work already referred to, mentions that the following different deficiencies have been met with :

1. Absence of the testicle only (left one most frequently absent), and this may be unilateral or bilateral.
2. Absence of the testicle, epididymis, and more or less of the vas deferens (most common).
3. Absence of the whole apparatus.
4. Absence of all or part of the excretory apparatus, the testicle being present.

When such deficiencies are unilateral, and the other testicle and its apparatus are natural, the sexual functions and the bodily and mental power are not necessarily interfered with, as exemplified in my two cases, but if bilateral the patients are sterile, and in addition the other genital organs are usually so feebly developed that they are also impotent.

ANOTHER CASE OF CONGENITALLY MISPLACED TESTICLE.

Since reading this paper before the Society I have operated upon another interesting case of congenitally misplaced testicle.

CASE III.—The patient was a well-developed boy, aged 16, who applied to me in connection with trouble in his right testicle. On examination the right side of the scrotum was small and much contracted; it contained no testicle or cord, and was quite empty and closed. A small testicle was present at the side of the upper part of the perineum and its cord could also be felt passing out through the external ring. At times the testicle and cord disappeared and passed up into the inguinal canal, just below the internal ring. The left testicle was normal and in its proper position. As the right testicle, meanwhile, was giving rise to inconvenience, the boy's father asked me to operate. An incision was therefore made from a point opposite the external ring down to the upper part of the scrotum. At this time the cord and testicle were drawn up into the inguinal canal and so were not exposed by the incision. After a little dissection a sac, much resembling the sac of a hernia, was disclosed, and was carefully separated from surrounding tissues. This sac was opened, and was found to be the tunica vaginalis, which was patent for some distance up the inguinal canal but did not communicate with the general peritoneal cavity. Below the tunica vaginalis ended at the upper part of the scrotum, where it was firmly attached but quite closed. Coming off from this portion of the sac was a diverticulum, which admitted the finger readily and passed down towards the perineum for an inch and a-half. It was into this diverticulum that the cord and testicle passed when they descended from the inguinal canal. Having introduced a finger into the inguinal canal and made some traction upon the upper part of the tunica vaginalis, the testicle was easily drawn down, and, its attachments being carefully divided, it was placed in the scrotum and secured there in the method already described. The greater part of the tunica vaginalis and its diverticulum were then excised, a ligature having first been applied above the point of their excision.

The testicle in this case was small but apparently fairly well developed, but the epididymis was not properly developed, the vas deferens ending in a few convolutions at the point of its junction with the testicle.

In this case I passed the stitch securing the testicle to the bottom of the scrotum, through the skin on the inside of the opposite thigh, as I found that this gave traction more directly in the natural line of the cord than when the traction was made from the same side.

In conclusion, operative interference cannot, of course, be of service in such cases of deficiency, but it may, I think, be justifiable in order to remove a condition giving rise to local or mental irritation. If complicated with hernia, an operation may be necessary in order to relieve the hernia.

REFERENCE.

¹ *Journal of Anatomy and Physiology*, vol. xxvii.

FUNDAMENTAL POINTS CONNECTED WITH THE PATHOLOGY OF DIABETES MELLITUS.*

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THE primary point to be dealt with in connection with diabetes mellitus is that carbohydrate, in the form of sugar, is eliminated with the urine in a manner that does not occur in health. From this it follows that in diabetes an inaptitude exists within the system for the proper application of carbohydrate matter to the purposes of life. Thus, briefly stated, diabetes consists fundamentally in a mal-application of carbohydrate through an error existing somewhere or other within the system.

The amount of carbohydrate reaching the system from the food is exceedingly variable, but under natural circumstances

no matter what amount, within ordinary limits, is ingested, it does not afterwards become visible to us. All that is observable is that it disappears from view, and that the system derives benefit from it. Exactly the reverse is met with in diabetes. Instead of disappearing from view, the carbohydrate reaching the system from the food is afterwards discoverable in the urine as sugar. Proportionately to the amount of carbohydrate ingested is sugar discoverable in the urine.

Penetrating further, the blood of the general circulation is found to stand in a similar position to the urine. Normally, there is in the urine a certain small proportion of sugar which is not to any sensible extent influenced by the character of the food. Normally, also, in the blood, there is a certain standard amount of sugar present irrespective of the nature of the food. There is no difficulty in definitely expressing its quantity, which may be said to stand at somewhere about 1 per 1,000. It seems to be a standard component of the blood just as we find sugar entering as a constituent into the various tissues of the body; and, moreover, it is susceptible of being shown¹ that, as in the tissues, the sugar is not solely dextrose, but dextrose associated with other cupric-oxide reducing carbohydrate so as to give rise to a product possessing a cupric-oxide reducing power considerably below that of dextrose. Such is a representation of the normal state, and the small amount of sugar present in the urine corresponds, it may be considered, with that existing in the blood.²

Concurrently with the outflow of sugar in diabetes there is an increased amount recognisable in the blood. The sugar eliminated has pre-existed in the blood, and the fault lies in its having been there. Carbohydrate food now leads to the undue presence of sugar in the contents of the circulation, and it is by virtue of this that it appears in the urine. The sugar escaping may be taken as an index of the sugar that has wrongly been present in the blood.

The point is thus reached that diabetes is fundamentally connected with the wrong presence of sugar in the blood, and the question that next presents itself is, To what cause is the wrong presence attributable? Can it be that the carbohydrate of our food naturally reaches the general circulation as sugar, and through failing to disappear accumulates and thence passes into the urine, or is it that the carbohydrate ought not in reality to reach the general circulation, and by wrongly doing so renders itself evident in the manner that is observed?

The amount of sugar that escapes in diabetes gives a measure of the amount of sugar that would reach the circulation from the food and have here to disappear if this constituted the natural course of events. Everything conspires to show that it is quite impossible that such an amount of sugar could enter the circulation and not be revealed in an unmistakable manner by the urine. Indeed, in proportion as sugar in any way reaches the circulation so is an effect produced upon the urine.

For sugar to reach the circulation and not influence the urine there ought to be the capacity in the blood of immediately effecting its disappearance, inasmuch as a part of the blood goes direct to the kidney where elimination would occur of a portion of the sugar. No such capacity, however, has been shown to exist, and this affords an insuperable objection to the destiny of carbohydrate matter being its transit as sugar through the general circulation. Reliance has been placed upon old experiments which represent a marked loss of sugar during the passage of the blood through the capillaries from the arteries to the veins. I confidently assert that the results given will not stand the test of examination. The figures are altogether discordant with those definitely known to belong to the normal state. As I have pointed out in my *Physiology of the Carbohydrates* published in 1894, the experimental procedure is exceedingly open to fallacy in various directions. In my own experiments, where the utmost precaution was taken to escape from fallacy, no practical difference was discoverable in the amount of sugar in arterial and venous blood and my results have been confirmed by many authors. Bing has recently published³ experiments dealing exhaustively with the whole question of the presence of sugar in blood and concludes from his observations that if any difference exists in the amount of sugar present in the various parts of the circulation it must be so small as to lie within the limits of error of observation as he is unable to find any.

* Read at the thirteenth International Medical Congress held in Paris.

By approaching the subject in another way it is susceptible of being made to show that sugar does not disappear on undergoing transit through the circulation in the manner that has been represented. It can be experimentally introduced into the circulation by intravenous injection, and although only an exceedingly small quantity may be employed, the results show that considerable time is taken for its removal to be effected, and, further, that its presence in the blood is revealed by the urine. In a series of experiments, recorded in the *Journal of Physiology* for 1899, I introduced definite quantities of various kinds of sugar into a superficial vein of a rabbit's ear, and noted the condition of the blood and the urine at different times after. The operation is performed like an ordinary subcutaneous injection, and no disturbing effect is produced upon the animal. After a specified time the animal was killed and its blood collected in a manner to obtain it free from the influence of *post-mortem* change. After the injection of 0.25 gram of dextrose per kilo body weight—that is, only one four-thousandth of the weight of the animal—the blood at the end of a quarter of an hour showed that only a trifling disappearance of the injected sugar had occurred during this time. In experiments where, with the same quantity of sugar injected, an hour was allowed to elapse, the urine secreted during that period gave distinct evidence of the passage of sugar into it, from which the inference is to be drawn that whatever sugar reaches the circulation manifests itself by the production of an effect upon the urine.

Insurmountable difficulties attend the view that the carbohydrate matter of our food passes in the form of sugar through the circulation to the tissues for destruction. The facts of modern science give it no support—indeed, they stand opposed to it. The transit could not occur without being brought to our knowledge by the state of the urine, and no possibility of disappearance exists of a nature to satisfy the requirements of the case. It may be truly considered that if such a transit took place we should all be glycosuric in proportion to the amount of carbohydrate ingested. The sugar assumed to pass to the tissues for destruction would also pass to the kidney for elimination. It is the same stream of blood that would administer to both purposes, and for there to be no glycosuria we are forced into the position that destruction can proceed while elimination remains in abeyance. To provide for freedom from glycosuria the carbohydrate of our food must be prevented reaching the general circulation as sugar; and this point brings us to the consideration of the broad question of the mode of utilisation of carbohydrate in the animal economy.

The problem now before us is: In what way does the carbohydrate matter of our food become disposed of so as to be prevented reaching the general circulation as sugar? Any solution that is offered of this problem to be satisfactory must locate the disposal somewhere between the seat of absorption and the point where the general circulation is reached; that is somewhere before the hepatic veins are arrived at.

If we look broadly at carbohydrate matter in relation to the operations of life, we find that by one kind of influence small molecular-sized carbohydrates become built up with concurrent dehydration into large-sized molecules, and that by another kind of influence the carbohydrates of large molecular size are broken down and hydrated into the forms of small molecules. The building up with dehydration is effected by protoplasmic action, or the agency of living matter, whilst the breaking down and hydration are effected by the agency of ferments. Throughout living nature these two processes are carried on. By ferment action the carbohydrate is placed in a suitable state for absorption, which is the first operation required to be carried out. After absorption has taken place the carbohydrate falls within the influence of living matter, and by protoplasmic action is placed in a position to proceed towards fulfilling its purpose in the economy of life. The changes induced by protoplasmic action are designated as assimilation.

It is the change wrought upon absorbed carbohydrate that places it in a position to pass in the direction of utilisation, and evidence goes to show that if this change is not brought about it remains as sugar, and in this state is carried to the general circulation, whence it flows off as waste material with the urine. Thus, what is wanted to avert the outflow as sugar is that by the proper performance of assimilation the

carbohydrate should be disposed of without sugar being permitted to reach the general circulation.

To this question of assimilation I will now direct attention. I have entered into it fully in my work on *The Physiology of the Carbohydrates*, published in London in 1894. A German translation by Karl Grube was published in the following year by Deuticke, of Vienna. As a result of experimental inquiry I have been led to consider that by the following three processes the carbohydrate of our food is disposed of in the villi and in the liver, and thus prevented reaching the general circulation as sugar:

1. Transformation into fat.
2. Synthesis into proteid.
3. Transmutation into glycogen.

1.—TRANSFORMATION INTO FAT.

The production of fat by animals from carbohydrate was at a former time the subject of keen controversy. No doubt now exists with regard to its occurrence, and from what is observable around us it is carried out upon an extensive scale. Although the question of fat production is no longer a matter of dispute, the localisation of its production has not engaged the consideration it deserves. We all know that when reformed fat is ingested it finds its way into the villi, and thence into the lacteals, to the contents of which it gives a milky character. Milky chyle, even, it may be, as pronounced as after fatty food, is discernible in the lacteals of the vegetable feeder after starchy food in which the amount of fat present must be regarded as altogether insufficient to account for what is observed. I look upon it that it is by protoplasmic action exerted by the cells belonging to the villi that fat is produced from carbohydrate. The cells can be seen to become loaded with fat just as is noticeable after fatty food, and the fat thus produced passes in identically the same manner into the system as that introduced ready formed from without.

Analogy from the operations of life in the vegetable kingdom suggests that the carbohydrate becomes incorporated with nitrogenous matter into a complex molecule, and that by a rearrangement within fat is cleaved off. This brings the genesis of fat as an act of assimilation into a parallel position with its genesis from the proteid constituents of the tissues, which is so conspicuously made manifest to us in the condition known as fatty degeneration.

2.—SYNTHESIS INTO PROTEID.

The entry of carbohydrate matter into the constitution of proteid received a large share of attention in my published work to which I have referred. Recognising that carbohydrate was obtainable as a cleavage product from proteid, consideration was carried to the synthetic production of proteid by the agency of living nature, and the whole was found to stand in harmony. There is no need for entering into the matter here, as I consider it may be said that the glucoside nature of many proteids is now regarded as established. "Glucoproteids," indeed, is a term which has now found its way into common use as a classifying expression.

The proposition advanced by me is that the carbohydrate of food reaching the villi as sugar, and falling within the influence of the cell protoplasm encountered becomes incorporated into proteid, which probably reaches the system through the lacteal stream. It is known that an animal constructs its own proteid instead of taking it in ready formed from without. In the combined state the carbohydrate can be transmitted through the circulation without running off through the kidney on account of the molecule containing it being too large to pass by diffusion through the limiting membrane of the vessels. In the free state, on the other hand, in consequence of the smallness of the sugar molecules, incompatibility exists for retention in the circulation.

By synthesis into proteid the conditions harmonise with what is wanted. The carbohydrate can be conveyed to the tissues, without risk of escaping as waste material, and there applied to the purposes of life. It is not for me to speak here of the manner in which it is applied, but it is now recognised that it exists in a locked-up state in the tissues, and thus circumstanced it is located so as to be at all times ready to contribute as needed to meeting the wants engendered by the chemistry of life. It is not improbable that metabolism may deal with it while actually within the molecule, and that a

succession of changes may occur before it is finally resolved into carbon dioxide and water. Observation in experimentally induced diabetes has disclosed that under the absence of food and, when the store of glycogen has been exhausted and the only possible source for the sugar is the tissues of the body, the relation between nitrogen and sugar in the urine shows that as much as 45 to 60 per cent. of the proteid molecule may be eliminated as carbohydrate. This forcibly points to the extent to which the synthesis of carbohydrate into proteid must be carried on in connection with its assimilation as a subsequent step to absorption from the food.

3. TRANSMUTATION INTO GLYCOGEN.

This kind of operation is carried out upon a very extensive scale in the vegetable kingdom. Through it the enormous amounts of cellulose, starch, etc., existing take their origin. The process consists of a building of small molecules into large ones, with a certain amount of associated dehydration, and its accomplishment is effected by the agency of living protoplasm. The sugar, absorbed from the alimentary canal, that may happen to escape transformation into fat and synthesis into proteid in the villi, is carried by the portal vein to the liver, and here becomes transmuted into glycogen. In this way the liver exerts a supplementary action in checking the passage of sugar into the general circulation; and when—as under natural circumstances—this is complete, the general circulation and, thence, the urine is protected from becoming charged with sugar. The glycogen may be looked upon as simply a convenient temporary halt in the application of carbohydrate matter. There are grounds for the view that it passes into fat, and in the bird, where the villi and lacteal system are in a very imperfectly developed state, the liver, it is permissible to consider, occupies a position of cardinal importance in the economy in relation to the production of fat.

Presumably it is not exclusively in the liver that this process of transmutation in the direction towards glycogen is carried on. Glycogen is met with elsewhere, and it seems to be one of the properties of protoplasmic matter to form it when the suitable conditions exist. It is a notable circumstance, which I have dwelt upon in my writings, that dextrose introduced into the system by intravenous and subcutaneous injection is afterwards found to have been converted to some extent into a substance of lower cupric-oxide reducing power and therefore transmuted, with dehydration, in the direction of glycogen.

The proposition springing from what has preceded is that by assimilation in the manner pointed out the carbohydrate of our food is prevented reaching the general circulation as sugar, and it follows that if it does not reach the general circulation as sugar the opportunity is not afforded for it to escape as sugar with the urine.

If assimilation should fail to be fully carried out the non-assimilated carbohydrate must follow some other course, and observation tells us that it reaches the general circulation as sugar, and flows away as waste material with the urine. It may be said that the assimilative power is not found in anyone to be of unlimited capacity, and thus in the healthy subject sugar may be made to appear in the urine by an excessive ingestion of carbohydrate matter.

When the assimilative power falls short of what is natural, carbohydrate that can be taken by a normal person without producing glycosuria can no longer escape doing so, and in proportion as the power is reduced so is the curtailment of the amount of carbohydrate that can be taken without throwing sugar into the urine. Very varying degrees of impairment of the power are found to exist in different cases producing varying degrees of severity of the condition to be dealt with, and this requires to be taken into account in treatment in order that a properly-adjusted dietetic management may be adopted.

By a test diet information is readily obtained regarding the extent to which the assimilative power is deficient. It may happen that the loss of assimilative power is such that even with a properly constructed fully restricted diet the carbohydrate contained in it (it is not possible to construct an existence diet entirely free from carbohydrate) suffices to throw a certain amount of sugar into the urine. Ordinarily the loss does not amount to this, and hence by the restricted diet a sugar-free state of urine may be induced. With a less

extent of loss a certain amount of food of a carbohydrate nature will be found to be susceptible of being taken without leading to the passage of sugar; and thus it is observed to run on, more and more carbohydrate being tolerated in proportion as there is less and less loss of assimilative power.

The effect of adjusting the supply of carbohydrate to the assimilative power existing to dispose of it is intrinsically to place the system in a natural state. It is not the mere fact of the waste of food attending the elimination of sugar that constitutes the source of trouble in diabetes; this is but a minor part of the question. The source of the various symptoms is the presence in the system of the sugar which has preceded the elimination. The blood of the general circulation stands in a position antecedent to the urine. The sugar found in the urine has previously existed in the blood, and has thus created in this fluid a deviation from the natural state which tells injuriously upon the entire system. It is not natural for the blood of the general circulation to contain more than a certain small amount of sugar which, under normal circumstances, is not influenced by the presence of carbohydrate matter in the food. When an increased quantity of sugar is present as the result of faulty assimilative action, the blood becomes thrown into an unnatural state by which its fitness for administering to the nutritive and other operations of life is interfered with. The various symptoms encountered in diabetes depend upon the abnormal presence of sugar in the blood, and immediately this condition is altered by excluding from the food the carbohydrate that fails to be assimilated the symptoms subside. The speediness of the alteration in the condition of a patient is often wonderfully marked.

The transit of sugar through the system that can be controlled by the reduction of ingested carbohydrate means the infliction of unnecessary harm, and the harm inflicted stands proportionate to the amount of sugar that is allowed to reach the system and thence escape with the urine. The fact of the avoidance of sugar affords evidence that the system is already overburdened with carbohydrate, and anything which conduces to its increase will have the effect of adding to the troubled state existing.

What is wanted for rectifying matters is restoration of the assimilative power. This, according to my experience, is not attainable unless the system is brought into a natural state by controlling the transit of sugar through it from the food. This is indicated by the removal of sugar from the urine, and with this removal steadily maintained cases present themselves in which first of all a little carbohydrate food is found to be tolerated without leading to the voidance of sugar, and then more and more until it may possibly happen that an ordinary diet can be resumed without occasioning a reappearance of sugar in the urine. The class of case in which this favourable issue may be met with is that occurring amongst persons above the middle period of life, and in this class, instead of being a rare event it is not uncommon to find that the assimilative power may be restored to a certain point, and at this point, more or less short of what is natural, remain. Under such circumstances, as long as the carbohydrate taken is within the limit representing the assimilative power existing there is no sugar voided, whilst, when the limit is overstepped, sugar appears in the urine in proportion to the extent to which the excess has reached.

It is the "alimentary" form of diabetes to which I have been referring, and in this form the elimination of sugar is not only controllable by regulation of the food, but there is an absence of abnormal tissue disintegration.

In the other and more grave form of diabetes to which I have suggested that the term "composite" should be applied, the eliminated sugar is in part derived from the tissues of the body as well as from the food. By morbid tissue breaking down the carbohydrate contained in the proteid molecule becomes cleaved off and, passing into the blood, reaches the urine. Other products also arise from this abnormal tissue disintegration, and through these likewise passing into the urine an indication is afforded of the action going on. β -oxybutyric and diacetic acids accompany the sugar and distinguish the "composite" from the "alimentary" form of the disease. In the latter the pathological condition is confined to a mal-assimilation of the carbohydrate matter of food, whilst in the former there is this and in addition an abnormal setting

free of carbohydrate, in the form of sugar, from a previously combined state.

If, now, we give a comprehensive glance at the position of our knowledge of the conditions standing at the foundation of diabetes, it may be said that the effect of modern research is to carry us away from the view that there is a functional transit of the carbohydrate matter of our food as sugar through the general circulation to the tissues. Under such a view we are faced with insuperable difficulties in relation to the information we possess with regard to both health and diabetes, whilst under the view contended for in this communication everything satisfactorily fits in, and a rational working basis for the treatment of diabetes is supplied.

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THE FACE AND PUPIL IN ALCOHOLIC NEURITIS.

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ALCOHOLIC neuritis is so common, and the literature about it so extensive, that the signs I am about to mention have probably already been described before, yet I have not come across a description of them, and should be glad to learn if such a description has appeared.

The loss of knee-jerk and extreme hyperæsthesia of the skin in advanced cases are of course known to everyone, but before these occur, and while the knee-jerk may be only sluggish or may even be unaltered, a peculiar expression of the face is sometimes noticeable. The face becomes mask-like and expressionless, the lips appear to move apart from the cheeks, but what is sometimes still more extraordinary the lips themselves may seem very mobile. The eyebrows and eyes may move in accordance with the lips, but a fixed and unexpressed band stretches across the nose and cheeks between the eyes and lips, the skin upon the cheeks remaining motionless and unwrinkled, while the lips, eyebrows, and forehead may be moving freely. I was much struck by this condition on seeing it one morning in two patients successively. In the first patient I had no difficulty in obtaining a history of alcoholism. As the second one entered the room I was struck by the similarity between the appearance of his face and that of his predecessor, but I could only elicit a history of excessive smoking both from himself and his wife; they both assured me that while the patient smoked excessively he was exceedingly temperate in regard to alcohol. A few days afterwards, however, I had a letter from the patient's partner saying, "I suppose so-and-so told you that he had been taking a great deal more spirit than was good for him?"

Another point is the condition of the pupil reflex, which is just the converse of the Argyll-Robertson phenomenon. In a number of cases of alcoholic neuritis I have noticed that the reflex of the pupil to light is rapid and extensive, whereas the contraction of the pupil on accommodation to a near object is slight and sluggish or entirely wanting. Indeed in one or two cases I have observed a dilatation instead of contraction on accommodation.

EXPLOSION OF ACETYLENE GAS.—An accident that might have been attended by much more serious consequences occurred a few days ago at Chapel-en-le-Frith, Derbyshire. One of the hotels in the town had been fitted up with acetylene gas. A representative of Husson's Acetylene Syndicate happening to call at the hotel he was asked to inspect the generator, which was supposed to be leaking. He must have known that acetylene is more explosive than coal gas. If so familiarity had bred contempt. On lighting a match a loud explosion occurred, during which the representative of the syndicate was injured in the face and hands. At first it was thought his eyesight was destroyed. Fortunately none of the injuries were of such a nature as to prevent the traveller leaving the district two days afterwards. It should be remembered that while acetylene is an excellent illuminant it is a highly explosive gas.

ON THE CAUSATION OF THE CONGENITAL STRIDOR OF INFANTS.*

(With Illustrations on Special Plate.)

BY
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THE clinical features of a typical and simple case of congenital stridor may be summarised as follows:

The infant, who appears normal in other respects, is noticed shortly after birth to have noisy breathing. The noise consists of a croaking sound accompanying inspiration, which rises to a high-pitched crow when a longer or more vigorous breath is taken; expiration may be accompanied by a short croak when the stridor is loud, but at other times it is noiseless. Even in the most severe cases there are occasional brief intervals during which there is no sound audible; but, with this exception, the stridor goes on constantly while the child is awake, and sometimes even when he is asleep. Any emotional excitement or any physical cause of deeper breathing, such as exposure to colder air or to the exertion of sucking, is apt to intensify the sound. The child's power of crying and coughing is unaffected. The breathing, although noisy, is not accompanied by the slightest distress, and there is no cyanosis. There is, however, always marked inspiratory indrawing of the thoracic and abdominal walls, except in the mildest cases.

The stridor increases in loudness during the first few months, and, after remaining about the same for a few more months, gradually lessens and disappears during the course of the second year. Long after it ceases to occur habitually, however, it is occasionally set up by emotional causes.

Considerable difference of opinion has been expressed as to the causation of these cases. The symptoms have been attributed to posticus paralysis (Robertson) or to abductor spasm, due to adenoids or to some other source of irritation (E. Smith, Lövi). Some again have blamed an enlarged thymus (Avellis), and others a congenital malformation of the upper aperture of the larynx (Lees, Sutherland and Lack, Variot, Refslund). Attention has also been drawn to the soft collapsible character of the laryngeal structures in the infant (Goodhart, etc.), and one of us (Thomson) has already suggested the view which we confirm and further elaborate in this paper. This view is that the primary cause of the obstruction is probably an ill-co-ordinated spasmodic action of the muscles of respiration—a choreiform respiratory spasm—analogue to stammering—as distinguished from a laryngeal spasm.

The site of the obstruction which causes the noise has variously been thought to be in the pharynx, at the upper aperture of the larynx, at the cords, and in the trachea at the level of the thymus. In the presence of so much difference of opinion it seemed to us worth while to make a further attempt to ascertain what facts can be established with regard to these cases, and to what extent the various theories of causation are in keeping with them.

As the condition is entirely confined to young infants, it will be well to begin by referring to the peculiarities of the larynx and of the breathing at this time of life.

THE LARYNX IN THE YOUNG INFANT.

Our observations upon the anatomy of the larynx in infants and young children have been based upon the examination of fifty specimens removed from subjects in whom no obstruction of the upper respiratory passages existed. For the majority of these we are indebted to the kindness of Dr. Theodore Shennan, pathologist to the Royal Hospital for Sick Children and to the staff of the Royal Maternity Hospital. The larynges of the stillborn infants were in many cases examined *in situ* by means of a dissection which exposed them from behind; the remainder, taken from children up to the tenth year of life, were examined after removal from the body by the ordinary *post-mortem* method. Our attention was directed mainly to the upper aperture of the larynx. This

* Read in the Section of Diseases of Children at the annual meeting of the British Medical Association, Ipswich, July-August, 1900.