inclined to attribute them primarily to the disturbance of carbohydrate metabolism, and especially to the upset of normal glycogenic function. Many investigators have pointed out effects that disease and extirpation of the thyroid have on the morphology of the pituitary gland, and vice versa, but no constant changes have so far been established.

Does Insulin Antagonize Pituitrin?

There is no clear evidence on this point. We have been struck with the tendency common in diabetics on insulin treatment to become obese on very low diets, sometimes less than 20 calories per kilogram of body weight, but it is rather drawing a bow at a venture to attribute this to inhibition of normal pituitary function. We have heard, however, of a male insulin case who is developing more definite symptoms of hypopituitarism—deposition of excessive fat round the abdomen and buttocks and the loss of pubic hair. We have unfortunately not been able to get in close touch with the case up to the present. The similarity of the appearance of many insulin cases to that of hypopituitarism was noted early by several clinicians in America.

One of us has produced evidence that insulin has a remarkable effect in controlling and ameliorating certain cases of Graves's disease,⁶ and other investigators have observed the same effect. In the same way we believe that insulin might affect acromegaly favourably and prove useful in its treatment, but so far we have not had a suitable case of active acromegaly on which to try it.

Conclusions as to the Effect of the Pituitary on Carbohydrate Metabolism.

Any conclusions we draw are put forward very tentatively. It would seem that the pituitary has a powerful stabilizing influence on blood sugar and carbohydrate metabolism. There are two well recognized mechanisms which control and affect blood sugar concentration. The first is the mechanism which produces varying amounts of endogenous insulin to keep the blood sugar normal by balancing the carbohydrate of the food. It is clearly anabolic in function. The second is the immediate action of adrenaline in raising the blood sugar by mobilizing glycogen to meet any extraordinary needs of the individual for sugar. This mechanism is clearly katabolic. Pituitrin has no definite immediate action on blood sugar, but it controls and compensates the excessive action of the other two substances, tending to keep the blood sugar normal and at an optimum for the individual. These are the facts. But the explanation of how pituitrin can at one time stimulate glycogenolysis and at another inhibit it, as it appears to do, remains a complete mystery. It may be dangerous to deduce the normal action of an internal gland from the effects produced by its extracts, but where the pituitary is concerned the evidence of disease points to the same conclusions. We would suggest that in normal metabolism the pituitary gland, like the thyroid, maintains a balance between anabolism and katabolism. When the gland is upset in either direction an unbalanced condition of metabolism follows, and the first manifestation of this, perhaps the primary cause of all the other metabolic changes, is the upset of the glycogenic regulation of carbohydrate stores and blood sugar concentration.

SUMMARY.

1. Subcutaneous injection of therapeutic doses of 1 c.cm. of posterior lobe extract (pituitrin) have no appreciable or constant effect on blood sugar concentration in normal and diabetic individuals.
2. These doses markedly antagonize the effect of insulin on blood sugar, both in normal persons and diabetics. Experiments with ergotamine show that this antagonism is produced by the mobilization of glucose by pituitrin.
3. The insulin tolerance of normal individuals in the fasting condition is about 15 to 20 units. Much more can be tolerated when insulin is balanced with food.
4. Curious symptoms caused by therapeutic doses of pituitrin in normal individuals are described.

5. Blood sugar experiments on a case of diabetes insipidus are described and their significance is discussed.

6. It is suggested that the pituitary gland, like the thyroid, is one of the most important factors in producing a normal balance between anabolism and katabolism and does so primarily by its effect on glycogenic function and carbohydrate metabolism.

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ON THE TREATMENT OF CONVERGENT CONCOMITANT SQUINT.

BY

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SINCE the meeting of the International Ophthalmic Congress in Edinburgh in 1883 I have always adopted, as a general plan of operative procedure, advancement instead of tenotomy, and on more than one occasion I have ventured to say that tenotomy in ordinary circumstances amounts to malpraxis. It is certainly to Dr. E. Landolt that we owe this changed point of view. Forty years ago he pointed out, in numerous writings and later in a small monograph on the muscles of the eyeballs, the unreasonableness of tenotomy. Strabismus does not depend on overaction of the convergence, but on a defect in the action of the external recti muscles, due no doubt to a fault in the innervation. Landolt has conclusively shown that there is no overaction of the internal recti—that the error is one of impaired latent divergence.

The definition I always gave to the students who attended my instruction was: When the axes of vision do not intersect at the point of fixation, then there is squint. This definition includes all possible cases of squint, and, when properly interpreted, includes also the various forms of heterophoria.

In concomitant convergent squint the axes intersect, if they are in the same horizontal plane, at some point nearer than the point of fixation. If they are not in the same horizontal plane they cross each other somewhere nearer than the point of fixation. One of the characteristics of the variety of squint under consideration is that for almost any point of distant fixation within the field of vision the angle between the two axes is a constant; thereby differing materially from the forms of squint due to muscular paralysis and from those other cases in which the movement of one of the eyes is impaired by the presence of an orbital growth.

Treatment of convergent concomitant strabismus as it occurs in young children has a twofold object—namely, (a) the functional development of the squinting eye both as regards visual acuteness and as regards binocular vision; (b) the removal of an obvious disfigurement.

To a considerable extent treatment should be determined by the age of the patient and the time which has been allowed to pass from the first appearance of the squint. When the condition supervenes in early childhood, say before the patient attains 3 years of age, immediate treatment is urgently required, for if the eye be allowed to squint for a considerable time amblyopia is definitely and permanently established. The delay of a few months inevitably means that the eye is rendered permanently amblyopic. Such patients form an important group which should receive very special attention.

If the onset of true strabismus does not take place till the fifth year or later, it is generally found, if the eyes be otherwise healthy, that each eye is possessed of good visual acuteness. The cases forming this group are few; they border very closely on esophoria, and treatment has

for its object the establishment or restoration of binocular vision, and sometimes, although infrequently, the removal of a disfigurement.

In addition to these two well defined groups, a third must be mentioned. Sometimes, even in cases in which the defect has begun in the first years of life, each eye is found to have excellent visual acuteness. I have always found that from its onset the strabismus has in such cases been alternating. At times the young patient was seen to be using the right eye for fixation and at other times the left. When that has been the case the function of each eye has been developed, and in each the vision is satisfactory. The treatment applicable here is precisely the same as for the second of the above mentioned groups (alternating convergent strabismus).

The first class of cases is of extreme importance, for, if there be any carelessness in treatment, permanent amblyopia will be established and the value of the eye will be very much reduced. In my opinion the first essential is to cause the young patient to use the squinting eye for general fixation. If this be done its function will become developed, and it will become and remain a good eye. The best method of accomplishing this is to throw the non-squinting eye out of action by mydriasis, so that the small child is compelled to use the squinting eye for fixation. As a rule it suffices to place a few drops of a 1 per cent. solution of atropine sulphate in the conjunctival sac of the non-squinting eye once every second day. When this treatment is followed for some time it is found that the little patient now uses the eye which originally was the squinting eye for purposes of fixation, and that the other eye, which at first was straight, is apparently affected with strabismus.

When the fixation changes from one eye to the other I always feel satisfied, for then I am sure that the function of the eye is developing and that ultimately both eyes will be possessed of good visual acuteness. After the change has taken place I continue the same treatment for a month or even six weeks so as to establish the function of fixation in the eye which at first appeared to be the one affected. Sometimes, although rarely, this treatment suffices to remove the squint, so that both eyes appear to be used for fixation. In the majority of cases, however, at the end of the time indicated, the eye which originally deviated, and which will henceforth be called the eye A, is used for fixation; whilst the other, which hereafter will be called the eye B, deviates inwards, and that to the same extent that A did when the patient was first seen. There is now the fear that the functional development of the eye B will be arrested and that it may become permanently amblyopic. The treatment is therefore reversed and the mydriatic is applied to the eye A and is so applied till the eye B again becomes straight. When this takes place the eye A may remain straight; if it does the mydriatic should be used to A very sparingly, perhaps only once in ten days, and should be stopped altogether if the eyes remain apparently without convergence for distant fixation.

So long as there is any convergence I use the mydriatic alternately in the manner described, and thus ultimately secure the functional development of each eye, and get in each good visual acuteness. The use of mydriatics is much to be preferred to the covering of one eye with a pad or a bandage, for if the child be not under the care of a trustworthy nurse it will remove the covering altogether. A bandage is too insecure unless it be carefully attended to by a competent nurse. The primary essential in the treatment of a young child afflicted with squint is to secure the development of good visual acuteness in each eye. If that be not accomplished then unilateral amblyopia becomes established and the affected eye is permanently impaired as an organ of vision.

After the originally squinting eye, A, becomes the eye used for fixation I allow it to be used for that purpose for at least a month or even for two months, although B is convergent for distant fixation. At the end of that time I begin to use the mydriatic to A till B becomes the fixing eye, and thus alternate the use of the mydriatic for a year or a year and a half unless in the meantime the strabismus has disappeared. Again, I say that at this stage

the primary object is the development of visual acuteness in each eye.

Spectacles should be prescribed as soon as possible. In very young children errors of refraction cannot be measured with any degree of accuracy, and in addition glasses cannot be worn. This is not so serious a matter as might be thought. Clinical experience daily shows that children or even young adults who have never suffered from strabismus may have a very considerable amount of uncorrected hypermetropia and at the same time have excellent visual acuteness. The uncorrected defect has not in such circumstances prevented the development of good acuity. It is not uncommon to find children with 3 or 4 diopters of hypermetropia who nevertheless have standard vision when tested either by the types of Snellen or of Landolt. I have known a lad 16 years of age with 5 diopters of hypermetropia and full acuteness of vision in each eye. So long as an individual has a range of accommodation sufficient to correct the hypermetropic error such a result need cause no surprise.

For these reasons I delay ordering correcting glasses till measurements can be made with some approximation to accuracy and till the patient is sufficiently advanced as to be able to wear glasses. So long as I know that each eye is possessed of good visual acuteness—a function which is never lost—I am in no hurry to prescribe glasses till it can be done in a satisfactory manner.

Similar considerations determine for me the question of operation. If each eye has by the treatment here described obtained good vision, there is no particular hurry. Such vision is permanent unless some other untoward event occur. If permanent amblyopia is established in one eye, or is in the process of making, it is not likely that any operation will be a remedy. My own experience may be unfortunate, but I have not found that operation for convergent strabismus is successful in such circumstances. Within a few weeks of the operation the deviation will be found to have returned. It is quite different, however, when each eye is possessed of good visual acuteness and the patient has attained such an age as to be capable of receiving benefit from orthoptic treatment.

Probably the best apparatus for orthoptic treatment is the very ingenious amblyoscope devised by Mr. Claud Worth. There are numerous pictures suitable for stereoscopic combination, all well arranged and suitable for the purpose; but of these, two sets are of special interest. The first consists of a parrot in front of one eye and a cage in front of the other. The young patient is first of all exercised in seeing the parrot and the cage simultaneously. As soon as that is accomplished the patient is directed to adjust the instrument so as to bring the parrot into the cage. This simple exercise must be continued for some days till the result is obtained without any difficulty. To ease the monotony of the process, some of the other designs sent with the instrument can be substituted. These exercises do not to any extent promote the awakening of the function of perspective, at least not so well as the two which I consider of special value for this purpose. In these there is placed before each eye two circles which are not, as seen singly, concentric nor of the same size. On each side the larger circle contains the smaller eccentric circle. When seen with the amblyoscope the original four circles (two before each eye) become blended into two—namely, a larger outer circle and a smaller inner circle. In addition they are now found to be quite concentric and the smaller to appear either nearer to or farther away from the observer than the larger.

When the patient has reached such an age as to be capable of this training, then, if it be necessary, operation should be performed, preferably by double advancement as recommended by Landolt. As soon as possible after the operation the patient, wearing his correction for any existing ametropia, should resume the exercises with the amblyoscope.

If the concomitant convergent squint does not set in till the age of 5 or 6, or if in earlier life the affection has been alternating, then each eye is found to be possessed of good visual acuteness. Here all that is necessary is to advance each external rectus and to begin training with Mr. Worth's amblyoscope or other reliable form of stereoscope.