attended to. Good scales are an essential part of the equipment to enable us to control the progress of the cure and determine the effect of lactation in the puerperae. Of course the general laboratory of the institution will furnish the necessary laboratory examinations.

This preliminary announcement of the plans of the maternity department of the Chicago Municipal Tuberculosis Sanatorium is permitted by the trustees of the institution, all of whom have shown much interest in this new department. They have been prepared under the special direction of the president, Dr. Theodore B. Sachs, and of the architect, Mr. Otis.

This outline of the sanatorium management of tuberculous mothers and their children is given as a contribution to the solution of the problem, and to invite interest in it and stimulate discussion of the principles and details of the plan. Later we hope to be able to describe its workings and compare them with those of other institutions which may be incited to undertake similar work.

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ABSTRACT OF DISCUSSION

DR. WALTER J. MARCLEY, Minneapolis: We have here the possibility of the control of the tuberculous mother, the proper care of her lying-in period, prevention of tuberculosis in the young child, the sanatorium treatment of children from the home already infected and the education of the mother who will go back to her home. We know that it is more and more necessary to work with the children already infected. The details of the plan are to be worked out. Whether the child shall be fed on the milk of the tuberculous mother, whether the mother will be content to look through a glass window at her child, whether the mother would go into an institution and whether she would stay, are all details of the plan to be settled from the social point of view.

DR. MARY STRONG, Omaha: We do not believe in feeding babies on the milk of a tuberculous cow, why then should we ever feed a baby on the milk of a tuberculous woman? It seems to me that the latter is worse.

DR. CHARLES S. BACON, Chicago: I suppose it is known that the milk of the tuberculous cow becomes contaminated with the tubercle bacilli from the intestinal tract unless there is some tuberculous sore of the udder. It is possible that there may be infiltration of the germs through healthy milk-glands, but probably this is rare. This is a problem to be worked out and this as I have said can be done only by careful examinations, inoculations and other experiments.

SOME FEATURES OF ROENTGENOGRAPHIC CHANGES IN PITUITARY DISEASES*

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The studies of the function of the ductless glands enabled us to understand more fully many pathologic skeletal conditions until recently unexplainable. These conditions may reveal themselves either in disturbance of growth or in changes of configuration. In regard to the former we are familiar with the changes following disorders of the sexual organs, of the adrenal cortex and recently also of the pineal gland. Delayed skeletal development is exemplified in the well-known condition of hypothyroidism, a condition in which we find persistence or delayed closure of the epiphyseal lines and late appearance of the bone nuclei.

As illustrative of the changes in configuration the well-known condition of acromegaly affords us a good example. It is characterized by marked mandibular prognathism and enlargement of the hands and feet, accompanied by hypoplastic bony changes, especially to be noticed in the skull and here accompanied by enlargement of the sinuses. The pituitary body has for a long time been associated with these anomalies, and this early view has been confirmed by later investigation, although these studies have given us quite a different explanation for these relationships.

The great importance of roentgenoscopy in these conditions of pituitary disease is evident; for not only is the diagnosis often confirmed by the roentgenographic findings, but sometimes it is based primarily on them. Such an examination must be directed, first, toward the gland itself and its neighborhood, and secondly, toward the bony changes occurring in the skeleton in general as a result of the glandular disorder. The characteristic acromegalic findings are well known and will not be dwelt on in the following remarks, inasmuch as recent roentgenographic studies have not revealed any new features in the skeletal picture.

The changes in the cervicodorsal spine, previously described and recently referred to by some French authors, corresponding to the kyphosis so often observed in acromegalic conditions, are, however, interesting, although not generally known.

In view of the limited time at my disposal only two aspects of the roentgenographic studies of pituitary disease will be taken into consideration. First, the general changes in skeletal development heretofore referred to, and secondly, the changes in the skull and in the sella turcica, which are of great importance in relation to the differential diagnosis.

According to clinical experience the anterior lobe of the pituitary body seems to be the essential factor in the production of acromegalic manifestations which are believed to be the result of hyperfunction of this gland. No one has succeeded, however, in producing a similar condition experimentally by feeding or by transplantation. The manner in which this hyperfunction manifests itself does not seem to be dependent so much on the age of the individual as on the time of onset; that is, whether before or after the closure of the epiphyseal lines. If the latter have closed, acromegaly develops; if they are still open, simple gigantism without the specific acromegalic changes occurs. Numbers of instructive examples of such cases are to be found in the recent work of Cushing.[1] Of much interest also from the roentgenologic point of view are those cases in which at a comparatively early age the epiphyseal lines have closed and the subsequent hyperfunction of the hypophysis has produced real acromegalic changes. On the other hand, cases are reported which show only increase in stature in older individuals due to abnormally long persistence of the epiphyseal lines; but one must bear in mind that the rôle played by the pituitary gland in producing different types of gigantism, the normal and pathologic, has not been entirely explained.

In the majority of examples of the reverse condition, hypopituitarism, recorded in the literature, we find mentioned a lack of growth and delayed closure of the epiphyseal lines and a comparatively juvenile configuration of the skeleton without inclination to growth in height, a point of differential diagnostic value as contrasted with conditions dependent on changes in the

* Read in the Section on Surgery of the American Medical Association, at the Sixty-Fourth Annual Session, held at Minneapolis, June, 1913.

1. Cushing, Harvey: The Pituitary Body and Its Disorders, Philadelphia, J. B. Lippincott Company, 1912.

sexual organs which will be mentioned later. Aside from the delayed closure of the epiphyseal lines we find also a delayed appearance of the bone nuclei, a finding which is said to be characteristic especially for the conditions before referred to (Falta). These cases are often combined with tardy sexual development and adiposity. There are, however, cases of pure infantilism without marked trophic changes, in which enlargement of the sella turcica has sometimes been found corresponding to a pathologic condition of the pituitary gland, an example of which we find in Cushing's book.

This hypofunction may be due either to a primary change in the gland or to secondary injury from a lesion in its neighborhood; and it is especially in this regard, namely, whether the pituitary symptoms are due to changes in the gland itself or are secondary to a tumor of its neighborhood that roentgenoscopy may give valuable information.

Before I speak about this important point in differential diagnosis, I should like to mention some variations in the sella turcica which may normally occur; for it is well known that in normal conditions the sella may show a marked variation in size and shape. A measurement of 15 mm. anteroposterior and 10 mm. vertical diameter is considered to be the limit in size to which it may normally attain; but in considering the size of the sella it is necessary to take into account the condition of the other ductless glands, especially of the sexual organs, which are known to have a definite correlation with the pituitary gland. It is known that castration produces hyperplasia of the pituitary gland and secondary enlargement of the sella turcica (Tandler and Gross), as opposed to the findings in the so-called "eunuchoid type," in which no enlargement of the sella turcica has been observed, in spite of the many resemblances to the true eunuchs in their somatic appearance.

Concerning the female sexual organs, undoubted changes in the hypophysis during pregnancy have been observed and enlargement of the sella turcica on roentgenoscopy has also been reported; indeed, in older multiparous women we find rather often a comparatively large sella, a finding possibly due to ovarian insufficiency. One should be cautious in making a diagnosis of pituitary tumor in these persons in the absence of clinical tumor symptoms. It seems possible, however, that pituitary hyperplasia secondary to insufficiency of one of the remaining ductless glands could produce true acromegalic changes, as suggested by a case of acromegaly following castration in an adult woman (Goldstein).

Furthermore, the condition of the thyroid gland must be taken into consideration, for in many cases of myxedema enlargement of the sella turcica can be demonstrated roentgenologically.

The two commonest variations—the short and rather deep, and the long and rather flat types of sella—seem to be dependent in some way on the shape of the base of the skull (Schüller). The first type we find, as a rule, in brachycephalic persons, the second in those who are bradycephalic.

Another interesting correlation has been noted by Fitzgerald, who asserts that the size of the sella always corresponds to the length of the posterior portion of the base of the skull, but that it is in indirect proportion to the distance from its anterior wall to the ethmoidal spine. The size of the sphenoidal cells seems also to bear an important relation to the configuration of the sella turcica. Although we have as yet no certain knowledge concerning these things, we frequently find a small sella in association with a massive sphenoidal bone or with poorly developed sphenoidal cells, aside from the acromegalic cases in which the enlargement of the sinuses belongs to the characteristic syndrome.

The anatomic relations of the sella turcica are the more important because we cannot see the gland itself on the roentgenogram. In spite of the cases occasionally reported, it is important to know that the shadow of neither the normal nor the pathologically enlarged gland can be seen on the plate, except in the rare cases in which calcification has taken place, a condition more often found in the so-called *Hypophysenganggeschwülsten* (Erdheim) and roentgenologically described in a single instance by Algyogy. Recently I have observed three further cases in Dr. Cushing's clinic which seem to belong in the same group, a report of which will be given in greater detail at a later time.

In general, however, it may be said that conclusions in regard to disorders of the gland itself can be drawn only from the changes in the bony parts. These changes in the sella turcica are represented by its enlargement, by a thinning of the floor and by a thinning and absorption of more or less of the dorsum and of the posterior clinoid processes.

It is now interesting and of great importance to note, as it has been shown by Erdheim and Schüller that the order of appearance of these changes in the sella turcica is quite different in the case of a tumor of the pituitary gland itself—the so-called intrasellar tumor, on the one hand, and tumor of the hypophyseal stalk, or other pathologic condition, of the immediate neighborhood of the gland, on the other hand. In intrasellar tumors we find first an enlargement in the site of the sella, with increasing thinning of its floor and of the dorsum sellae, followed later by more or less pronounced absorption of the posterior clinoid processes and of the dorsum sellae. This thinning of the floor and of the dorsum may finally cause a disappearance of the normal border, so that after a time we may find on the roentgenogram only very faint lines—the remains of the dorsum sellae.

Quite different is the sequence of changes in the other types of tumor mentioned. Here the absorption of the clinoid processes and of the dorsum sellae is first noticed, and although later we find an enlargement of the sella, nevertheless this enlargement is rarely so pronounced as in the case of an intrasellar tumor; and the sella is always of the characteristic flat type, as compared with the deep and round sella of an intrasellar tumor. It is evident that in a later stage of development in these two types it would be difficult or quite impossible to make a differential diagnosis.

Furthermore, in tumors of the brain which have no topographic relation whatsoever to the pituitary gland and in the case of internal hydrocephalus, we find not infrequently changes due to the increase of intracranial pressure, and very similar to those heretofore mentioned in connection with extrasellar tumors. In these cases the differential diagnosis can be made only from the clinical symptoms and the other Roentgen-ray findings in the skull, for tumors of the hypophysis in their early stage only exceptionally show signs of increased intracranial pressure on the roentgenogram. Tumors of the brain, on the other hand, often produce even at this time an enlargement of the diploetic veins and deepening of the pacchionian grooves and of the furrows corresponding to the convolutions of the brain. The differential diagnosis can often be made by the secondary changes of the skull and by a lack of the typical

acromegalic changes, such as a thickening of the bone, enlargement of the sinuses, mandibular prognathism, etc.

Especial attention should be called, according to Schüller, to the development of the so-called sphenoparietal sinus—a venous channel connecting the sinus cavernosus with the convexity of the skull. In big tumors of the sella this sinus is often enlarged, which can be explained by pressure of the growth on the sinus cavernosus. In normal persons, however, one must remember that a large sphenoparietal sinus is occasionally to be found; so that this condition must always be interpreted with a certain amount of caution.

In tumors of the acoustic nerve, a rather characteristic change in the dorsum sellae has been observed. These tumors sometimes produce not only a thinning of the dorsum sellae, as in other extrasellar growths, but also a rather characteristic tendency of the dorsum sellae to incline forward. This fact enables us at times to make a diagnosis of an acoustic tumor from the roentgenogram, especially when these changes of the sella are combined with the described enlargement of the meatus acusticus (Henschen).

All these examples show that changes of the sella turcica in size and shape occur rather frequently in conditions other than true pituitary tumors; that is, in tumors in the neighborhood of the sella turcica as well as in tumors without any topographic relationship to the hypophysis and in cases of increased intracranial pressure due to internal hydrocephalus. On the other hand, the great influence of the other ductless glands on the development of the pituitary gland and on the secondary changes of the sella turcica has been demonstrated. These facts prove that not every change in the sella turcica is necessarily to be interpreted as a result of a primary pituitary disease, a fact which I hope I have emphasized especially in these brief remarks.

A COMPARATIVE STUDY OF ANTIGENS FOR THE WASSERMANN REACTION *

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HISTORICAL REVIEW

In 1901, Bordet and Gengou published the method for complement fixation, which was designed for the purpose of detecting antigens; that is, such bodies as are capable of producing antibodies, as well as a definite group of serum substances, probably amboceptors, the nature of which is not yet determined. It is possible by this method to determine, by the use of a known antigen, whether a certain serum contains the specific amboceptor, or reversely, one may determine by means of a known serum whether the substance used as antigen contains the antigen bodies. Neisser and Sachs proposed the use of this method for the differentiation of albumin. Wassermann, Neisser and Brück were able to demonstrate, in the serum of monkeys which had been previously treated with extracts of syphilitic organs, the presence of substances which gave complement fixation with syphilitic extracts. Detre, as well as Wassermann, Neisser, Brück and Schucht, found the same substances in the serum of syphilitic patients. Their early experiments, however, gave very inconsistent results. Citron was the first to recognize that the amounts of antigen and serum employed by the former authors had been too small and that the influence of the specific medication on the reaction was unknown to them.

Porges and Meier, von Landsteiner, Müller and Pötzl and later Yamanouchi and others pointed out independently that a substance could be obtained by extracting syphilitic and normal human liver as well as other organs with alcohol, which, when mixed with the serum of syphilitics, gave rise to complement fixation, and which to a certain degree could replace the syphilitic antigen. Porges and Meier, as well as Landsteiner, incline to the view that the alcohol-soluble substance is a lipoid closely related to lecithin, while Levaditi and Yamanouchi ascribe less significance to the lecithin and consider the bile salts as the important substances. The complement-fixation tests carried on by Wassermann and Citron with various colloidal substances such as glycogen, albumoses, peptone, lecithin, oil and gelatin, as well as the experiments of Landsteiner and Stanovic with other colloids, led Citron and Wassermann to the assumption that the cause of the complement fixation is a chemicophysical change of the molecule due to its entering into combination with some other substance. The experiments of Seligmann also prove that in colloidal reaction with or without precipitation complement may be absorbed. The disappearance of the complement is not due to the molecular condition as such, but is due to the changed condition of the colloids. While this does not offer any explanation of the specific immunity reaction, it shows that aside from the immunity reaction there coexist other definite chemical reactions which cause the disappearance of the complement. This in no way alters the great value of the complement-fixation test for the biologic diagnosis of infectious diseases, for it is the special property of immune serums to influence to a greater degree that colloid which is their antigen.

These findings induced Wassermann to separate the complement fixation in syphilis from the generally accepted antigen-antibody hypothesis for other infectious diseases, for he assumed that all antigens must be albumins or derivatives of albumins, without considering that some lipoids or lipoid-albumin combinations might be antigens also. The experiments of Metchnikoff and those of Deyke Pasha and Reschad Bey point to the fact that it is possible to stimulate the organism to the formation of reacting agents, similar to antibodies, by the injection of fat-like substances. The cobra-lecithin experiments should also be mentioned in this connection. It was pointed out by Citron that the injection of animal and other poisons with lecithin causes the formation of toxolipoids which may act as antigen, that is, produce antibodies. Such antibodies against the syphilitic toxolipoids may have a lipoidophil group which is brought out in the admixture with lecithin.

The fact that the serums of luetic patients are rich in ferments capable of splitting certain fats and lipoids and the presence of such ferments to a lesser degree in the serums of patients suffering from other infectious diseases, such as leprosy, tuberculosis, scarlet fever, etc., may be the reason why such serums react with syphilitic antigen. Thus it is possible that in the Wassermann reaction we are dealing with several distinct complement-fixation reactions of entirely different character, one of which may be specific.

In spite of the fact that the Wassermann reaction is as yet unexplained, it is widely used for the diagnosis of syphilis. The aqueous extracts of the syphilitic liver

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