related I have lost but 3 from the operation, and these were all amongst my earlier operations. This gives a mortality of just over 9 per cent. I feel sure that, with growing experience, we shall be able to reduce that mortality still further. If so, there is no reason what that condition known as catheter life should not in the main disappear. To some, it is true, it proves a matter of but slight inconvenience, but there are few who would not gladly resume their more youthful habits of micturition, even at the risk of an operation, if they realized to the full the dangers they are incurring from sepsis, quite apart from the weakness and lack of energy which is brought on by frequently rising at night to empty their bladders. If the best results are to be obtained, the operation must be performed before the bladder becomes septic.

REFERENCES.

¹ *Archiv f. Pathologie*, cxxvi, 139. ² *Annales des Maladies des Organes Genito-Urinaires*, 1898, vol. xvi, p. 797. Hypertrophies et Neoplasies Epitheliales de la Prostate.

THE LIFE-SPAN OF FILARIA MEDINENSIS.

By SIR PATRICK MANSON, M.D., K.C.M.G., F.R.S.,

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OPPORTUNITIES for ascertaining with approximate accuracy the duration of the life-span of the guinea-worm are rare. The annual recurrence of a guinea-worm season in some of the endemic districts affected by that parasite suggests that at least one year, less the three to six weeks necessary for the preparatory metamorphosis in cyclops, must elapse between the date of infection of the human host and the appearance of the mature, embryo-emitting worm at the surface of the body; and, further, that the season of infection is correlated to an annual recurrence of certain hydraulic and thermic conditions favourable to cyclops and to the evolution of the parasite in that crustacean. But it is hard to prove this incontrovertibly from observation in the endemic regions, seeing that it is generally impossible in these localities to exclude the possibility of the infection having taken place at some date prior to or subsequent to the commencement of the postulated year.

As the following cases avoid this source of fallacy they are worth recording.

CASE I.—On May 9th, 1903, I saw, with Dr. Jollye, of Alresford, a gentleman who had just returned from India. He was the subject of multiple guinea-worm infection. His story was that he had been shooting in the Deccan from February to March, that a guinea-worm had presented in the latter month in his left leg and had caused so much suffering from abscess and sloughing that he had been obliged to stop shooting and had come home. He arrived in England a few days before I saw him. Meanwhile two more guinea-worms had made their appearance, one in each thigh. At the date of my visit both worms were alive and readily emitted their young on the skin in their neighbourhood being douched with cold water. This gentleman believed that he had acquired the parasites in India, but on my pointing out to him the improbability that animals which might be 3 ft. in length could attain that size in the course of two or three months he informed me that he had been travelling in Uganda and on the Upper Nile in the spring of the previous year.

CASE II.—Four days after I saw this patient Dr. J. A. Mansell Moullin brought to me a gentleman from whose right axilla a guinea-worm was protruding. The parasite had been partly extracted by rolling out; the foot or so of worm still in the tissues was easily withdrawn. It contained, as shown by microscopic examination, living embryos. I asked the patient where he had been travelling the previous year. He replied that he had been in Uganda and on the Upper Nile in the spring of 1902, and had not been in the tropics since. "Strange," I said, "only four days ago I saw a patient with guinea-worm who had also been travelling at that time in Uganda and on the Upper Nile." "Was his name —?" "Yes," I replied. "Why," said the patient, "he was my companion from Entebbe to Khartoum."

Manifestly these gentlemen had become infected in the same place and about the same time—that is, approximately, a year before their worms presented at the surface of their bodies.

Subsequently one of the patients was good enough to supply me from his diary with the following particulars about dates and route:

We were in East Africa in 1902, mostly in the neighbourhood of Lake Navaisha, from February 10th to March 10th, and on the road between Entebbe and Gondokorro (where the water was very bad in many places), from March 17th till May 25th, and on a Nile boat between Gondokorro and Khartoum from May 25th till June 10th.

THE Organizing Committee of the Universal Exhibition to be held at St. Louis has announced that it will refuse admission to all articles actually or potentially hurtful or dangerous. In this class are included patent medicines the formula of which is kept secret.

The FitzPatrick Lectures

ON THE

HISTORY OF MEDICINE.

Delivered in the Royal College of Physicians.

By JOSEPH FRANK PAYNE, M.D.,

Fellow and Harveian Librarian.

LECTURE II.

[ABSTRACT.]

BESIDES their native herbal medicines and the more scientific therapeutics and pathology which they had borrowed from the Greeks, the Anglo-Saxons made a large use of charms and what are called magical rites in the treatment of disease. It would be a mistake to suppose, as is sometimes thought, that this was their only or chief method of treatment, or that it was in any way peculiar to the Anglo-Saxons. A great deal of it was taken from the later Greek and Latin medical writers, who show a credulity and superstition quite equal to that of our ancestors.

Again, the magical and superstitious medicine lasted much longer than the Anglo-Saxon period. It went on all through the Middle Ages up till recent times, and is not extinct even at the present day. But it is by no means characteristic of our own country. Indeed, the numerous collections of "folk lore," or what is called "folk medicine," from the peasantry of Continental countries, especially Germany, show that ancient superstitious beliefs of this kind are more prevalent and more inveterate among them than they are among our own people. What is most remarkable is not only that the same general beliefs have survived, but that the very same forms of words have in many cases been preserved for centuries, and may be even now recited in certain places. There is distinct evidence that formulae like those here considered were used by people calling themselves doctors at the end of the eighteenth century, and probably even later.

It is very difficult to define precisely what is meant by magical medicine or what by charms. But broadly, they imply a belief in some supernatural efficacy belonging to verbal formulae recited or written under special circumstances or with reference to special objects. Originally, it would seem that this belief implied also the belief in spirits, demons, or some supernatural beings, who could be either conciliated or coerced by the use of certain words. The belief in supernatural personages gradually waned; and in the case we are now considering heathen or mystical conjurations were to a large extent replaced by Christian prayers and benedictions, while the occult rites of unknown origin were superseded by the services of the Church. But the belief in the supernatural power of certain words in curing disease remained.

Without pretending to a complete classification, the various magical processes and charms may be brought under the following heads:

I. Prayers or invocations addressed to medicinal herbs, or to supernatural beings supposed to have power over them.

II. Special verbal formulae or observances employed in collecting the medicinal herbs or other natural remedies.

III. Prayers and mystical words repeated over the patient or written and applied to some part of his body, with or without ordinary remedies. Such words are very often in a foreign tongue unknown to those who use them, such as Latin among the barbarous or uneducated, Greek or Hebrew among the Latins, and so on; sometimes in a quite unknown language, which have been called Ephesian charms. But they may also be in the vernacular.

IV. Direct conjurations or exorcisms addressed to diseases as if they were evil spirits.

V. Narrative charms—that is, trivial stories relating to sacred or legendary persons who suffered or did something analogous to what the patient is suffering from.

VI. Material magic—that is, the attribution of magical power to certain objects, such as plants or parts of animals, stones, or engraved gems, called amulets, these objects being not used medicinally, but applied in some way to the patient's body.

VII. Transference of disease by a magical formula or ceremony to some animal or material object, or in some way to the outside world.

Examples of all these can be found in older medical literature,

as well as in the Anglo-Saxon books, and also throughout succeeding centuries.

The actual origin of these beliefs and practices is extremely obscure, and cannot here be considered. Doubtless there was an element of traditional popular belief in each particular country; and also as regards European medicine, an introduction of Oriental superstitions. But they formed no part of the regular classical medicine of the Greeks and Romans till the period of its decline. Hippocrates, Galen, Aretaeus, Celsus, are entirely free from such superstitions. The first Greek medical writer of any repute who introduced the incantations into the practice of medicine was Alexander Trallianus, who has already been referred to as having been a great authority with the Anglo-Saxon leeches. Alexander has been blamed, and justly, for thus lowering the character of Greek medicine. He was, however, followed in this by later Greek physicians and by those late Latin writers to whom the Anglo-Saxons were much indebted. The Latin work of Marcellus Empiricus, older than Alexander, which appears to be partly founded on Roman popular medicine or folk lore, was the great repertory of superstitious rites and formulae.

On examining the Anglo-Saxon charms a considerable number are found to be directly taken from or founded on passages in the late Latin writers; a few are suggestive of passages in the Greek physicians.

From all these sources it is easy to find examples of the various kinds of magical medicine above spoken of:

1. The invocation of herbs is found in Alexander Trallianus. For instance, he recommends as a remedy for gout that the sacred herb hyoscyamus or henbane should be dug up with certain precautions and addressed as follows:

Sacred Herb! I summon thee to the house (of my patient) to stop the rheum of his feet, etc.

I conjure thee by the great name Jaoth Sabaoth.

The Anglo-Saxons did not use prayers addressed to the herbs themselves; but benedictions and prayers to God or the saints were often substituted. But there are instances of certain formulae of conjuration. For instance, the herb mugwort (*artemisia*) had the reputation of preventing a man who carried it with him from getting tired on a journey. But it was to be gathered before sunrise with these words, "*Tollam te, Artemisia, ne lassus sim in via.*"

2. Special words and mysterious rites were often made use of in gathering medicinal herbs to give them special virtue. The formulae used by the Greeks and Romans being generally heathenish, the Anglo-Saxons often substituted Christian prayers. For instance, for gathering celandine the directions are: "Delve round the root and take it up with thy two hands turned upwards, and sing over it nine paternosters, and in the ninth, at the words 'Deliver us from evil,' snap it up, etc."

There are also some very remarkable Anglo-Saxon "lays," that is, poems celebrating the virtues of herbs. In one of them Wodan is referred to, showing that it must have originated in heathen times.

In many of the directions for gathering herbs, the essential thing was to name the sick man and his father. This was a popular belief among the Romans, as quoted by Pliny, and is found in Marcellus Empiricus. For the old ceremonies the Anglo-Saxons often substituted prayers and litanies. Thus, before gathering certain herbs, litanies of the saints and the paternoster were to be sung in church. Then the clergy or choir were to go three times round the herbs intended to be gathered singing the same. The herbs were to be brought into the church with the same song, and twelve masses sung over them in honour of the twelve apostles; then they could be used.

3. The most important part of magical medicine consisted in mystical formulae, conjurations and prayers, either pronounced over the patient, or else written out and in some way applied to his body. Originally, perhaps, most of them were intended to be sung, as shown by such words as *carmen* and *incantamentum*. These were well known among the Greeks, and many instances might be quoted from the poets, from Homer downwards, of wounds being healed by the use of magical words. Alexander Trallianus recommends for the gout that a certain verse of Homer (*Iliad*, ii, 95) should be written on a gold leaf, while the moon was in the sign of Libra, wrapped up and applied presumably to the patient's joints. Why this particular verse was chosen does not appear; it would not seem specially appropriate.

The Anglo-Saxon charms were mostly in Latin, sometimes with corrupted Greek or possibly Hebrew words. One charm is described in the book itself as Scottish, but according to

the editor the words belong to no known language. On the other hand, in another case, the apparently unintelligible words turn out to be corrupt Irish. In some instances the words seem to be without doubt mere rhyming or jingling nonsense, as for instance, "Gonomil, orgomil, marbumil, etc.," words which were to be sung into the right ear of a man, but the left ear of a woman, in case he or she had swallowed a worm in drinking water. The use of such charms was often combined with the use of drugs. In one prescription a drink made of twelve herbs, over which seven masses had been sung, was to be drunk out of a church bell with the accompaniment of singing certain psalms; also the mass priest was to sing a formula of benediction over the patient. This was for a "fiend-sick" man—that is a demoniac or lunatic. Sometimes charms were written on the "holy dish" or sacramental paten, and washed off with holy water, which was to be drunk.

4. Exorcisms addressed to diseases as evil spirits are not common. An example is a charm for a "strange swelling" (what was meant by this is hard to say). The sufferer was to sing a paternoster, draw a line round the sore, and say *Fuge diabolus! Christus te sequitur*. There is an elaborate charm against agues and fevers, in which they are adjured in the name of Christ to depart. A form of words against "poccas," that is, small-pox, is remarkable because this word is taken as the equivalent of variola, since it has been doubted whether the old English writers used the word "pox" in this sense. Many charms of this kind are found in late Latin writers, and also in Alexander Trallianus. In some the demon of disease was threatened with the wrath of Solomon.

5. *Narrative Charms*.—This class of charms was used by the late Romans; for instance, by Marcellus Empiricus, and probably in still earlier times. In the Anglo-Saxon books they are always Scriptural stories or else Christian legends. One of the most extraordinary, or most absurd, is against toothache. It relates how, when Christ was sitting with his disciples, Peter looked sad, and when our Lord inquired the cause he complained of toothache; whereupon Christ uttered a long adjuration addressed to migraine or any other pains not to harm the servant of God. This was, of course, to be repeated. The story of Longinus, the traditional name of the centurion who pierced the side of Christ upon the cross, was told in order to take away a stitch in the side. To hasten childbirth the story of the raising of Lazarus with the solema words "Lazarus come forth!" was thought efficacious. All these three narratives and others like them were used not only by the Anglo-Saxons, but frequently in the Middle Ages, as shown in the various medical MSS; and some are found in Gilbertus Anglicus.

6. *Amulets Derived from Natural Objects*.—As a preservative from fits a fox was to be caught, its canine tooth knocked out while it was alive, and the animal then set free. The tooth was to be wrapped in a fawn skin and carried on the body. The eyes of a crab removed from the living animal were good for eye affections, if hung round the neck. In all cases the animal was to be kept alive. For headache certain herbs were to be bound on the head with a red fillet. There are many similar prescriptions in Alexander Trallianus and Marcellus Empiricus.

7. *Transference of Disease*.—It is a common belief in many parts of the world that disease is something which can be got out of the sick man, and transferred to something outside. The Anglo-Saxons had mysterious rites, sometimes combined with forms of words, for this purpose. Often the disease was transferred to running water. Thus, for a certain skin disease it is ordered to score or scarify the neck after the setting of the sun; to pour the blood silently into running water, to spit three times, and say, "Have thou this evil and depart away with it." Or, again, a hazel or elder stick was to be taken, a name written upon it and stained with blood. Then it was to be thrown over the shoulder or between the thighs into running water. In another case an oaken stick was to be stained with blood, then four strokes made with it towards the four quarters of heaven. Then it was to be thrown away and a certain charm recited. This was a charm against "flying venom," or, in modern phrase, airborne contagion, meaning, apparently, epidemic diseases.

LATER BOOKS OF ANGLO-SAXON MEDICINE.

One book contained in the three volumes of *Leechaoms* differs a good deal from the rest. It is that which bears a Greek title, *περί Διδάξεων*, interpreted as meaning "Of Schools of Medicine." This title, however, only refers to the first

chapter of the work. The rest consists of a collection of medical receipts, differing from those in the other books of the Anglo-Saxon library. It is entirely free from charms and superstitions, and the prescriptions are for the most part simpler than those of the Anglo-Saxon leeches. This treatise has been shown by a German philologist, Dr. Max Löwenack, to be based upon a Latin work belonging to the first period of the school of Salerno—namely the *Practica* of Petroncellus or Petronius, a work written probably about A.D. 1035, and printed in the *Collectio Salernitana*. One fragment has been traced to the writings of another Salernitan teacher, Gariopontus, of the same period. But these identifications do not account for the whole of the Anglo-Saxon text, and it does not seem that this was translated directly from the Latin. The actual origin of the work is therefore still somewhat obscure.

The date of this manuscript is the first half of the twelfth century, probably before 1150. It shows that the Anglo-Saxons were beginning to profit by the teaching of the school of Salerno before that school was influenced by the Arabian medicine. It also shows that the Anglo-Saxon medicine, like the other early English written literature went on for some time after the Norman Conquest.

To this same period belongs another MS., which contains a version of the *Herbarium* of Apuleius later than that previously spoken of. This is not included in Mr. Cockayne's *Leechdoms*, but has been published in Germany, as edited by Herr Berberich. This MS. is referred to the middle of the twelfth century, about 1150. It therefore touches on the extreme limit of Anglo-Saxon written literature—and, indeed, is described by Herr Berberich as "early middle English"—but, like the last-mentioned work, shows the long continuance of Anglo-Saxon medicine after the Conquest.

This work closes the early English medical library, and, as the celebrated Anglo-Saxon Chronicle came to an end in 1155, the general literature and medical literature of our early ancestors reached their limit about the same time.

The Croonian Lectures

ON

MUSCULAR MOVEMENTS AND THEIR REPRESENTATION IN THE CENTRAL NERVOUS SYSTEM.

Delivered before the Royal College of Physicians of London.

By CHARLES E. BEEVOR, M.D.,

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LECTURE IV.

[ABSTRACT.]

ASSOCIATION OF MUSCLES IN ACTION.

THE fixation action of muscles was described by John Hunter in his Croonian Lectures on Muscular Motion, delivered before the Royal Society in 1777,¹ where he stated that there is in every animal, therefore, a fixed point from which the parts of the body take their principal motions. In the human body this fixed point seems to be in the joints of the thigh bones, which point being in the middle of the body must be common to the extremities..... Besides this there are many fixed points, so that the body is to be looked upon as a chain of joints whose general centre of motion is in the joints of the thighs.

This centre of motion corresponds to the point of centre of gravity described by subsequent observers. The position of the fixed point depends on the attitude of the person and the place where his body comes in contact with the ground and where it gets a firm foundation. We have to distinguish in any movement between the muscles which take part directly in that movement and the muscles which are used to fix the joints which lie between the joint which is actively engaged and the fixed point or base on which the structure works. Again these fixing muscles have to be separated into those which always take part in the strong movements irrespective of the posture of the person, which we may call essential, and those which depend on the position of the person and where his fixed point or base is, which we may call postural. I should therefore describe the muscles taking part in any one movement as:

- (A) Prime movers.
- (B) Synergic muscles.
- (C) Fixation muscles: (1) Indispensable or essential, (2) postural.
- (D) Antagonist muscles in occasional movements.

The principal or prime movers are the muscles which directly produce the action required, and are called by some authors the "agonists"; the synergics are the muscles which, as I have previously stated, are brought into the combination when a prime mover has, by passing over two or more joints, two or more actions of which only one is required; the synergics neutralize these undesired actions. The fixation muscles, as I have already described them, are: (1) Those which are essential to the movement in all postures, and which are not influenced by the position of the person; and (2) those which only act to prevent the equilibrium of the trunk being disturbed by the movement, and which I have therefore called "postural." The antagonists produce the movement which is diametrically opposed to that of the prime movers.

[Dr. Beevor described and criticized the classifications of Winslow and Duchenne, and proceeded as follows:]

John Hunter² stated in his Croonian lectures that there is no one known muscle in the body that we can throw into action separately and independently of the collateral effects of others. Duchenne³ has expressed the opinion that partial muscular contractions do not exist in Nature, that they are only produced artificially by means of faradization, and Dr. Hughlings Jackson has laid down the dictum that "nervous centres know nothing of muscles, they only know of movements." This in other words means that the ordinary individual has no power to make any one muscle contract by itself, he can on requiring to attain a certain object order a certain movement, but the mechanism by which that movement is produced and the muscles which are required to perform that movement, and the order in which they act is not known to the brain. Having illustrated this point by reference to the movements of extension of the wrist by means of the extensors of the fingers against resistance when the muscles came into action in a definite order, which apparently cannot be altered, and to the intimate association between the principal movers and the synergic muscles in the extension of the thumb, Dr. Beevor expressed the opinion that an individual has no power voluntarily to leave a muscle out of a combination to which it belongs.

Another question, he said, is, Is it possible to voluntarily add to the list of muscles which are told for a certain movement, or to supplement when one is paralysed? It has been said that the anterior portion of the deltoid can replace part of the functions of the pectoralis major, but it must be remembered that the only function to which this could refer would be the action of advancing or adducting the humerus, but the deltoid is naturally associated with the clavicular part of the pectoralis major in this movement, and if the pectoralis were paralysed by a peripheral lesion, the deltoid would continue to act exactly as before, the movement being imperfectly carried out; one muscle would not replace the other. On the other hand, when the muscles proper to the movement are paralysed, the difficulty may be overcome by a series of other movements. I remember seeing a case with paralysis of the flexors of the elbow in a man, who managed to produce flexion of the elbow by advancing the humerus, rotating it out, and by this means letting the forearm be flexed by gravity, but here the muscles were not supplemented by other muscles, but an entirely different group was thrown into action by which the desired change of position was obtained. I think, therefore, that although by exercise and training it may be possible to alter the arrangement of the muscles taking part in any movement, the inability of a patient with lead paralysis to induce the extensores carpi to act out of their proper order is against this possibility. By mechanical means, such as transplantation of tendons, first recommended by Nicaladoni⁴ in 1882, it is possible to take a muscle out of one group and put it into another, and I have had the opportunity of seeing the results of some of these cases under the care of Mr. Muirhead Little⁵ and Mr. Tubby⁶ at the National Orthopaedic Hospital.

From a consideration of the above statements I think that one is justified in saying that for every voluntary movement there is a definite number of muscles, usually two or more, which come into action in a definite order which cannot be altered, and the individual members of which cannot be omitted, and cannot be supplemented except perhaps by long training and exercise or by operative procedure. In every voluntary movement there is a minimal number of muscles