Lettsomian Lectures

ON

THE SURGICAL DISEASES OF CHILDREN.

DELIVERED BEFORE THE MEDICAL SOCIETY OF LONDON.

BY

THOMAS BRYANT, F.R.C.S.,

ASSISTANT-SURGEON TO GUY'S HOSPITAL.

LECTURE III.

MR. PRESIDENT AND GENTLEMEN,—In the lectures I have already had the honour of delivering, I endeavoured to bring before you the chief points of difference between the surgical affections of the child and adult, as they are observed in the nervous, respiratory, circulatory, and urino-genital systems. I propose on the present occasion to point out in what way the diseases of the bones and joints differ in the child from those in the adult, and then to pass on to consider, as far as time will allow, the subject of tumours.

SURGICAL AFFECTIONS OF THE OSSEOUS SYSTEM IN CHILDREN.

There is one great anatomical difference between the bones of children and of the adult, which it is important to bear constantly in mind when we are considering their pathology; and it is this—that in the *adult* a bone may be regarded as a separate thing, composed entirely of one piece; whilst in the *child* we must remember that it is made up of several parts—a central body or shaft, epiphyses or extremities, and the intervening soft and pulpy structure through which these grow and subsequently unite. In the adult, this union is supposed to have taken place, although it is well known that in some bones a perfect junction of the shafts with their epiphyses is not completed till a much later period of life than it is in others.

When considering the diseases of these structures in children, it is, therefore, always necessary to remember the fact that the bones are composed of separate portions; that these have distinct sources of nutritive supply; and that each is liable to be affected by disease as an independent part.

An epiphysis of a bone may be the subject of a disease which will not involve the shaft to which it is to be subsequently connected; and the shaft may likewise be similarly affected, and yet the epiphyses be left completely free. Disease may also attack the intervening soft and pulpy layer by which the growth of the shaft is carried on, and its subsequent union to the epiphysis is to be finally secured. In children, therefore, the diseases of the shafts and epiphyses demand a separate consideration; and the affections of the intervening pulpy layer will likewise receive an independent notice.

It may be remarked, that authors have failed to enlarge upon this great difference between the diseases of the bones of children and of the adult; and it is with some pleasure that I now bring the subject before your notice.

Inflammatory Diseases of the Shafts of the Long Bones in children are unfortunately very common; and, unless attributable to some external injury, the majority of cases are found in the cachectic and so-called strumous subjects. They are generally slow in their progress and certain in their results, the end being far too frequently a necrosis or death of the part. In idiopathic cases, the progress of this inflammation of the shafts is generally remarkably slow, and it is often marked by a torpidity and want of definiteness in the symptoms, which renders a parent careless and indifferent to the affection; and this feeling produces a dilatoriness in seeking surgical advice, which has nothing but an injurious influence upon the ultimate result of the case.

In some instances, this disease is only manifested externally by a gradual expansion or apparent dilatation of the bone, the external and soft parts around appearing pale and natural; and it is not till many months have perhaps elapsed that other external signs of mischief make their appearance. If the disease, however, be allowed to proceed unchecked, death of the bone will to a certainty take place, when inflammation of the integument and suppuration will necessarily make its appearance, ending in the formation of sinuses and cloaca communicating with the diseased bone.

The constitutional symptoms during the progress of these changes vary in their intensity in different patients. In the majority, they are very mild; little but an aching pain in the part demanding notice. If the surgeon be consulted at this second stage of the disease, he will observe a marked difference in the temperature of the part, the integument over the diseased bone feeling much hotter to the hand than the parts around; and firm pressure upon the bone will, in all probability, cause increased suffering.

On a careful examination of the bone at this time, it will be found uniformly enlarged, and apparently expanded; its external surface being smooth and uniform. At a later stage of the disorder, when the soft parts have become implicated and the bone has died or become necrotic, the external or visible symptoms are too well marked and positive in their nature to demand notice.

It must also be remarked that, in these cases of idiopathic osteitis, it is rare for one bone alone to be the subject of disease. The symmetrical bones, as a rule, sooner or later become more or less involved, and in some cases nearly all the long bones in the body; this fact tending to point to the constitutional origin of the disease. I have had under my care for some time past a girl aged 11, who has been the subject of osteal disease for four years. The humerus, ulna, and radius of both arms have been diseased; and in both ulnæ exfoliation has taken place. Both tibiæ and fibulæ are now affected, with the right femur; and it is to be remarked that the left tibia is exactly three-quarters of an inch longer than the right; one bone measuring 11½ inches, and the other 11 inches. During the whole progress of this case, a constant aching of the bones was the only symptom; and at times this was very slight, at others being very severe. Under the influence of tonics and rest, marked benefit has been bestowed; the diseased action in many of the bones has been arrested; and their gradual restoration to their natural dimensions has been observed.

This case also illustrates another point which is

generally to be noticed in like instances; and that is, when the shafts of bones are diseased in children, the epiphyses are left sound; and that, even in such a typical case of the disease as the one I have just quoted, no epiphysis appeared to be affected to the slightest degree. This pathological point tends of itself to prove the anatomical distinction between the parts; and when we proceed to consider the diseases of the epiphyses, a like point will have to be recorded.

The *elongation of an inflamed bone* is a pathological fact of extreme interest; it has been observed before, and noticed by different authors; but cases illustrating the point are not common. In the example quoted, the difference between the two tibiae was three-quarters of an inch, and both were inflamed; the longest bone, however, being the worst; proving that, under the influence of the inflammatory process, a long bone increases lengthways, as well as in its diameter; although it may be a question whether, on the cure of the disease, the bone will regain its normal length, as it unquestionably may its normal dimensions in all other respects.

In the *treatment* of these cases there is but one principle to follow—to improve the general health. The disease is one essentially of debility, and is to be met by good living, good air, and tonics, as quinine, iron, cod-liver oil, or any other which may best suit the peculiarity of the case. The syrup of the iodide of iron is a good preparation, and is a favourite of mine; but any, or all in order, may be given with advantage. The inflamed limb must, however be well raised and kept at rest; warm fomentations afford much relief in the early stages. I have never seen any benefit result from the local application of iodine; it causes much pain to the patient by inflaming and irritating the integument; and it appears to be quite useless. A warm fomentation gives much greater comfort, and, when combined with rest, seems the most serviceable.

When the bone is necrotic, it is to be removed; but surgeons should be careful not to interfere in these cases too soon. The powers of nature, when fairly assisted, in restoring diseased parts in children to their normal condition, are almost unlimited; and the surgeon has, therefore, only to remove diseased bone when it is evidently lying alone, separated from its matrix, and acting, therefore, as a foreign body. Too early attempts to interfere are followed by nothing but harm, and should therefore be avoided. Amputation of a limb for such an affection is rarely, if ever, to be entertained.

The necessity of an early detection of this disease is a point of primary importance. In a large proportion of cases, the surgeon is not consulted till it has existed for a lengthened period, and has progressed to an advanced condition; the mildness of the symptoms masking its true nature. Any aching of the bone, if constant, is a symptom of great value, for it is undoubtedly the earliest by which this cachectic form of osteitis is ushered in; and such a symptom should never, therefore, be treated lightly; for at this early stage of the disease, by rest and tonics, a speedy convalescence may with some certainty be predicted, and months of misery and subsequent deformity be probably saved.

I might quote many cases to illustrate every point in this paper, but it is hardly necessary; the limits of my lectures urging me to pass on to another sub-

ject no less important—namely, the inflammatory affections of the *epiphyses*.

Inflammation of the Epiphyses or the Articular Extremities of Bones. The epiphyses of the bones of children are remarkably prone to inflammatory affections; and it is due to this fact that diseases of the joints at an early age are so common and so obstinate. It may without fear be asserted that at least two-thirds of the cases of joint-disease which are found in children are due to inflammatory affection of the epiphyses; and the symptoms by which this disease is to be recognised are not obscure.

As previously stated, these epiphyses may be regarded as independent parts; they are still distinct as bony centres, and have not yet united to the shaft and become part of the body of the bone. As a result, the local symptoms which accompany these inflammatory affections are confined to the epiphyses, and seldom, even at a later stage, involve the shaft itself.

The earliest symptoms of any inflammatory affection of the epiphyses are somewhat obscure, a mere aching of the part being probably the only one which is to be observed. To external observation at this early stage of the disease, there may not be any change in the appearance of the part, although some increase in the temperature of the integument over the bone is often to be recognised, when it is compared with the temperature of the integument above and below the seat of the disease. If the nature of the affection be not recognised, and some weeks or perhaps months be allowed to pass without its detection, other changes will make their appearance; and of these the most marked is an absolute enlargement of the bone. It appears as a kind of dilatation and general expansion, and will be at once observed when a comparison is made between the corresponding epiphyses of the healthy and the diseased side. The bone at this stage will probably be somewhat more tender than natural, firm pressure over it exciting pain. The increase of heat in the part will at this period be also very palpable.

As time progresses, and if the disease be allowed to take its course, other symptoms will appear; and of these, some effusion into the articulation is the most positive, this being the result of a low form of synovitis, from the extension of the inflammation to the synovial capsule. The nature of the disease is, however, the same. The synovitis is palpably secondary to the osteitis of the head of the bone; and, if the disease in this part have not progressed too far, the synovitis will disappear when the osteitis is cured. It will be thus seen that the progress of the inflammatory affection of the epiphyses is precisely similar to the inflammation of the shaft; a gradual expansion of the bone, attended by an aching pain, forming the chief symptoms. At a later stage of the affection, also, the analogy still holds good; for, if the disease be allowed to go on unchecked, suppuration and the death of the bone will to a certainty take place; and, in the majority of cases, this suppuration will pass towards the joint, when disorganisation of the joint-cavity will then be added to the difficulties of the case. It is an affection such as this which is often described as a strumous disease of a joint, but which is really essentially an osteitis attacking the epiphysis or head of a bone in a cachectic child, and which is as free from

any strumous or tuberculous disease as any other inflammatory affection of a cachectic type.

If the nature of this affection be detected at any early stage, a complete cure may unquestionably be obtained in a large proportion of the cases which fall under observation. It is too true, however, that in the majority of cases the disease is not recognised in its primary condition; the want of positive symptoms which are capable of exciting fear in the uneducated mind being the probable cause of this neglect, as the mere aching of the bone or joint is regarded only as a "growing pain", and the enlargement of the bone and increase of heat are not positive enough to be observed. Should, however, the surgeon at this stage be consulted, he must be alive to the nature of the case. I always look upon a "growing pain" with suspicion, and, on examination, seldom fail to find its cause; osteal disease being the chief. I would, therefore, wish to impress upon all men the necessity of a careful examination of a limb the subject of such a complaint; and, in all cases of "growing pains", to fear some inflammatory affection of the osseous system. This fear may be wrong; but by carrying it into practice much benefit will be obtained, and many limbs and joints saved which would otherwise be lost. I could quote numerous cases illustrating these facts, both the evils of delay and the benefits of the practice; but no practical benefit could be obtained by doing so, if I have succeeded in convincing you of the truth of these remarks.

Treatment. In the earliest stage of this form of disease, the treatment is very simple. Like the inflammation of the shafts of the bones, it is a constitutional affection, and one of debility. It is found in weakly and cachectic subjects, and in strumous or scrofulous, if a simple cachexia signifies the same. It requires, consequently, a tonic regimen and medical treatment; good air, good living, and tonics being absolutely essential. As local remedies, rest in the horizontal position and warm fomentations are likewise most important. Under such treatment, this disease may readily be checked in its earliest stage; that is, if no further organic change in the structure of the bone has taken place, than its infiltration with inflammatory product, and its consequent expansion.

When the inflammation has extended to the synovial membrane, and an effusion into the articulation has been produced, the same treatment is to be carried out as we have recommended in the less complicated example; but the prognosis of the case is not so favourable, and greater care in the carrying out of the instructions is to be observed. A successful issue is still, however, to be anticipated; a bad result being looked for only in the extremely cachectic and unhealthy subject. Should the inflammation, however, end in partial or complete necrosis or death of the bone, suppuration and disorganisation of the joint will, in all probability, be the result; but such cases will claim our notice under another head.

It will be remarked that, although this disease is an inflammatory one, leeching, blistering, and mercurials have not been alluded to; and I do so now simply to express the opinion that they are not only useless, but absolutely injurious. Cauterisation of a joint affected with this disease is not a practice from which much benefit can be expected.

Inflammation of the Soft Pulpy Layer which exists between the Shafts of the Long Bones and their Epiphyses. It is now well known by anatomists that, at the junction of the shafts or centres of bones with their epiphyses, there exists a soft pulpy vascular layer of connective tissue, by which the growth of the body of the bone is maintained, and its subsequent union with the epiphyses secured. At an early period of life, this pulpy layer is well marked; for, as growth and development are at this time most active, the tissue is necessarily very vascular. Obediently also to the law that, in proportion to the activity of the action going on in the part, is its disposition to inflammatory disease, this tissue is unquestionably highly prone to inflammatory affections. I believe that a large proportion of the cases of acute suppuration about a joint in children have their origin at this seat; and this is often shown to be the case by an exfoliation of some portion of the surface of bone in contact with this pulpy layer. If the disease involve the whole connective tissue of the bone, a general exfoliation of the upper portion of the shaft may be produced; or, if this result do not take place, some arrest of development of the bone's growth may be the end.

The disease may make its appearance as an acute or a subacute affection. It is, however, generally acute, and is manifested by a marked swelling at the seat of the disorder, accompanied with great pain and constitutional disturbance. An abscess will then form, which may rapidly envelope the joint and upper part of the limb; and, when this has opened and discharged its contents, convalescence may result; or, what is more frequent, a piece of bone varying in extent will come away, and a cure follow.

The majority of cases such as I have described appear about the shoulder-joint, although the disease may be witnessed at any other articulation. The following cases may be given in illustration.

It must be added that, in this disease, the epiphysis itself is not often involved; this pulpy layer being more intimately connected with the shaft, the growth of which takes place through it; the epiphysis having an independent vitality and independent vascular supply. As a consequence, disease of this structure involves the shaft in preference to the epiphyses.

CASE 1. Mary S., aged 8, applied to me in Dec. 1860, with a large abscess completely covering the whole shoulder. It had been coming for six weeks, and had caused intense pain and some constitutional disturbance. The abscess extended over the clavicle to the middle of the arm; and the slightest movement of the extremity aggravated the pain. A free incision was made into the part posteriorly, and a pint, at least, of pus taken away. A good poultice was then applied, and tonics given.

When I saw her again, a week afterwards, the swelling had entirely subsided; the joint could be moved without pain; and no signs of mischief within the cavity could be detected. The original wound was still discharging; and a second over the bicipital groove had made its appearance. The pain also had disappeared. It was clear, from this example, that the disease was not in the shoulder-joint, although it was not far from it. A probe when introduced through the opening passed upwards upon the bone, but no exposed bone could be detected. I believed the case at this time to be a case such as I have

been describing. After the lapse of a few months, its true nature was revealed; on April 28th, 1861, a piece of bone came away, which was evidently the upper portion of the shaft of the humerus, where covered with the pulpy vascular layer. On May 23, a second piece of the same character was removed from the anterior opening, and recovery ensued. I saw the child one year afterwards, and the cure was complete.

CASE II. A similar instance to the above appeared in the person of Mary B., aged 11, who came under my observation in November 1862. Exfoliation of bone, which was evidently the upper surface of the shaft where in contact with the epiphysis, took place; and recovery ensued. The natural opening in this case was also over the bicipital groove.

CASE III. A third case occurred also in the person of George W., aged 14, from whom bone came away of the same nature, and recovery followed.

CASE IV. In Matilda D., aged 3½, a like exfoliation was followed by a like result.

Other cases of the same nature as the preceding might readily be extracted from my note-book; but they all tell the same tale—that of an acute or sub-acute abscess over the joint, followed by exfoliation of the layer of bone which is covered with the pulpy vascular tissue through which the bone grows; and subsequent recovery. It is to be remarked also that the abscess, if left to open naturally, bursts over the bicipital groove; this being the same position which an abscess from a suppurating shoulder-joint generally selects. All these cases have occurred in children, when the growth of bone and the activity of this pulpy layer is most active; and they, as a rule, have a good result. I have recorded in the *Guy's Hospital Reports* of the year 1862, an example of arrest of development of the humerus following an injury to the shoulder-joint, which I believe to be allied in its nature to those I have already quoted. In it, the accident was followed by an inflammation of this pulpy connective layer, and subsequently by an arrest of the growth and development of the bone; this growth being mainly affected through this tissue.

My colleague, Mr. Birkett, has also published in the same work a like case.

I have the records also of a second case of arrest of development after suppuration and exfoliation of bone, in Emma C., aged 9 years. The abscess occurred when she was seven years old; and this was followed by exfoliation of bone, the cicatrix, when seen, being exactly over the head of the metacarpal bone of the left middle finger. This bone was also at least half an inch shorter than its neighbours. The movements of the joint were perfect, proving the integrity of the epiphysis, and indicating the probability that the original disease was situated in the soft pulpy layer, at the junction of the shaft with the epiphysis, that the upper portion of the shaft had come away, and had thus given rise to the subsequent deformity.

It is hardly necessary to dwell longer upon this subject, the few remarks which I have made being, I trust, sufficient to draw your attention to the point, and to mark the true nature of the cases which I have described, for they are all tolerably distinct.

I have thus briefly alluded to the three forms of inflammatory affections which are found to attack the bones of children: namely, of the shafts, epiphyses,

and intervening epiphysal structures; all of which are of an allied nature; but in each the symptoms of disease are quite distinct and readily distinguishable. I have also dwelt upon the anatomical causes of the differences between these osteal affections of early life and of the adult; and trust that I have not, in my efforts at condensation, left you uncertain as to my meaning or as to the nature of the diseases I have described. I look upon the distinction which has been made as most important, and have, therefore, gladly seized this opportunity of bringing the subject under your notice, as I am not aware that the true nature of these cases has hitherto been described.

Fractures of Bones will now for a few minutes occupy our attention.

Congenital Fracture and Dislocation. The fact that congenital fractures of bone and dislocation occur in infants is now too well established to admit of a doubt, although the examples illustrating its truth are not abundant.

I have, however, seen but one example of intra-uterine fracture, which came under my care on Feb. 10th, 1862; the case having been brought to me by an intelligent pupil, in whose practice it occurred. The particulars of the case are as follows.

CASE. The mother of the child, two weeks prior to her confinement, experienced a fall, and struck her abdomen sharply against the corner of a large weighing-machine. Signs of labour at once appeared, which were arrested by rest; and, at her due period, a female child was born, after a natural labour, with a fracture of the middle of the right femur. When I saw the case two weeks subsequently, the existence of a fracture was quite clear, for it had not been fixed. The bone could also be readily bent into its natural position. I bound it up with cardboard splints well padded with cotton wool, and kept it in position by broad strips of firm plaster. The fracture rapidly repaired, and in one month convalescence was established.

The case is worthy of record for several reasons: first, from its being a congenital or intrauterine fracture, an example of an accident which is recognised, but not often observed; secondly, to illustrate the facility with which the bone was restored to its normal position, a point which may always be observed in fractures of early life, from the fact of the bones being but partially developed, and containing more of the organic than inorganic elements; and thirdly, from the practice which was carried out, firm splints and hard appliances being rarely required in the treatment of such and allied fractures.

The limb should always be well protected from any unequal pressure by carded cotton, before the mill-board splints, which answer every purpose, are applied. Good, firm, linen strapping, closely surrounding the limb, binding the splints together more firmly and more securely than any bandage, and is far less cumbersome.

Respecting congenital dislocations, I have had no experience; but must refer you with pleasure to some excellent remarks upon this subject made by Mr. Athol Johnson, in his lecture, in the *BRITISH MEDICAL JOURNAL* for 1860.

It will be hardly necessary to detain you long with the consideration of ordinary cases of fracture of the bones; but it will be inconsistent with my original design, if I fail to point out to you the differences

between the fractures of bones as found in children and in adults.

Fractures through the body of a healthy bone are not common in early life; by far the greater number of instances taking place in children who are the subject of rickets. In these cases, it is well known that the bones are readily fractured; and in the case represented by the drawing which I now hand round, the mother states that at least twenty different fractures have taken place. In such cases, repair of the fracture is, however, rapidly performed, one month or five weeks being generally amply sufficient to complete the process.

Incomplete, or so-called "green-stick" fractures, form another peculiarity of infant life; the second name of "green stick" explaining their true nature, the bone being fissured vertically into fibres, but not separated transversely, precisely in the same manner as a green stick. This form of fracture may be found in any long bone. I have seen it in the arm and forearm, and also in the thigh; but have never noticed it in the tibia or fibula.

The youngest patient that I have seen who was the subject of this injury was a boy aged one month. The fracture was in the centre of the humerus; it had taken place some time previously, and was supposed to have been produced at birth. The bone was readily restored to the right line and fixed in splints, a good recovery taking place.

CASE. A very severe instance of this incomplete fracture presented itself before me in the person of a male child aged eighteen months. The right femur was really bent at a right angle, the foot and leg presenting outwards. It was produced by an attempt to catch the child when falling from the arms of its nurse. The fracture was readily restored by manipulation, and fixed with millboard splints, the limb being well padded with cotton wool, and the splints maintained *in situ* by strapping.

Fractures of the Clavicle are also very common. My colleague, Mr. Forster, in his practical work on *The Surgical Diseases of Children*, believes this fracture frequently to be one of the incomplete form; but as this bone is one of the earliest which is ossified, and at birth is, therefore, one of the strongest in the body, this opinion appears somewhat improbable. I would rather believe that these so-called fractures more often belong to the next class of cases to which I shall allude; viz., the separation of the epiphysis; the body of the bone being separated from its sternal epiphysis.

This *Separation of a Bone at its Epiphysis*, from anatomical reasons, can only take place in early life. It is, therefore, a second point of difference between the cases of fracture of bones in the child and adult. It is a commoner form of injury at this time of life than a dislocation of a joint, and is, perhaps, more frequent than an ordinary fracture.

It is the most frequently found at the upper and lower part of the humerus and carpal extremity of the radius; but it may take place in any bone. Considerable care is required to diagnose with correctness the nature of these accidents. They are too frequently looked upon as cases of dislocation, and are, therefore, maltreated; the absence of a distinct crepitus being the principal cause of this difficulty. They are to be treated in the same way as a case of fracture; the epiphyses are to be returned to their normal position by manipulation, and splints applied,

great care being observed that there is no undue pressure over the parts.

This leads me to say one word on the subject of dislocations, which are unquestionably cases of some rarity; the majority of the so-called cases being a separation or dislocation of the epiphyses, to which we have just alluded. The treatment of these injuries, however, are the same in the child as in the adult.

[To be continued.]

Original Communications.

OBSERVATIONS ON SOME OF THE EFFECTS OF THE APPLICATION OF THE CALABAR "ORDEAL BEAN" TO THE EYE.*

By JOHN W. OGLE, M.D., Assistant-Physician and Lecturer on Pathology at St. George's Hospital.

As the observations, first of all made by Dr. Fraser, and extended by Dr. Robertson, on the effects of the Calabar "ordeal" bean upon the eye will no doubt attract (and most deservedly so) very considerable attention, I have thought it might prove of interest to place on record the results of some of the experiments which I have been induced to make with the same agent. In the present communication, I will notice only the results which I have found to be produced by its application upon the pupil of the eye, not wishing to interpolate any mention of such effects upon the power of vision, the "accommodation of the eye," as were manifested at the same time.

I was, in the first place, naturally wishful to determine for myself the fact that the healthy and active pupil of the eye could be made, at will, to contract by the application of this agent; and the following experiments were therefore instituted at the onset.†

EXPERIMENT I. A young woman, aged 24; the sight of whose right eye was so far impaired that she could only distinguish light from darkness. The left pupil was of the ordinary size, and moderately active; the right one was very sluggish under the action of light, and much larger than its fellow.

I applied a single drop of my weakest solution (No. 1) of the Calabar bean between the eyelids of the right eye at 1.25 P.M. I found at 1.55 that the pupil, which before had been considerably larger than that of the other eye, had become so contracted that it was only of about half the size of the other one. How long it remained so contracted, I am unable to say.

EXPERIMENT II. A woman, aged 51, with both pupils equal, acting but sluggishly under light, and both of them smaller than natural and healthy pupils generally are. I applied one drop of my No. 1 Calabar bean solution between the lids of the right eye at 1.40 P.M.; and at 1.55, the pupil was only half as large as that of the other eye.

EXPERIMENT III. A man, aged 53, paraplegic; with

* These observations were completed, though not communicated to this JOURNAL, before I had the opportunity of becoming acquainted with those which other experimenters (following Dr. Fraser and Dr. Robertson) have made, and placed on record.

† I have had four preparations of the Calabar bean made for me by Messrs. Bullock and Reynolds. First, a watery solution of a spirituous extract, of which one minim was equivalent to two grains of the bean (No. 1); secondly, a similar but stronger solution, in which one minim was equivalent to four grains of the bean (No. 2); thirdly, a strong spirituous extract, of which fifteen grains were equivalent to four hundred grains of the bean (No. 3). In the use of the former two, I dropped the solution, by means of a camel's-hair brush, between the eyelids: the latter (the extract) I used by first moistening it with water, and then smearing it over the inner surface of the lower lid. The fourth preparation of the bean which I have had made is a paper saturated with a solution, analogous to the atropine paper of Mr. Streetfield. This Calabar bean paper I have not yet tried, or made use of.