

Elephantiasis arabum / by Sir J. Fayrer and D'Arcy Power.

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Fayrer, Sir Joseph, 1824-1907.

Power, D'Arcy, 1855-1941.

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Publication/Creation

[London] : [Smith, Elder], [1879]

Persistent URL

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Elephantiasis arabum.

By STR J. FAYRE, M.D., F.R.S., and D'ARCY POWER, B.A.

I AM indebted to my friend and former colleague, Mr. S. Bowen Partridge, Professor of Surgery in the Medical College of Calcutta, for the two specimens of this disease that I have the honour of submitting to the Society this evening. He describes them as follows:

"One, the smaller one, is a very typical specimen of the lymph scrotum. I removed it on 19th June, 1878, from a Hindoo beggar, æt. 25, named Gunga Vishnu. He was born in Hyderabad, but had resided in Calcutta for the last ten years. The tumour was of three years' growth, during which time he had irregular attacks of fever once or twice a month. During each febrile attack there was copious discharge of sometimes milky, sometimes sero-sanguinolent fluid, and he had got into the habit of giving himself relief by a rough sort of tapping, namely, pinching off a bit of distended integument with his nail and encouraging the fluid by pressure. The tumour after removal weighed 11 ounces. I operated *bloodlessly*, and he is making a good recovery, in fact, is nearly well."

"The other was an ordinary case (of elephantiasis), which I removed from a Brahmin, æt. 30, resident of Calcutta, a broker. It was of two years' growth, and weighed after removal 3 pounds 4 ounces. I operated *bloodlessly*, and he also is doing well."

"I examined the fluid in the lymphoid case on one occasion, not very thoroughly, however, and did not find any *filariæ*."

These, therefore, are examples of the two forms of elephantiasis that are so frequently seen in some parts of India,¹ notably in Bengal and on the sea coast where the sea air and the malaria unite.

I think they may be interesting to the Pathological Society if only as a supplement to the late communications on lymphoid disease, and I am enabled through the aid of Mr. D'Arcy Power to

¹ I find, for example, that in twelve years, from 1859 to 1871, I operated on 193 cases, of which 158 recovered and 35, or 18·2 per cent., were fatal. The tumours varied in weight from a few ounces to upwards of 100 lbs.

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illustrate the following remarks by an excellent series of microscopical preparations of sections of the structure of these abnormal growths.

The recent investigations of Lewis in Calcutta, Manson in China, and Bancroft in Australia, throw a new light on the etiology of elephantiasis, and seem to show that it is frequently associated with, if not caused by, hæmatozoa—*Filaria sanguinis hominis*.

Dr. Bancroft has detected the parent worm of this embryo, which was originally discovered by Wucherer in Bahia in 1866, by Lewis in Calcutta in 1869, in chylous urine, and most important of all by Lewis in 1872 in the blood of persons suffering from chyluria, elephantiasis, and other diseases; whilst Manson in China made the remarkable discovery that the mosquito acts as intermediary host, and therefore probably as a propagator of the parasite, depositing it in water after undergoing developmental changes in the insect tissues. It is then transferred to man, where becoming sexually mature, it sheds its embryo in swarms into the blood to become the source, it is said, of elephantiasis, and possibly several other morbid conditions.

Elephantiasis is a non-contagious disease, endemic in certain localities, generally intertropical, and near the sea coast, characterised by recurrence of febrile paroxysms attended by great suffering, inflammation, and progressive hypertrophy of the integument and areolar tissue, chiefly of the extremities and genital organs, and occasionally by swelling of the lymphatic glands, enlargement and dilatation of the lymphatics, in some cases by the coexistence of chyluria and the presence in the blood of certain hæmatozoa; the hypertrophy of the integument resulting in enormous enlargements of the extremities, scrotum or labia, accompanied by an albuminous deposit in the cells of the areolar tissue, and by degeneration of the muscular and osseous tissues.

Natural history.—It is endemic in India, the Malayan peninsula, China, Egypt, Arabia, the West Indies, parts of America, chiefly within the influence of the sea air—and probably, sporadically, all over the globe, perhaps excepting in extreme northern and southern regions. It has been observed that removal from the endemic area checks, whilst return there reproduces the disease.

It is totally distinct from elephantiasis græcorum (true leprosy), with which, the same generic term being applied to both, it is still sometimes confounded: as shown by V. Richards they are occa-

sionally coexistent. Of 636 cases recorded by him in Orissa forty individuals, or 6·29 per cent., were thus affected.

The ordinary form in which the disease presents itself is hypertrophy of the integument and areolar tissue of some part of the trunk or limbs, and notably of the legs and genital organs. The skin becomes enormously thickened by hypertrophy of all the fibrous elements of its structure, attended by the deposit of a quantity of albuminous fluid in the cells of the areolar tissue. The papillæ are prominent and much increased in size. The integument is formed into hard masses or folds, with a rugose condition of the surface, not unlike the appearance of an elephant's leg. The feet and toes are sometimes almost hidden, and the scrotum or labia form enormous outgrowths, often attaining great weight in the male, accompanied by large hydroceles. From the male they have been removed weighing upwards of 100 lbs.

The appearance of such a tumour, where the disease has its chief seat in the integuments of the penis, is well shown in fig. 1, or of the scrotum, in fig. 2. In some cases these are the seat of a dilated and turgid condition of the lymphatic vessels, which during the periods of vascular excitement, when the febrile attacks occur, give way and discharge a chyle-like fluid; in others the surface assumes a temporarily herpetic condition which weeps an acrid and offensive serous exudation.

These outgrowths are not to be regarded merely from their local point of interest. They are the result of certain climatic influences whose exact nature is not at present determined; though, considering the geographical range of the area where the disease is endemic, it seems probable that, whatever other cause may be at work, the so-called malarious influences play an important part in its production.

Lewis's discovery of hæmatozoa in the blood of those affected with chyluria, coupled with the fact that such subjects are also frequently, if not always, affected by elephantiasis with its febrile paroxysms, hypertrophied integument, and lymphatic disturbance, is not only very suggestive of a community of origin of these morbid conditions, hitherto regarded as different, but also tend to suggest an explanation of other imperfectly understood forms of tropical disease and cachexiæ.

It may be well, whilst recognising that hypertrophy of the integument may occur in other conditions, to limit the term

elephantiasis as now used, to the constitutional form of the disease that occurs within certain endemic areas, and which is manifested by paroxysmal febrile attacks, accompanied by a disturbed condition of the lymphatic system, chyluria, hæmatozoa, and progressive inflammatory hypertrophy of some portion of the tegumentary system.

Cases occasionally present themselves in which hypertrophy of the integument alone, or in combination with a greatly disturbed and dilated state of the lymphatics and glands, with or without a certain amount of constitutional disturbance, occurs; but although it may be so far correct to call such cases elephantiasis, it should be borne in mind that they are more local in character than the disease in malarious intertropical countries.

Elephantiasis affects both sexes, and all ages and conditions of life. No race is exempt, but it is much more frequent, relatively, in the dark than in the fair races, and it appears that men suffer in a much larger proportion than women.

Waring says that of 945 cases observed in Travancore, 716 were males, or 75·76 per cent.; whilst 229 were females, or 24·34 per cent., or about $3\frac{1}{2}$ males to one female. It must be remembered that prejudices against submitting females to treatment or examination exists strongly in the East, and may in some measure account for the disproportion.

It is most common in adult and middle life; and comparatively rarely begins in a very young child or an aged person; the period of life between twenty and forty being that most liable to suffer.

Some authorities deny that it is hereditary. Richards says he is persuaded that hereditary predisposition is frequently a leading cause of its manifestation. Of 236 persons 193, or 73 per cent., had one or both parents affected.

It not unfrequently occurs without much obvious injury to, or disturbance of, the general health during the intervals between the febrile attacks, which in some cases are few and slight. The appetite, spirits, and strength are good, the functions are all normally performed, and the only inconvenience is that due to the size and weight of the outgrowth. On the other hand, it is frequently quite the reverse; the rapidly recurring febrile attacks, the pain, exhaustion, suffering, and visceral complications, induce a state of cachexia and debility sometimes so serious as to render even surgical interference impracticable. Withal, it should be

stated that hepatic and splenic enlargements do not as a rule result from the persistence of the elephantoid fever alone, though not unfrequently, as a more direct result of malarious poisoning, they seriously complicate the evils of the sufferer's condition. It should be noted that albuminuria, as well as chyluria, is occasionally present.

In some cases, after the outgrowth has attained a certain bulk, it ceases to grow altogether, or increases slowly and insidiously without febrile disturbance, and in such cases the general health remains good, but there is generally a tendency to recurrence of the fever once or twice a month; when the parts affected become tense, hot, painful, and swollen, and often discharges a serous or lymph-like fluid, which may be acrid and offensive. Some tumours, on the other hand, are very slightly, if at all, so affected, and remain perfectly dry.

In all cases, however, some growth goes on, and even when, as occasionally happens, fever has ceased to recur, there may be a gradual, but slow and painless increase of the hypertrophy. The greatest variety and uncertainty characterise the duration and progress of the growth; sometimes it is very rapid, at others it is slow, with intermissions of activity and indolence of development.

According to Richards, the average duration of the disease, as deduced from the observation of 636 cases, was $11\frac{1}{2}$ years; he notes that the earliest age was nine years, whilst the latest at which he observed it was eighty years.

It appears from this that the disease has little influence in shortening the duration of life. Richards further remarks that the period at which it first appears is by no means limited, though it principally attacks persons between the ages of fifteen and forty years, and that he had never known an infant to be attacked: experience, however, proves that young infants are not exempt, though, in them, it is rare.

In certain cases there is some reason to believe that it interferes with the procreative powers, not only mechanically, but by the cachexia and debility induced. Men, however, who have long been incapacitated, have become fathers after removal of the tumour, and there seems no ground for concluding that the presence of the disease elsewhere than in the genitals, unless it be accompanied by exhaustion and debility, causes failure of the generative powers in

either sex; though it would seem that some women have a tendency to miscarry when suffering from elephantiasis.

Various causes are assigned for the disease in the regions where it prevails. Air, water, food, and, as it is frequent near the sea-coast, eating fish, have been credited with it. The proximity of certain forms of vegetation, the geological formation of the soil, have each or all been regarded as predisposing and determining causes. Climate and locality, combined with poor living, are doubtless predisposing causes; and it is probable that (as Lewis has suggested), like other disturbances of the lymphatic system, it may be found to be intimately associated with the existence of hæmatozoa.

Lewis describes the *Filaria sanguinis hominis* as a minute embryo, often exceedingly difficult to detect, but sometimes found in great numbers in the blood of persons suffering from chyluria and elephantiasis. It is enclosed in a tubular sheath, within which it elongates or shortens itself; the average diameter is about that of a blood-corpuscle, and its average length about forty-six times that of its greatest width, *i. e.* its diameter is about $\frac{1}{3500}$, and its length $\frac{1}{75}$ of an inch. It varies, however, slightly in size. It approximates more closely to *Filaria medinensis* embryo than to that of *Trichina spiralis*, though much smaller than either, especially in breadth.

It is impossible not to recognise the important bearing that these researches may have on the causation and pathology of elephantiasis, chyluria, and disordered conditions of the lymphatic system.

Further investigation may probably not only confirm this view of their origin, but throw fresh light on the subject, and perhaps show that the disease is endemic in certain districts where this particular filaria is indigenous and the mosquito most abounds, because the blood of the indigenous residents is fitted to be its habitat.

Dr. A. Webb believed that in some cases the disease had a syphilitic origin. This view, however, has not met with much support, nor is it founded on any very convincing evidence. As to its malarious origin it may be said that it is not always most prevalent where paludal fevers are most severe, and that though frequently complicated by elephantoid fever is not identical with malarious fever. It seems probable that, as in the case of dysentery, goitre, and other forms of disease, its occurrence may be in some way determined by the causes that give rise to intermittent fever,

such as we are wont, failing a more precise definition, to call malarious.¹

The subjects of this elephantoid fever, at least in India, are very strongly impressed with the belief that it is due to lunar influences and have the firmest belief that the paroxysms are synchronous with and dependent on the changes of the moon; as it undoubtedly does frequently happen that the febrile accessions and excitement of the local disease take place coincidently with lunar changes, it is not strange that a notion which is of such universal acceptance among certain classes, as the influence of the moon on vital action, whether in disease or health, should find favour where there is such apparent ground for believing in it. Such is the case, however, and one might as well try to persuade the sufferer that he had no fever at all, as that it was not so caused.

No race is exempt from the disease, but, whatever may be the explanation, the white suffer less than the dark races. It does occur occasionally, though very rarely, in the pure European in India, more frequently in those of mixed descent; most frequently in the native, and possibly by the operations of *culex* acting as an intermediary host in the genetic cycle of the filaria. It will generally be found that where it occurs in persons of apparently European parentage, there is a mixture, however slight, of dark blood. Waring says that the lower animals are not exempt; and even birds have been known to suffer from a swelling of one or both legs, which, though unaccompanied by fever, was in all respects similar to the hypertrophy of elephantiasis.

The disease occurs in different forms and in various degrees of severity. In some the attacks of fever are of repeated recurrence, from intervals of a fortnight to that of months; the increase of

¹ Dr. Bancroft, in Australia, suggested, and Dr. Manson, in China, discovered, that the mosquito is the intermediary host in which the embryo filaria undergoes development, and is by it transferred to the water, whence it finds its way into the body of man. This being the case, it is probable that the mosquito may play an all-important part in the dissemination of the disease; and such, Dr. Manson believes, is the case. Indeed, he appears to think that the geographical distribution of the disease is coincident with that of *culex*.

Whilst attaching the greatest importance to Manson's views, which receive support, both in fact and analogy, I am not yet prepared to admit that elephantiasis is so closely dependent on this insect. Further observation may suggest some modification of these views—may prove that the disease is not altogether dependent for its spread on this insect.

hypertrophy in the limbs or genital organs being rapid. In others the febrile paroxysms are irregular, of slight intensity, and the growth of the hypertrophy slow and less pronounced.

Long intervals of quiescence, varied by occasional increase of swelling, with very little manifestation of a febrile tendency, occasionally occur; in certain cases there is continuous increase, but unattended by any obvious disturbance of the general health.

The hypertrophy in most cases appears to be simply an increase in the natural elements of the part, the blood-vessels and lymphatics sharing in the growth. In some the lymphatics and lymph spaces are most concerned, giving rise to a condition described as "lymph varix" by V. Carter, and by me as *nævoid elephantiasis*. It has also been well described since by Manson, Macleod, and others, when it is frequently associated with chyluria, in which the appearance of a soft and fluctuating swelling, which when punctured gives issue to a white or pinkish fluid, very closely resembling chyle, is presented. The lymphatic glands also share in the enlargement. In other respects the progress of this is like that of the ordinary form of the disease. In the majority of cases of scrotal elephantiasis, one of the earliest symptoms is the formation of hydrocele.

In certain cases (chiefly occurring in Europe) the increase in size of the lymphatics occurs without more marked disturbance than occasional fits of excitement in the part, accompanied by increase of temperature and discharge of chyle-like fluid from the distended vessels; the loss of which, when profuse, causes considerable exhaustion. These cases, though perhaps not identical with, are very closely allied to, true elephantiasis.

The relation of filaria to this and other diseases requires further investigation, and it seems probable that we may obtain important results in regard to its etiology.

But little impression has as yet been made by constitutional treatment. Remedies, though useful during the febrile paroxysms, in moderating their severity and the excess of local action, have little power in preventing recurrence or in checking the onward progress of the disease.

A due combination of local and constitutional remedies, with rest, improved diet, and improved hygienic conditions, may, and no doubt do, materially control the progress of the disease and relieve suffering. No remedy, however, is so potent as change of climate. This, if effected in the earliest stages, may completely

arrest the disease, and perhaps, but this is doubtful, even disperse any incipient structural change that may have occurred.

This has occasionally been observed in rare cases in Europeans, that returning to Europe, they have, after a time, lost the disease, and almost, if not entirely, any hypertrophic changes that may have occurred. Natives of India improve, and the disease often ceases to progress, if they leave the endemic area during the early stages and reside in other and drier localities. Such a change, for example, as from Calcutta to Delhi, in the case of a native of Bengal, is often effective in arresting, if not in curing, the disease. It is constantly observed, however, that after the hypertrophic condition had become advanced, the paroxysms of fever are still liable to recur, even when the climate is changed, though they do so with less violence, showing that the tumour itself acts in some way as the source of a dyscrasia that perpetuates the recurrence of the febrile state, which does not cease altogether until after it has been removed. This, where the disease affects the genital organs, is possible. When the limbs are the seat of the disease, it is not so.

The onset of elephantiasis is frequently violent and attended with great suffering. There is high fever, intense pain in the lumbar region, the groin, the spermatic cords and testes, which become much congested and swollen, whilst acute hydroceles form. This is often attended with sympathetic vomiting, nausea, rapid and erythematous swelling of the external parts; and if the extremities be attacked, the swelling is often very tense and painful, accompanied by much effusion into the areolar tissue. The surface of the integument is much inflamed, and sometimes discharges a serous ichor or chyle-like fluid, according to the extent to which the lymphatics are involved in the particular case. There is much constitutional disturbance, increase of temperature, and often depressing nausea and vomiting when the cords are implicated, when the great tension and swelling of the cords is apt to dilate the abdominal rings so widely, that when it subsides after recovery, the patient is liable to suffer from hernia through the widened inguinal passages.

During the fever and excitement, salines and aperients, with local soothing applications, fomentations, and often opiates, are necessary to relieve pain and give rest. When this stage has passed, quinine is useful, and if anæmia exist it should be combined with iron, which may be all the more necessary if other indications of malarial cachexia be present. Many remedies have been recommended,

but there is no reason to believe that beyond their general action as tonics, antipyretics or febrifuges, they have any special effect on the disease. Richards thinks that he has seen benefit result from confining certain natives of Orissa to a milk diet; but it is to be feared that even this simple form of treatment will not always succeed.

It is impossible to over-estimate the importance and value of change of climate; in the case of Europeans it should be to Europe; in that of natives of the country to a district where the disease does not prevail—away from damp and malaria as much as possible; further, all measures should be resorted to that can tend to improve the general health and the condition of impoverished blood which no doubt exists.

Surgical treatment, where the hypertrophy is advanced, is often most successful in relieving the sufferer not only of the tumour, but also of the fever, which ceases when the outgrowth is removed; it would seem that the outgrowth acts as a source of dyscrasia, keeping up the recurrence of fever as long as it remains.

Tumours of the genital organs, sometimes of enormous size, are now removed with complete success, and, considering the formidable character of the operation and the magnitude of the mass—which has occasionally exceeded 100 pounds in the male—with comparatively small mortality.

The removal of a scrotal tumour is effected by incisions along the course of the cords and the dorsum penis. The cord, testicles, and penis are turned out by a few touches of the knife, and then reflected and held up on the abdomen, while the mass of the tumour is rapidly swept away by a few bold incisions in the perinæum. The removal should not occupy more than two and a half to three and a half minutes, unless any complication arise from adhesion of the testes to cicatrices, such as are often caused by the application of the moxa, a favourite native method of treating the disease in the early stages.

The numerous venous and arterial bleeding points should then be arrested by ligature or torsion, and the surface of the wound dressed with simple oiled lint and antiseptic dressing.

No attempt should be made to preserve flaps of integument either for the penis or testes. It is unnecessary, and almost certain to be followed by recurrence of the disease. The process of cicatrisation goes on rapidly, and in from two to four months all is closed in by

cicatrix tissue, which gradually perfects itself, and has no liability to become the seat of a recurrence of the disease.

Before commencing the operation, especially in the case of a large scrotal tumour, it is well to drain it of blood by placing the patient on his back, elevating the tumour on the abdomen for an hour or so before the operation, during which time pressure by a bandage (a modification of Esmarch's) may be used, and cold (ice) applied. During the operation the application of a whipcord ligature drawn tightly round the neck of the tumour prevents loss of blood, and it is very important that not more blood than can possibly be helped should be lost from the numerous bleeding points which are seldom controlled by fewer than twenty to thirty ligatures, often more. The shock of the removal of so large a mass is often severe. The patient should in such cases be left on the table until reaction has thoroughly set in, and care taken that at or soon after this period, no hæmorrhage should occur from small vessels which during the operation may have escaped notice.

In thin persons the abdominal tourniquet may be applied.

The process of healing occupies from two to four months, but when complete is very satisfactory. The genital organs are covered and protected, and the relief to the sufferer, who had for years been encumbered with a tumour of perhaps thirty to sixty pounds weight, may be imagined! The procreative powers are also frequently restored. Of 193 cases of scrotal elephantiasis operated on in the Medical College Hospital in Calcutta between 1859 and 1871, 158 recovered, thirty-five, or 18·2 per cent., proved fatal, the causes of death being pyæmia, embolism (cardiac and pulmonary plugging), diarrhœa, tetanus, shock.

The tumours removed varied in weight from a few ounces or two or three pounds to 110 lbs. The ages of the patients ranged from 20 to 50 years.

It has been suggested that elephantiasis of the limbs may be treated by ligature of the main artery. It is difficult to understand on what physiological principle this mere temporary starvation of the limb should have any efficacy in permanently removing the local expression of a constitutional disease. That it might temporarily ameliorate it, there is no reason to doubt, but the same effect could be produced by pressure on the limb or its artery, or by continuance in the recumbent posture; and such, indeed, has been the result of experience in certain cases in India. Ligature of the femoral

artery, which was necessarily accompanied by protracted rest in bed, the application of bandages, and the general diminution in size that would follow such an ordeal, were followed by a considerable reduction in the size of the leg. The improvement, however, was temporary, and the disease returned to its original dimensions on the patient's resuming the usual mode of life.

Report upon two specimens of scrotal tumour.—The specimens immediately after removal had been placed in a tin canister containing strong alcohol. The tin was hermetically sealed, and was forwarded to Europe. The tumours were transferred directly after the tin had been opened into strong alcohol. A small portion of each, situated at the upper part of the scrotum 1·25 inches behind the raphæ, immediately below the projection of skin which had been reflected from the urethra, was then cut off and placed in absolute alcohol for twenty-four hours. A portion of the tissue which had been thus hardened was then embedded in a mixture of paraffin and oil, and was cut in the usual way with a razor wetted with spirit. The sections were afterwards stained in picro-carmin, when the muscles and epithelial structures were stained yellow by the picric acid, whilst the nuclei became carmine coloured, as well as in hæmatoxylin—anilin blue or anilin violet. The specimens were then put through the ordinary dehydrating and clarifying processes, and were finally mounted in Canada balsam. The sections were made in transverse and longitudinal directions.

After preparation by the method described the sections were examined microscopically with one of Hartnack's microscopes, the combinations used being the ocular No. 4 and the objectives 4 and 7. In the microscopical examination the points to which the attention was most carefully directed were the epidermis, the rete Malpighii, the distribution of pigment, the subcutaneous tissue, the hair-follicles, the glands, the blood-vessels, the lymphatics, and various foreign bodies. The nerves were not seen to any great extent, owing in part, no doubt, to the method by which the tissue was preserved.

Taking the points to be noticed *seriatim*, we find that—

The epidermis is not modified, at least noticeably; it is not materially thickened, yet it is thicker than in the case of the second tumour. The cells are less flattened, and their nuclei are somewhat more perceptible, whilst the line of demarcation between the

epidermis and the rete Malpighii is sometimes less well defined than in the smaller tumour, the epidermis thus appearing to run more gradually into the rete.

The rete Malpighii is of considerable thickness, whilst its constituent cells are distinct and well-marked, the nuclei being seen with the greatest clearness, otherwise it does not appear to have undergone material change.

The pigment is evenly diffused throughout the vertical row of cells which constitute the lowest layer of the rete, extending slightly into the upper part of the subcutaneous tissue.

The subcutaneous tissue is very greatly thickened; it contains a very large amount of unstriped muscular tissue, arranged in narrow bands vertically as well as transversely. The subcutaneous tissue is chiefly composed of areolar tissue intermixed with elastic fibres; numerous free nuclei appear to be present in the neighbourhood of the muscular bundles and in the upper layers. The subcutaneous tissue is very compact, and appears to be entirely devoid of fat.

The hair-follicles and hairs appear to be quite normal.

The glands are the sebaceous and sudoriparous.

The sebaceous glands are small, but are otherwise normal.

The sweat glands are large and somewhat complex; they appear to be situated at different heights in the tissue, some being nearer whilst others are further from the surface. The sweat ducts are therefore of varying lengths, but are of small diameter.

The blood-vessels are very numerous, and are of large size.

The lymphatic channels are fairly numerous, some of them being of considerable diameter.

In the smaller of the two tumours the lymphoid form.

The epidermis is not modified, at least to any great extent; it forms only a thin layer, consisting of stratified cells, whose boundaries cannot be distinguished.

The rete Malpighii is of very considerable thickness, but whether this is due to hypertrophy or is the normal condition of the part in the skin of an Indian it is impossible to state without examination of the unaffected skin from the same part in a healthy subject, and this we regret that we have been unable to obtain.

The pigment does not appear to be either increased or lessened. It appears to be deposited in some parts between the epidermis and the rete Malpighii, as well as in the deeper layers of the latter.

The subcutaneous tissue is throughout very greatly hyper-

trophied. It is chiefly composed of areolar or ordinary white fibrous tissue intermixed with a little elastic tissue. Unstriped muscular tissue appears to be developed in some parts to a very much larger extent than in others; as a rule, however, it is only sparingly present. In many of the sections there is an exceedingly large development of lymphoid tissue. Fat is also present in considerable quantity.

The hair-follicles are considerably enlarged and thickened, the enlargement being chiefly due to hypertrophy of the root sheath.

The sebaceous glands are greatly hypertrophied, and are filled with a lymphoid tissue.

The sudoriparous are likewise largely developed, not only in regard to the diameter of the tube, but also to the complexity of its coils. That this deviation from the ordinary type is not normal may be seen by comparing it with the condition of the glands in the larger tumour.

The blood-vessels are large, and may in many cases be seen to be filled with corpuscles.

The lymph channels are large.

Small, highly refracting, angular bodies, which stain deeply, are seen in several of the sections; they are situated in the subcutaneous tissue. The importance and relations of these bodies we are at a loss to comprehend. The sections have been most carefully and systematically examined for *Filaria sanguinis hominis*, of which, however, we were at first unable to find any trace either in the adult or larval form. In this task, one of no small labour, we must acknowledge the great courtesy and kindness of Dr. Cobbold, who assisted us in the most liberal and painstaking manner, and from whose observations we have derived the greatest benefit. Upon a more careful examination of the tissues we have come to the conclusion that certain nuclear-looking bodies may possibly represent sections of the filariæ. These nuclei, which have been already mentioned, were at first supposed to belong either to lymph corpuscles, to the large flat cells present in subcutaneous tissue, or to unstriped muscle. On further investigation, however, they are found to be small semicircular bodies, not unlike portions of a red blood-corpuscle, and of about the same diameter; they stain deeply, and are enclosed in a sheath, which is apparently structureless in transverse section. They are present in enormous numbers, and are found chiefly in the larger tumour. They appear also to be

present in the smaller tumour. In one of the blood-vessels they are also present, though they are not seen there with great distinctness.

The tissue of the scrotum is somewhat difficult to examine, first, on account of its having been preserved wholly and for somewhat too long a period in strong spirit; and, secondly, because there are, at least, five structures which might be taken to resemble a filaria in transverse section. Thus, the small hair-follicles when the section of the hair has dropped out; the ducts of the sebaceous glands, more particularly when they are filled with secretion; the ducts of some of the sweat glands; sections of the contracted blood-vessels; and, lastly, sections of the lymphatics, might all be readily mistaken for such a structure.

February 8th, 1879.

HENRY POWER,
D'ARCY POWER.

*Postscript to Sir Joseph Fayrer's and Mr. D'Arcy Power's paper
on elephantiasis.*

Comparison of the normal with the pathological appearances.—Since the above paper was written Sir Joseph Fayrer has succeeded in obtaining the scrota from two Indians unaffected with elephantiasis. These specimens were preserved and treated in exactly the same manner as those previously described.

Microscopical examination showed that, in the case of one scrotum, a large quantity of fat was present in the deeper part of the corium and subcutaneous tissue. To such an extent was this developed that the fat occupied 0·247 millimètre when the entire thickness of the skin was 0·38 millimètre. As is well known this appearance is exceedingly unusual, inasmuch as the skin of the scrotum and penis in common with that covering certain other parts of the body is generally stated to be wholly destitute of fat. The occurrence of fat has already been noticed in the case of the ordinary form of elephantiasis. It must, however, in all probability be regarded as normal, and indicating a diseased but still common condition, since two subjects out of four exhibited this change, whilst in the other two specimens no trace of fat cells could be detected.

The epidermis in the diseased scrota does not appear to have undergone any alteration, for in both the normal and pathological conditions it is represented by a thin layer of stratified cells.

The rete Malpighii seems to be less developed, the individual cells being less distinct and less numerous in the healthy tissue. In elephantiasis, therefore, this portion of the integument becomes slightly hypertrophied.

The pigment layer in the two diseased specimens is lighter in colour than in the normal forms, but this change may be due to an individual peculiarity.

The corium in the healthy tissue is composed superficially of a close network of connective tissue in the ordinary way, with accompanying muscle-fibres and elastic tissue. It contains the hair-follicles and sweat glands. The deeper portion is much less dense, and contains a large proportion of involuntary muscle-fibre. The papillæ of the corium are of large size, and are frequently compound.

The hair-follicles are not unusually large in the normal scrotum, and they are situated between the superficial and deep layers of the corium, or in the fat when this is present. In the unhealthy tissue, however, the hair-follicles have undergone a marked increase in size, due chiefly to an increased development of the outer root sheath.

The sebaceous glands are neither prominent nor well marked in the healthy skin, and it is in this point that the greatest difference appears between the sections of the healthy tissue and those made from the one affected with the ordinary form of elephantiasis. In the latter case not only are the glands themselves of enormous size, but the component cells are very large and distinctly defined.

The sweat glands in every section are large and very complex.

The blood-vessels in the healthy tissue are fairly numerous, but they are developed to a very much larger extent in the diseased specimens. The same remark will apply to the lymphatics.

The bundles of involuntary muscular fibres are present in considerable quantity, though not in such numbers as in the cases of elephantiasis.

Nuclei are also present in large numbers, especially in the tissue immediately below the rete Malpighii, but they are generally elongated or angular, and appear to belong to the connective tissue and muscle. In no case so far as has been observed do they present the peculiar semicircular appearance which was noticed in some of those belonging to the diseased tissue.