *filaria Medinensis* has taken place, it may not be inopportune to offer a short experience of the treatment necessary to the removal of this parasite. The general impression as to the entire available method

of surgical procedure for riddance of the worm would seem to be fairly summarised as regular winding and the application of antiseptic moisture. Before mentioning two other methods of extirpation, some impressions as to the behaviour of the worm, which may enable one the better to judge as to the most suitable method to adopt and mode to proceed, may be noted.

The worm is almost invariably found marching to the extremities, so that its anterior end is most distant from the heart. Should it be interfered with or naturally obstructed, as by the tissues surrounding joints, it may temporarily turn; but it prefers to double inwards to backwards. The worm is able to lay hold of the tissues with its anterior extremity, but not by its posterior. This can be easily seen if extraction on the double is for a moment delayed when all but completed, when the skin will show a puckering and drawing inwards opposite the channel through which the anterior extremity passes, which, on their catching hold, will rather break than yield; whereas this does not occur on withdrawal of the posterior extremity.

Preparatory to the formation of the vesicle, when the worm begins to pierce the true skin, in addition to local sensations, there is usually general cutaneous itching, and not unfrequently a roseolar rash.

The distensibility of the worm is considerable, and the process of winding is not necessarily the displacing of the entire worm, but only the coiling of so much of its extension as can be safely taken in before it gives way to the resistance offered by its vitality and the mechanical impediments of its length and the tissues surrounding it. It would seem as if an injured worm readily, if not immediately, exercises its powers of contractility to resist mechanical means of extraction; but a worm whose vitality is unimpaired may be entirely displaced before this force may be apparent, and before it can lay hold of the tissues with its mouth. The period after distension by winding necessary to a worm to accommodate itself would indicate the frequency with which the process might be repeated; and, as a matter of practice, it may be repeated every eight hours.

A dead guinea-worm may exist in the living tissues without producing any irritation. On one occasion, after removal of a guinea-worm from a Mahratta cart-driver, I was examining him with the view of ascertaining if others existed, when I came upon the characteristic whipcord running across the upper aspect of the left elbow. I pronounced it to be a guinea-worm, which he admitted, but stated that it had been there for two years, and was dead. An incision was made, and fifteen inches of a worm were withdrawn; it was firm and of a translucent appearance in greater part, but with milky opalescent spots at intervals.

Guinea-worm dies out in localities where tanks or ponds, equally used for drinking and washing, completely dry up during the year, and would seem to be endemic only where these do not do so. The way to stamp out the disease is obvious.

The Mahomedan *hakim* and Mahratta *dharavallah* seem to reason that treatment might be so applied as to stink the worm out, coax it out, pull it out, or suck it out. Upon the lines of these four ideas, I would refer to measures for its removal.

The mephitic theory, not being able to stand the test of physiological reasoning, has not been pursued in practice by me further than to test the value of the application of assafetida poultices as an incitement to the more rapid extrusion of the animal and an auxiliary to the winding process; but I am unable to endorse what has been urged by sufferers to me in their favour.

The coaxing-out theory would appear to be more reasonable. Observation of the natural behaviour of an uninterfered with mature worm, from the moment of extrusion to complete escape, during prolonged immersion in running water for instance, where it would be aided in its escape, and at the same time nourished and protected against the deleterious effects of exposure to the air, would doubtless prove that it is not so hard-and-fast a tenant as is supposed. The readiness with which an uninjured partially extruded worm will, in running water, come out six inches or more, and the fact that coils of the worm are frequently found on a poultice, are matters of frequent observation. In the application of poultices to aid winding and promote extrusion of the worm, that moisture should be thoroughly retained, so that there should be no drying up, is more important than the quality or kind of poultice. At the same time, I have to remark that brinjele poultices have been with me more fertile in showing coils of worm than linseed or other poultices. As a protection against the air, and to retain the consistence and vitality of the worm, glycerine and water painted on its extruded part seemed to be useful. A difficulty occurs in protecting the part from the accidents of rubbing, and especially during the sleep of the patient, when he is apt to displace the poultice and break the worm. But the winding process and all these aids to it are applicable only to the extruded worm. It is probable that in temperate countries, where the worm is unfrequent and not expected, this will be the most usual condition when

* BRITISH MEDICAL JOURNAL, June 14th, 1879.

relief is applied for; but in tropical countries, and especially in localities where it is endemic, the worm is usually first discovered like a piece of whipcord under the skin, or about to form its characteristic vesicle. Although the animal may give no perceptible indication of its presence, which it only determinedly does, as a rule, on its piercing the true skin, if looked for, it will almost always, except in very fat persons, be first found at one or several spots under the skin; and the larger and firmer it feels, so it may be considered the more mature (its immense ovicac being the more crowded with its active brood), and the readier to yield to one or other of the following methods of immediate extraction. These methods may be named (1) incision and traction, and (2) incision and suction, including suction without incision.

1. When the worm can be felt at more than one spot under the skin, the place to select for operation is, *ceteris paribus*, one-third from its anterior extremity, which, as has been stated, is furthest from the heart. The reason of this has already been indicated in the statement that the worm can lay hold of the tissues with this end, and an equality is thus endeavoured to be established between the amount of resisting force of each end. An incision is to be made above on a line with the worm, and, as it is approached, dissection must be made accurately, and with care not to prick it in the slightest. It is well to allow one inch or one inch and a quarter of incision through the skin, and three-quarters of an inch of dissection immediately above the worm. An aneurism-needle should now be passed round it, and it is preferable that two pairs of hands should be ready to steadily and continuously pull hand over hand, in opposite directions, without a moment's interruption, each end of the worm. In the majority of cases, when the needle is passed round the worm, a foot or more will come out on the double without perceptible resistance, but subsequently the resistance of the further tissues and the contractility of the worm come into play; but these obstructions, unless the distance of either end is too great, or the worm is much entangled in tendons or joints, will not prevent it from following on traction. What has to be guarded against is an interruption in steady pulling, which would seem to afford the worm opportunity to seize the tissues with its oral aperture. In 1868, in Thayetmyoo in Burmah, I first had occasion to observe the effect of cutting down and pulling out on the double a guinea-worm on the dorsum of the foot; but not till 1872, at Belgaum, Bombay Presidency, in the case of a battery with its followers infested with guinea-worm, from Ahmedabad, had I opportunities of studying the behaviour of the worm and employing this mode of extraction. Subsequently, a considerable field of practice was opened to me amongst the Garriewallahs passing through Belgaum to and from the Dharwar districts, who used to apply in numbers to have their worms removed. I then came to the conclusion that the worm, if looked for, would be first most frequently perceived under the skin, and that in this state it was easy of removal, and not liable to the accidents and wearisome defects of the winding process. In the case of the battery, an examination of the men twice weekly enabled me to pick out not a few cases of "worm" to whose hosts their presence was matter of much surprise, and who were then immediately operated on, their limbs surrounded with a bandage, and sent to duty without any necessity for admission to hospital. I found the native cartmen, on account of their leanness, much better subjects for the recognition under the skin of, and dissection for, the worm, and from one I was able to remove at one sitting three entire unbroken worms. When I failed to draw out both or either ends, the worm was wound up on the double, painted with a little glycerine and water, and covered with a poultice or wet lint. With the view of relaxing the hold of the animal with its mouth, I had begun to try the effect of an injection of salt water and santolin in water from a subcutaneous syringe into the tissues of its extruded portion; but experimentation in this direction was so short-lived as to be without result. But even with this occasional failure at immediate removal, a worm rolled up on the double is removable with more than double speed by the winding process; and, if careful protection against injury be afforded, one subsequent attempt may suffice to withdraw it.

2. I subsequently learned that the worm can be extracted by incision and suction, and probably by suction without incision. An operation by a native expert was thus described to me. There was a coil of worm to be felt under the skin, and for some days previously the worm had been lively and giving indications of piercing the skin. The operator rubbed the skin for some time over the worm with the points of his fingers, and then made two small incisions and applied a trumpet-shaped tube horn, about one foot in length, at the small end of which he sucked. He carried on this process of air-exhaustion for some time, recovering his breath from time to time, while he closed the tube with the point of his tongue. On removal of the instrument, a clot of blood with the complete worm was presented. I have not had opportunity to ascertain the extent of applicability of this process; nor

am I aware if any surgeon has either used a suitable instrument or demonstrated suitable cases in which to apply it; but this is doubtless the direction in which the best results at the smallest trouble to the patient will be achieved. The ordinary cupping-glass has been used, but there are obvious objections to suction by this instrument. The cases in which this process would be most suitably applied are probably all those where a local irritation of the skin indicates impending penetration by the worm, and it is also probable that, even after rupture of the vesicle, and so long as the vitality of the worm is not impaired by injury, exposure to the air, or discharge of its brood, it will be removable by suction. The effect of the preparatory finger-rubbing may be to stimulate the worm to vital action, but probably to break up and render easily penetrable the tissues between the bottom of the incision and the end of the worm.

I have not been able to come to any conclusion as to the value of galvanism as an aid to extraction. Military apothecaries in India have always suggested it, and this I believe was taught them at the College in Bombay. I applied it in two instances before incision and traction, without failure occurring. It is possible that its application before incision and traction, or incision and suction, would guarantee the success of these operations, and it is probable that traction after incision should be performed in this country under tepid water or a spray of steam.

The worm ought not to be looked upon in the light of the surgical idea of an obnoxious "foreign body" only, but of a vital foreign body whose natural development towards generation is simultaneous with an attempt to escape for this purpose from its host.

THERAPEUTIC MEMORANDA.

ON PILOCARPIN IN ASTHMA.

P. M. is a warder in H.M. Prison, Waterford (of which I am surgeon), and is about fifty years of age. His heart and lungs are perfectly sound, and neither father nor mother suffered from asthma. He had been for many years in the Royal Irish Constabulary; but, having one day fallen asleep in the open air, he awoke very much chilled; and from this he dates his first attack of asthma. He tried to carry on for some time, but the attacks becoming more severe and frequent, he had to leave the constabulary service. He then entered the prison service as warder; and his health, although he still suffered from occasional attacks, was much improved for about five years. This I attribute in great measure to the exceptionally high ground on which the prison is placed. Last October, however, he was again attacked by asthma, complicated by acute bronchitis of both lungs, and very nearly lost his life. He, however, recovered; but since this time has been a martyr to the disease, with occasional remissions for a few weeks, and from the 4th April, 1880, to the end of last June, had entirely to give up duty. I tried all the usual remedies: smoking of stramonium and datura tatula, bromide of potassium, lobelia, etc.; also, I am almost ashamed to say, some patent papers for burning—viz., ozone-paper, and Palmer's anti-asthmatic papers (the latter, it is only fair to state, in general giving prompt relief to the dyspnoea). He was about resigning his position in despair, when Dr. Berkart's valuable articles on the treatment of asthma fortunately appeared in the BRITISH MEDICAL JOURNAL; and on June 25th I gave him his first injection of pilocarpin, using Messrs. Savory and Moore's discs for the purpose, and commencing with one-twelfth of a grain. This had no perceptible result; so next day I increased the dose to one-fourth of a grain. This was followed by the usual effects—salivation and diaphoresis. There was no depressing effect on the heart's action, and he spent an unusually quiet night. Next day, and every day following for a week, I injected one-third of a grain with most beneficial results. One day, indeed, he suffered for a short time from nausea and vomiting; but this soon passed off. He resumed his duty as prison warder on July 4th; and he informs me that he now sleeps the whole night, and, with the exception of a slight "choky" feeling on awaking first thing in the morning, which soon passes off, says he "never was better in his life". I am at present giving him arsenic internally, and an occasional injection of pilocarpin. His appearance is much improved, and he is evidently increasing in weight.

WILLIAM L. MACKESY, M.B., L.R.C.S.I., Waterford.

ARSENIC IN SKIN-DISEASES.

THE perusal of Dr. Farquharson's paper on the use of arsenic in skin-diseases, published in the JOURNAL for May 29th, 1880, which has just reached me, leads to my sending a report of the following case, in which one point in Dr. Farquharson's paper is well borne out; namely, that it is by no means necessary to induce the physiological effects of arsenic in order to produce the curative effects of that drug. It is also a well-