physical symptoms of chronic abdominalism, and presumably the mental symptoms also, to "auto-intoxication." This doctrine has been so much discussed in recent years that I do not propose to weary you with a further consideration of it; but although there may be an element of self-poisoning in some of these cases, I feel bound to express the opinion that it will not account for all the symptoms. Nor have I any new theory to offer. There remains, when all is said and done, a good deal of mystery about the chronic abdomen, and it needs further study—especially, perhaps, from the psychological side and from the standpoint of the relation of the vegetative nervous system to the emotions.

TREATMENT.

In the treatment of the chronic abdomen the most important thing is to catch the patient early. If she has once set her feet on the slippery slope which leads to successive operations she is undone. A timely "fattening cure," followed by the provision of an efficient abdominal support, regulation of the bowels by the mildest laxative, supplemented if necessary by simple enemas, an abundant but unirritating diet, soothing of the nervous system by bromides—these are the physical measures. On the mental side the patient should be encouraged to take up some definite occupation which will provide her with an interest outside herself.

In an incipient case such means may suffice, but if one has to do with a confirmed example of the disorder one's task is much more difficult. At the outset the question of operation is sure to arise. The patient will probably have already had her appendix removed at least, and if any further operation is decided upon it is best, I believe, to make it of a purely exploratory character. The incision should be large enough to permit of a thorough investigation of all the viscera—for even the chronic abdomen may be the seat of organic disease—any bands or kinks may be dealt with, but short-circuits are to be avoided at all costs, and organs should not be removed unless they are demonstrably diseased. Whether fixation of the colon is worth while I do not know, as I have not seen a sufficient number of cases in which at least two years have elapsed since the operation. Immediate benefit is no criterion of permanent relief, for, as I have already pointed out, these patients are always improved for a time by a new treatment. Colectomy of any degree is a grave proceeding not to be undertaken lightly. In any case a thorough exploration may at least satisfy the patient's mind as to the absence of serious organic disease, and so pave the way for a healthier mental attitude in future.

Apart from operation, the physical treatment will proceed on the same lines as in an early case, but success is much more difficult to attain.

There remains the mental side to be dealt with. What is to be desired here is something which will dislocate the patient's mind from its perpetual revolution round her umbilicus and set it open to wider horizons. The war cured some and loss of fortune and bereavement have cured others; but these are drastic remedies which it is not within our power to prescribe. Suffragettism undoubtedly was the salvation of some abdominal women, but the suffragettes are now experiencing the tragedy of fulfilled ambition, and probably many of them have relapsed. Marriage, and the advent of a child—even an adopted one—are often potent remedies, and the fancy religions—Christian Science, Theosophy, Spiritualism, and so forth—may be ways of escape. One of my patients, an ex-nurse (and ex-nurses furnish the most malignant types of the chronic abdomen), once consulted a palmist, who after looking at her hand said, "If I were your husband I would take a stick to you!" The advice was sound, and might often, perhaps, be effective. Whether the methods of M. Coué will help these patients remains to be seen. The difficulty is that many of them, despite their protestations to the contrary, really lack the will to be well, and their daily litany is: "Day by day, and in every way, I get worse and worse."

I confess, therefore, to some feeling of despair as regards the treatment of the more advanced cases of the chronic abdomen, and on the whole I am inclined to think that the less one has to do with them the better both for one's peace of mind and one's professional reputation. Yet, unfortunately, these cases are likely to increase in the future, for as civilization gets more complex, as fewer women in the upper classes marry, or, being married, have fewer and fewer children, all the factors which favour the development of chronic abdominalism will be more intense. It is a bleak prospect.

Hunterian Lectures

ON

MAN'S POSTURE: ITS EVOLUTION AND DISORDERS.

GIVEN AT THE ROYAL COLLEGE OF SURGEONS OF ENGLAND

BY

PROFESSOR SIR ARTHUR KEITH, F.R.C.S., F.R.S.,
CONSERVATOR OF THE MUSEUM.

[*Abstracts.*]

LECTURE VI.—THE EVOLUTION OF THE HUMAN FOOT.

WHEN dealing with the evolutionary history of the spine, thorax, abdomen, and pelvic floor we found that the human condition was the last of a series of steps which are seen to begin in the small orthograde ape, the gibbon. The missing evolutionary stages are not those which bridge the hiatus between the great anthropoids and man, but those which fill the gap between the orthograde gibbon and the older pronograde condition seen in monkeys. When, however, we came to consider the structure of man's groin and, to lesser extent, his pelvic floor, we found that the evolutionary gap was seen to lie between the human and the anthropoid stages. This is the case as regards all parts of man's lower extremities; more particularly is it true of his foot. Even in the gorilla, the anthropoid which shows the nearest approach to man in the use of its lower extremities for support of the body, the great toe is free and used as a grasping thumb.

The central evolutionary problem of the human foot is: How did the thumb-like great toe lose its independent nature and become merged in the metatarsal series? By what process did the free mobile great toe of the prehensile primate foot come to form the principal part of the rigid plantar arch of man? The transformation is all the more remarkable when we remember that a prehensile hallux was present at the first dawn of the primate type of animal, and has retained this form throughout the long history of the order, with the exception of that aberrant being, man.* In him the hallux has reverted to a primitive position in the metatarsal series.

Has the Foot of Man been Evolved from one which was Prehensile?

At the very outset this question must be asked and answered: What evidence is there that the human foot has passed through a prehensile stage? The human foot has the same structural composition as the ape's foot—the same bones, the same muscles, the same ligaments; it is only their arrangement and form that have become modified in the human foot. If in the higher primates we compare bone after bone, muscle after muscle, ligament after ligament, we find in every case a series which leads from the type seen in the pure prehensile foot of monkeys to the stage reached in the human foot. Take, for example, the three contrahentes muscles to be seen in the sole of the monkey's foot; they serve to approximate the heads of the metatarsal bones. In the sole of the human foot they are represented by mere fibrous strands; the story of their degeneration can be read in the feet of the orthograde apes. They are still present in the gibbon; they are in the retrograde stage in the chimpanzee, they are almost as much reduced in the foot of the orang and gorilla as in that of man. The interosseous muscles of the monkey's foot do not lie between the metatarsal bones, as in the human foot, but on their deep or plantar aspect. In the gorilla and orang they are set as in man; in the gibbon they occupy an intermediate position. Yet as the interosseous muscles appear in the foot of the human embryo they are set and arranged as in pronograde apes. In the course of development they take up their intermetatarsal position. We shall cite, when dealing with the structures which maintain the arch of the human foot, other evolutionary links which make us certain that the human foot is but the culminating stage in a series foreshadowed by anthropoid feet.

Flexion Lines of the Sole.

No more convincing evidence of the prehensile history of the human foot can be cited than the flexion lines to be seen

* See Professor Wood Jones's *Arboreal Man*, 1916.

on the sole of the baby's foot. Line for line they agree in their relative position and form to the flexion folds to be seen on the sole of the gorilla's foot. The sole of the newly born child has the inverted anthropoid position—an adaptation for grasping and climbing. The articular face on the internal cuneiform, on which the base of the hallux moves, is set obliquely in the foot of the human infant, thus recalling the original prehensile nature of the great toe. The astragalus of a baby has, in its general shape, and in the form of its articular surfaces, many points in common with the astragalus of the great anthropoids. Seeing how different is the use to which the great toe is put in man and apes it is wonderful that the muscles which serve the one can be made to answer the needs of the other. Only one hallucial muscle has been radically transformed in man—the short flexor of the great toe has had a second belly added to it. The other muscles have undergone a mere change in size and attachment.

The Shaping of the Human Foot.

When we take all these points into consideration there can be no hesitation in believing that the human foot has been evolved from one which was prehensile, and that stages leading on to the human form are to be seen in the feet of anthropoid apes. And yet in the development of the foot of the human embryo a prehensile stage—an ape-like foot—is at no time to be seen. If it were true that the human embryo, at every point of its development, recalled, or passed through, an ancestral phase, then we should expect to see a simian stage in the developing human foot. But the law of recapitulation is only partly true; development is a double process—it is recapitulatory, but it is also anticipatory. We see the two processes proceeding side by side and masking each other; atavistic features appear in the developing foot side by side with the new ones. The human foot was never shaped by any effort made by the growing or grown anthropoid ape, as Lamarck supposed, but arose for the first time in the embryonic foot—under the influence of the growth mechanism which controls the development of that organ. Hence it is that, up to a stage corresponding to the point reached by a human embryo at the end of the second month of development, the foot and toes of man and ape are much alike—the toes radiate forwards from the tarsus and all are united in a common web. At this stage the arrangement of digits is really that seen in five-toed mammals; it is an ancient form. Even at this stage the great toe of man is predominant in thickness although not in length. Then at the stage where the webbing disappears from the digits of the foetal ape and the great toe assumes its separate status, the foot of man goes on retaining the great toe in the primitive adducted embryonic position. The adducted position of man's great toe came about by arresting development at an early point of digital differentiation. It will be found to be true of nearly all the structural features which are distinctive of man's body that they make their first appearance in the embryonic or foetal stages of apes; subsequently they blossom to their full in man's body. Such foetal structures are not, as so often thought, recapitulations of ancestral phases; they are new evolutionary creations.

Functions of the Foot.

Such evolutionary studies as I am now laying before you are of interest and of use to medical men only if they throw light on how the human foot came by its functions as well as by its form. How did the supple prehensile simian foot become modified to serve as a lever—the "stepping-off" lever—so necessary for man's progression? In cases of "flat-foot" the lever becomes broken, and we know well how crippling this disaster can be. If we examine the foot of a pronograde monkey, or even of the orthograde gibbon, we see that it is in reality a Y-shaped prehensile organ. The stalk of the Y is represented by a short tarsus; the limbs of the Y represent the opposed digital and hallucial elements of the grasping organ. The hallucial limb is directly articulated on the tarsus, for its metacarpal bone serves as a phalanx in the grasping foot. In the digital limb of the grasping foot the four metatarsal bones are fixed with some degree of rigidity to the tarsus; the mobile toes articulate on the metatarsal segment of the sole. Thus, taking no notice of the great toe in the meantime, we see that the primate foot is made up of three functional segments—tarsal, metatarsal, and digital—each serving its own peculiar use in the prehensile foot. Now if we note what has happened to these three elements in the feet of the higher primates, as set out in the following table, we see that,

Table Showing the Proportion formed by each Element of the Foot in Man and Allied Primates.

	Proportion of Tarsus.	Proportion of Metatarsus.	Proportion of Phalanges.
Semnopithecus (monkey)	28 per cent.	33 per cent.	39 per cent.
Gibbon	28 "	30 "	42 "
Orang...	27 "	33 "	40 "
Chimpanzee	32 "	33 "	35 "
Gorilla	39 "	28 "	33 "
Human infant	46 "	31 "	23 "
Man (adult)	52 "	30 "	18 "

in all, the proportionate length of the metatarsal element remains nearly the same; on the other hand, as the digital element shortens, the tarsal element increases in length and strength. If we measure the length of a monkey's foot, from the heel to the tip of the longest toe—which is the middle digit in old-world monkeys—we note that while the tarsal element makes up only about 28 per cent. of the total length the digital or phalangeal element makes up 39 or 40 per cent. At the other end of the series we find the foot of man, in whom the tarsal element makes up more than 50 per cent. of the length while the digital element provides less than 20 per cent. of the length. Between these extremes lie a series of intermediate forms. In the proportion of the three elements the foot of the gibbon differs but slightly from those of the monkey; the evolution of the orthograde posture did not affect the proportion of the elements in the foot. With the evolution of the heavy bodies of great anthropoids the supporting or tarsal element underwent a great relative growth. This is not so evident in the orang because the foot has become specialized in a way opposite to that which occurred in the human stock; in the orang the hallucial element of the foot atrophied while the digital element underwent a great development. In man the hallucial element became predominant, the digital greatly reduced. Were it not for the form represented by the foot of the gorilla there would be a very decided break in the series leading from the anthropoid to the human foot. The proportions seen in the infant's foot helps to bridge the gap between the gorilline and adult human types. Thus we see that in shaping the feet of the higher primates Nature has gained her ends by increasing the tarsal or supporting element and diminishing the digital or grasping element. The human foot represents the climax of an evolutionary movement which began long ago in an anthropoid ancestry.

History of the Great Toe.

Turning now to trace the evolutionary history of the great toe or hallucial element, we note that in pronograde monkeys the length of the great toe is about 55 per cent. of the length of the middle or longest toe. In this measurement is included the length of the metatarsal bones as well as of the phalanges. Measured by the same standard, the great toe of the gibbon is 67 per cent., that of the gorilla and of the chimpanzee 68 per cent., while in man the great toe is usually equal to or greater than the length of either the second or third toe. The great toe of man has reached the 100 per cent. standard, but it must be remembered that this result has been attained as much by the reduction of the phalangeal elements of the four outer toes as by a real growth on the part of the constituent bones of the hallux. Nevertheless, the peculiar features of the human foot have been worked out by an overgrowth of the hallucial element as well as by the incorporation of this element in the metacarpal series.

Evolution of the Plantar Arch.

We come now to the most difficult part of our inquiry: How did man come by that peculiar feature of his foot—the longitudinal plantar arch? When the arch collapses, as in cases of flat-foot, the chief breakdown occurs at the mid-tarsal joint—particularly between the head of the astragalus and the rest of the tarsus. Now in pronograde monkeys the mid-tarsal is a flexible joint; when a monkey is "stepping off" from a branch it will be noticed that, while the heel is being raised, the hallucial and digital limbs of the foot still maintain their grasp; the heel is raised at the mid-tarsal joint. Although the orthograde gibbon retains the flexibility of foot seen in pronograde apes, one no longer sees a pure flexion movement taking place at the mid-tarsal joint. In the great anthropoids the tarsus has gained in strength and rigidity, yet movements of inversion and eversion still take place at the mid-tarsal joint with the greatest freedom. The tarsus of the great anthropoid serves the purpose of a lever, but there is no plantar arch. Even in the gorilla, the least arboreal of the great anthropoids, there is no arch; the sole of the foot is applied flatly to the branch which supports the weight of the animal. All the muscles of the sole and digits are concerned in grasping. The foot thus fixed to the branch becomes a base from which the muscles of the leg act in supporting and balancing the weight of the animal. Every muscle which has a tendon ending in the foot becomes a mover and balancer of the leg. It is only when we note the manner in which the chimpanzee, and particularly the gorilla, applies its feet when walking on the ground that we realize the possibility of the grasping anthropoid foot becoming converted through a series of serviceable intermediate stages into a supporting plantigrade one, such as we see in man. We obtain further confirmation of the possibility by observing the manner in which an infant learns to use its feet in walking. The anthropoid traits, very recognizable in the feet of Neanderthal man, lend countenance to the same line of reasoning. The gorilla, when on the ground, rests the weight of its body on the outer margin of the inverted foot. The foot is maintained in the inverted position by the anterior and posterior tibial muscles. The inverted margin of the tarsus is the beginning of a plantar arch; it is maintained in position by the action of the tibial muscles, which now assume a postural function. They have become postural muscles and work against their opponents—the long and short peroneal muscles—which also have now assumed a postural rôle. Between the invertors and evertors the foot is steadied, and the in-turned position of the sole maintained. The feet, being no longer grasping structures, become props on which the body has to be balanced.

In the application of the sole of the human foot to the ground in walking we can recognize three phases: first the heel comes in contact; then the weight of the body is brought to rest on the outer margin of the foot, and on the transverse pad of the sole; lastly, in stepping off, the weight of the body is thrown on the front part of the foot, particularly on the phalangeal elements of the great toe. In the gorilla there is the same sequence of events: the heel is applied first; the weight of the body comes to rest on the outer margin of the inverted foot; lastly, in stepping off, the toes, particularly the abducted great toe, are applied and used as a fulcrum. Now the inversion of the foot has raised the inner margin of the tarsus on which the great toe of the gorilla is hinged. We have only to suppose the incorporation of the metatarsal element of the great toe as a member of the metatarsal series of an inverted anthropoid foot to obtain the arrangement of parts which go to make up the longitudinal plantar arch of the human foot. The incorporation of the first metatarsal takes place, as already mentioned, in early embryonic life. The evolution of the plantar arch was dependent on an assumption by the tibial muscles of a postural supporting action.

We have spoken as if the simian great toe had been adducted to the other metatarsals during the evolution of the human plantigrade foot. There is evidence that the approximation was brought about as much by the bending inwards of the four outer metatarsals as by a bending outwards of the great toe. In the anthropoid foot the outer metatarsals continue the axis of the os calcis; the great toe continues in the main axis of the astragalus. In the human foot the great toe still maintains the direction of the astragalus but the outer metatarsals are turned inwards from the axis of the os calcis.

From these facts we infer that in the evolution of the human foot all the elements of the great toe became hypertrophied and that the hallux soon became functionally important in the act of stepping off. The four outer toes underwent a retrogression and their metatarsals were approximated to the hallux as much as the hallux to them. Much depended on the hypertrophy of all the elements of the great toe and on the retrogression of the phalangeal elements of the four outer digits. The growth of the tarsus, particularly of the heel, and the retrogression of the outer toes have already given a semi-humanoid character to the foot of the gorilla.

C

Evolution of the Supporting Structures of the Sole of the Foot.

The tendon of the plantaris muscle plies over a synovial groove on the heel of pronograde apes and ends in the plantar fascia. In the orthograde gibbon the heel has grown through the tendon; the plantar aponeurosis, being cut off, now forms a supporting structure for the sole. This is the case in all orthograde primates; in all of them the plantaris has become a vestigial muscle; it is more frequently present in the calf of man than in the leg of any kind of anthropoid, which probably is due to the overgrowth which has overtaken all the muscles of man's calf.

In the cutting off of the plantar aponeurosis and its fixation to the heel we see the first step in the evolution of the set of structures which help to support the sole of the foot. Another evolutionary change is seen in the short flexor muscles of the toes. In man all four bellies of this muscle rise from the heel and end in the toes; they serve to support the arch. In the prehensile, flexible foot of a monkey only the belly to the second toe arises from the heel; the other three have their origin from the movable tendons of the long flexors of the toes. In the great anthropoids the belly of the muscle to the third toe has also shifted to the heel; in a certain proportion of orangs and gorillas the muscle to the fourth toe has also gained an attachment to the heel; in man only has the belly to the fifth toe been shifted. Here we see further adaptations for plantar support. The action of the short flexor muscles has been changed by a migration of their point of origin.

Further changes of the same kind are seen in the strengthening of the quadratus plantae of the human foot; in only man is found the inner head of this muscle. Mention has already been made of the migration of the interosseus muscles to a position between the metatarsal bones. Such a position gives them power to brace together the metatarsal elements of the foot. In the human foot the internal ligaments of the tarsus and of the tibia and tarsus have been strengthened.

Flat-foot.

The evolution of the human from a grasping foot was necessarily attended by the creation of a neuro-muscular mechanism for maintaining the plantar arch. The muscles which became adapted for this new function were those used for inverting, everting, and fixing the tarsal elements of the prehensile simian foot. Slight modifications in the tendinous insertions of the anterior and posterior tibial muscles made them efficient supporters of the instep; the evertors, the long and short peroneal, required no alteration to serve their new purpose. A new evertor—the peroneus tertius—came into being in the human foot; it arose by the separation of the outer part of the long extensor of the toes. Every stage of its evolution is represented in the variations which occur profusely in the leg of modern man. The grasping muscles of the sole became converted into postural supporters of the arch. Flat-foot occurs when the postural function of the supporting muscles breaks down. Why the postural muscular mechanisms of the human body are so apt to become disordered we do not know. When that of the plantar arch breaks down the human foot reverts to a condition comparable to that seen in the grasping arboreal foot of anthropoids. The mid-tarsal joint becomes again freely movable; the metatarsal elements of the foot become turned outwards or everted—just as they are in the foot of an anthropoid when seizing a branch. Flat-foot is a reversion also in this sense: it results from the loss of a recently evolved function —one which man has attained late in his history.

Hallux Valgus.

Of all the primates, only man suffers from disorder and disease of the condylar joint of the great toe—the joint between the head of the first metatarsal and the base of the proximal phalanx. A knowledge of man's history helps us to understand why he has become the subject of this crippling deformity. Even in the gorilla, the most terrestrial of man's next-of-kin, the great toe is constituted so as to serve as a grasping thumb. Its metatarsal bone is freely movable, having the tendons of two muscles inserted to its base—the tibialis anticus and peroneus longus. Three short but stout muscles—the abductor, flexor brevis, and adductor obliquus —bend the proximal phalanx and thus assist in securing the arboreal foot grasp. The terminal phalanx is bent by the long flexor. Now in man all of these muscles have been retained, but their actions have been changed. The metatarsal bone has become stabilized as part of the arched lever of the foot; the two muscles attached to its base—the peroneus longus and tibialis anticus—have become postural in function, assisting in maintaining the arch of the foot. The two terminal phalanges, in place of being the movable parts of a grasping digit, have become the chief part of the fulcrum or base from which the human foot steps off; with each step the weight and force of the body falls on this joint of the great toe. Hence, with the evolution of the human foot the muscles which act on the phalanges, particularly the short muscles acting on the basal phalanx, had to take on a new rôle—they had to adjust and maintain the position of the hallucial phalanges at every phase of the "step off." Hallux valgus results from a breakdown of the neuro-muscular machinery which guards the condylar joint of the great toe. No doubt ill fitting boots contribute to this breakdown, but when it is remembered that the action of muscles which cross a joint are largely regulated by stimuli which arise within a joint, we see good reason for suspecting that the initial factor in the cause of hallux valgus arises within the joint itself. We do know that people of certain constitutions are particularly prone to disorders in the ball joint of the great toe.

The Normal Position of the Great Toe.

One last point as regards the "normal" position which the human great toe should hold to the rest of the foot. From a study of the footprints of native and unshod races, and also of English infants and children, I realize that a healthy and unblemished great toe may vary in position between two extremes. If on a footprint a line be drawn along the inner border so as to touch the impresses of the margin of the heel and of the ball of the great toe, what may be called an "inner directional" line is obtained. If a similar line be drawn along the outer border of the imprint—from heel to the outer margin of the foot-pad—an "outer directional line" is obtained. In healthy normal children and natives the great toe may be parallel to either outer or inner line, or may lie at any angle between these lines. The inner direction is the more simian, but which is the more liable to become the site of hallux valgus I have no evidence.

A CASE OF HYPERPIESIA.*

REPORTED BY

D. C. L. VEY, *M.C.*, B.A., M.B.CANTAB., M.R.C.S., L.R.C.P.,

HOUSE-PHYSICIAN, UNIVERSITY COLLEGE HOSPITAL.

With Commentary by

SIR CLIFFORD ALLBUTT.

FREQUENT as this malady is amongst the well-to-do classes of life, it is—so far as my experience goes (C. A.)—scarce in hospital practice. Moreover, by the duration of the malady, and its consistency for some long period with good health, the story is often broken or incomplete. When the patient has to seek advice, he may pass from one physician to another; in private practice, for various reasons, necropsies are rarely obtained, and when obtained may be very perfunctory. Consequently, until Dr. Batty Shaw made, in his recent book, a solid and valuable contribution to its pathology, our stock of fully observed instances of hyperpiesia was very scanty.

A patient, a man aged about 60, died during last Lent term in the Addenbrooke's Hospital with arterio-sclerosis, a very large heart, and a systolic pressure of 210 mm. But little was known of his history, and before death there had not been much time for an adequate series of biochemical and other observations. The necropsy was made by Dr. J. F. Gaskell, who reported that the kidneys (of which I made a naked eye inspection) were quite normal. Death was by cardiac defeat and its effects. The case was clearly proved to be one of hyperpiesia.

In this default of instances it seems well therefore to add to our store of evidence by publishing the following notes by Dr. Vey of a case of this kind at University College Hospital. Dr. Vey, then house-physician, watched the patient very closely and made ample clinical notes during the last fifteen months of his life, including the laboratory reports and the *post-mortem* findings. Dr. Vey described the case in his thesis for M.B. at Cambridge; and, with his permission, I have made (I hope not too drastic) an abridgement of his notes. I think that I have not omitted any relevant abnormal feature or reaction.

Report of Case by Dr. D. C. L. VEY.

A male patient, aged 61, a clerk, was admitted into University College Hospital, under Sir John Rose Bradford (and later under Dr. Sidney Martin), five times in fifteen months. The first occasion was on September 3rd, 1921. He had complained of dyspnoea on ascents for ten months, and of swelling of feet and abdomen for nine months. Previous personal history good; no bad habits.

On admission, respiratory rate 32, much general oedema; liver full; heart large and heaving; pulse regular, large in volume, rate 50 to 72. Systolic blood pressure 200. Urine very scanty; specific gravity high; albumin abundant; a few epithelial cells and leucocytes; no casts. Under treatment, which included digitalis, he improved greatly.

Second admission, December 28th, 1921; symptoms as before, but drowsiness also. Bled to 24 oz. Heart still larger, beat in seventh left space in mid-axillary line. Second aortic sound much accentuated. Blood urea, on two occasions, 20 and 37. Blood pressure (systolic) 210. Improvement as before. Blood pressure on discharge 180.

On the third and fourth admissions similar reports and results. Fifth admission, November 8th, 1922: oedema and dyspnoea worse than ever; but pulse regular, full and hard, rate 80. Radials thick; blood pressure 190. Heart as before. No murmurs in any area. Urine in first twenty-four hours 34 oz., and about the same for next seven days; specific gravity 1018; some albumin. Headache and drowsiness. Respiration at times tidal. No twitchings. Multiple incisions of legs answered well, relieving symptoms; and blood pressure fell a little to 180–200. Urine now generally reached to 70 oz., and on each of two days to 120. Blood urea on admission was 48 mg. per 100 c.cm.; a fortnight later it had fallen to 24. During a period of three weeks the daily percentage and the totals of urea in the urine ranged between 1.5 and 2.35; the total amount averaged about 40 grams. Chlorides averaged 3 grams daily. Two urea concentration tests were made on November 15th and December 5th. On the former date the concentration was 1.6 per cent. at the end of the first hour (vol. 160 c.cm.), and 1.7 per cent. (vol. 140 c.cm.) at the end of the second hour. On the second date 2.05 per cent. (vol. 224 c.cm.) was noted at the end of the first hour, and 2 per cent. at the end of the second hour.* There never had been any pyrexia, and the patient, as before, was doing well, when he had a sudden rigor; he was distressed and speechless; the temperature rose to 104.8°, he became unconscious, and died. The cause of this event was not apparent at the necropsy. A few days before death recent small haemorrhages had been reported in the right fundus oculi, and a single larger one in the left.

The diagnosis during life was very difficult. "Chronic parenchymatous nephritis" was suspected, though the extreme cardiovascular symptoms seemed hardly to confirm the suspicion. Dr. Goodhart in the *post-mortem* room, before the necropsy, expressed the opinion that "the kidneys would be found normal, or nearly so."

The relevant features of the necropsy were briefly as follows: Heart, 39 oz.; left ventricle much hypertrophied and dilated, and right ventricle also. Aorta, traces of old syphilis; many patches of atheroma, calcareous and ulcerative. Pulmonary artery and branches dilated, stiff on section, and showed atheromatous patches. Spleen large and fibrotic, with internal thickening of the arterioles, and fat droplets. Liver nutmeg, and some arteriolar thickening. Kidneys each 9 oz.; except that the renal artery was stiff, no abnormal appearance to the eye. Brain normal to the eye. Microscopically the myocardium revealed well marked interstitial fibrosis; no fatty degeneration.

From the kidneys frozen sections were taken and stained with haematoxylin and Scharlach R.; and paraffin sections were stained with haematoxylin and eosin. The larger arteries showed a moderate degree of internal thickening; this was more pronounced in the smaller, especially the interlobular and afferent; but not to obliteration. Fat droplets in the smaller vessels. Glomeruli "surprisingly little affected; a very few showed some atrophic change with fat droplets, but nearly all were remarkably healthy." "The tubules were practically free from change." Interstitial fibrosis was minimal.

Such in epitome is Dr. Vey's record of a case of hyperpiesia, in its later phases thoroughly investigated. That the patient, as was the case with the one mentioned in Addenbrooke's Hospital, died with more or less of uraemic symptoms is true; but it is now fully recognized that such symptoms may, and often do, occur in the "cardiac kidney," but in case of the patient's amendment pass off entirely. That the syndrome is essentially incidental in these cases and, in periods of amendment, transitory, has been very fully illustrated by certain French physicians; but as I am writing away from home I cannot give references. Dr. Vey reported drowsiness on the second, third, and fourth admissions; but during the temporary recoveries the uraemia passed off.

Little by little, then, our knowledge of hyperpiesia in its later phases is increasing, yet its causes still lie in obscurity, and, except in early phases, we are gaining but little power of relief. To some amendment we can attain, but in the later issues, and unfortunately these are too often the first symptoms

* The amounts of protein and salt taken in the diet were not calculated, but the diet was a very light one.