the time) show either a normal or a diminished amylase content in blood and urine. Our work therefore gives little or no support to this hypothesis.

So far we have found a subnormal blood diastase only in diabetes mellitus, liver disease, one case of albuminuria in pregnancy (Table III, K632), and one case of septic endocarditis. In most instances the urinary diastase was normal, so that the low blood values were not due to a diminished formation of the ferment. It is possible that a lowered renal threshold for amylase was present, such as has been suggested by Langdon Brown⁵ to explain the relatively high urinary figures (associated with normal blood diastase) in pregnancy toxæmias. Excluding the pregnant patient, our cases had little or no albuminuria. Otherwise we are at a loss as to what significance (if any) should be attached to these subnormal blood amylase findings.

In conclusion our results confirm the opinion of previous investigators (Allen⁶) that diastase tests are of little or no value in the diagnosis, prognosis, or treatment of diabetes mellitus.

Summary.

Estimations of diastase simultaneously in blood and urine have been made in fifty-five diabetics and a large number of controls, due attention being paid to the reaction of the urine, the diet, etc.

Our findings are in support of those investigators who have concluded that the presence of amylase is more or less accidental, and of little or no value in the diagnosis, prognosis, or treatment of diabetes mellitus.

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BRACHIAL NEURITIS DUE TO CERVICAL RIB.

BY

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MUCH has been published on the condition of cervical ribs and the symptoms which this abnormality may produce, but most of the articles have been contributed to meetings of specialists or to little read journals, and a pathological condition does not become common knowledge until it has been repeatedly brought to the notice of the general practitioner at meetings of societies which he attends or in journals which he reads.

HISTORICAL.

In 1893 Lewis Jones published a report of 6 cases of paralysis of the small muscles of the hand (some supplied by the ulnar and some by the median nerve), which did not progress and so differed from progressive muscular atrophy.

In 1902 Buzzard published a series of similar cases and diagnosed the condition as due to a lesion of an individual root of the brachial plexus, but was puzzled as to the cause.

Apparently neither of these physicians was aware that in 1891, at Edinburgh, Sir David Wallace had read a paper in which he reviewed the older (anatomical) literature on cervical ribs, and had shown a patient with pressure symptoms which Wallace attributed to a rudimentary cervical rib.

In 1895 Stiles recorded a case of his own and referred to 8 or 10 cases in which the cervical rib had been excised.

Thorburn was probably the first to use *x* rays to diagnose the presence of rudimentary ribs, and in 1904 he described before a London society two cases with pressure symptoms.

The connexion between the nerve symptoms and cervical ribs having thus been brought to his notice Lewis Jones endeavoured to trace the cases he had described eleven years earlier, and found that of 14 patients examined 10 showed one or more cervical ribs.

Edwin Bramwell was apparently the first to suggest (in 1903) that the lowest brachial plexus root might be pressed on by a rudimentary or even by a normal first thoracic rib, and in 1911 Sir Harold Stiles removed a portion of first rib, with satisfactory result, from a patient with typical pressure symptoms. Similar cases have been recorded by various surgeons (Stopford stated in 1919 that in less than two years he had met with 10 cases of compression neuritis

produced by normal first rib), but, so far from this having become common knowledge, Stiles informs us that it was news to not a few of the American surgeons to whom he lectured on the condition in the States in 1922.

EMBRYOLOGY.

In a limbless animal like the snake, to every vertebra is attached a pair of ribs, and each somatic segment has also its pair of segmental nerves. In the human embryo the arms and legs first appear as limb buds, the arm bud springing from five or six vertebral segments. These segments grow chiefly in a vertical direction, while the limb grows chiefly out at right angles and soon fails to cover the whole vertical extent of the segments from which it was derived. Thus, of the spinal nerves which supply the limb, the upper and lower nerves come to pass more and more obliquely between their points of origin and their point of entry into the limb. The nerves are relatively larger in the embryo than after birth, and they are of sufficient size to interfere with the forward growth of the rib mesoblast, so that in the cervical and lumbar regions the ribs are normally represented by the rudimentary costal processes of the vertebrae only. Occasionally a more or less perfectly formed pair of ribs spring from the seventh cervical vertebra; more rarely the first pair of thoracic ribs are incomplete or rudimentary. The limb bud is not constant in its origin: in some individuals it derives from the cervical segments alone, in others it derives also from the first dorsal segment, and exceptionally from the second dorsal segment also. The brachial plexus, being of course formed from the nerves of whichever segments enter into the origin of the limb, varies accordingly. Wood Jones states that where little or no contribution to the plexus comes from the first dorsal root there is a greater liability to cervical rib; in cases of rudimentary first rib the second thoracic nerve has been found to make a considerable contribution to the brachial plexus.

ANATOMY.

A rudimentary cervical rib is commonly an inch or more in length, and ends in a rounded knob from which a tight fibrous band passes to be attached to the first rib. An intercostal muscle exists between the rudimentary rib and the rib below; anteriorly the muscle fibres are gradually replaced by fibrous tissue. The lowest root of the brachial plexus more usually passes over and rests upon this fibrous band than upon the rudimentary rib itself.

CAUSE OF SYMPTOMS.

Cervical rib is of course a congenital condition. Pressure symptoms rarely occur before adult age. This is explained by the dropping of the shoulder which normally takes place as growth proceeds: in the child the clavicles rise markedly from their sternal ends towards their outer extremities; in adults (especially women) they not uncommonly slope downwards from their sternal ends. Apart from this general factor, there is almost always a definite exciting cause for the pressure symptoms. This may be an acute illness—for example, diphtheria—leading to stretching of ligaments; or a sudden weight lifting; or the pressure, say, of a violin above the clavicle; or unaccustomed use of the upper limb, strenuous such as digging, or intricate such as piano playing or typewriting.

SYMPTOMS.

The lowest root of the brachial plexus contains motor, sensory, and sympathetic fibres, and motor, sensory, trophic, and vascular symptoms may all be present in cases of rib pressure.

Pain.—The patient most usually consults a doctor on account of pain, which commonly extends along one aspect (more often the inner side) of the forearm. The pain is burning, neuralgic, or "pins and needles" in character, and a diagnostic point of importance is that it is relieved by raising the arm above the head, this movement lifting the nerve off the rib or fibrous band over which it has been stretched.

Paralysis.—Wasting of the thenar eminence is the most frequent motor symptom, the opponens pollicis and abductor pollicis being the muscles usually chiefly affected. Careful examination may reveal wasting of some of the interossei or others of the ulnar group of muscles, but the most characteristic clinical picture is one where there is very obvious wasting of the ball of the thumb.

Vascular Symptoms.—A weak radial pulse has been not uncommonly noted; very rarely oedema of the forearm.

Trophic Symptoms.—Gangrene of the fingers is a very rare symptom.

TREATMENT.

The symptoms being due to pressure on a nerve root, they cannot be cured except by removing the pressure, and this can only be done by surgical operation.

In the absence of pain it is doubtful whether a patient should be urged to submit to operation merely on account of paresis of some of the intrinsic muscles of the hand unless his occupation is one which requires the use of these muscles. But the doctor is hardly likely to be consulted unless there is pain; if he finds that pain in the hand or forearm is relieved by raising the limb above the head, and is accompanied by thenar wasting, he should have the patient x-rayed; and even if no cervical rib is found to be present the characteristic syndrome will justify a diagnosis of rib pressure and warrant recourse to operation.

The operation is a dissection of the neck, demanding an accurate knowledge of anatomy; if a cervical rib is present it is isolated, divided posteriorly, and removed. If no cervical rib is present a portion of the first rib is removed. Provided the symptoms have not persisted too long cure is to be expected—usually rapid cure of pain and much less rapid restoration of muscle power.

The case which we have to describe came under the care of one of us (W. W.) on March 16th, 1922.

He was a well developed, muscular young man of 25, living in the country, who had previously been in good health. Five months ago he began to have pain in the back of the right wrist; later it spread to the arm, and a fortnight ago the right side of the root of the neck became painful. The pain was intermittent, and he might be free from it for two or three hours at a time; but when present the pain was severe and burning, and at night prevented sleep. He found some relief from supporting the elbow. On examination, the pad of the forefinger was dry and black, and there was a smaller area at the tip of the thumb, and a quite small black spot on the tip of the middle finger. The right thenar eminence was smaller than the left, and the muscles of the right forearm had less tone in them than those in the left. Sensation was impaired in the thumb and forefinger.

Palpation at the root of the neck revealed on both sides a hard bone-like outgrowth, suggesting an extra rib, which was confirmed by a skiagram. The sensory impairment and trophic changes at the tips of the thumb and first and second fingers pointed to involvement of the sixth or sixth and seventh cervical nerves, and the slight wasting of the thenar eminence showed that the eighth cervical had not wholly escaped.

On inquiry as to a possible cause for the development of the symptoms the man stated that he had been digging rather vigorously in his garden for many days prior to the onset of the pain.

Operation.—On March 28th, 1922, through an L-shaped incision the right cervical rib was exposed and divided posteriorly and removed.

Result.—The operation was followed by immediate relief of pain. The trophic changes cleared up less quickly and the gangrenous tip of the forefinger had ultimately to be amputated.

Writing on October 25th, 1922, the family doctor thus describes the man's condition: "There is slight tenderness at the corner of the scar to the ulnar side—this has always been the tenderest spot. No anaesthesia or pain in forearm or hand. No trophic changes except that the terminal inch of the forefinger is slightly red, glazed, and numb. The muscles of the forearm are like a blacksmith's, very well developed, and there is no difference between those of the right and left hands except as regards the thumb muscles."

ASTHMA AND ADRENAL INADEQUACY.*

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I do not propose to enlarge in any detail on what we one and all picture to ourselves as asthma, and what we readily recognize as such, but there are a few points I should like to refer to.

Dieulafoy, in his description, says: "The attacks of dyspnoea which constitute asthma . . . appear suddenly weeks, months, or even years apart." They consist of two elements—(1) a nervous, which is constant, and (2) a catarrhal, which is variable, may not be present with first attacks, but appears as a complication in later attacks. The attack of asthma generally begins "in the early hours of the night." Then follows a picture of the patient during a paroxysm:

"An attack of asthma is rarely single; we usually see a series of attacks which are repeated for several days or weeks; they often return at the same hour—usually at night. . . . Analysis of the attack shows that the dyspnoea presents peculiar characteristics. . . . The painful and wheezing inspiration

only allows an insufficient quantity of air to enter the chest, and the expiration, which is still more painful and three or four times as long as the inspiration, does not drive out the inspired air. . . . We do not see sucking-in, as in croup, because in asthma the chest is always filled to its maximum with air."

In the true variety the nervous element is alone in play and it is only when catarrh appears that the picture is modified. "The attack of asthma is certainly produced by spasm of the muscles of respiration," though authorities disagree in allocating the spasm to the intrinsic muscles of respiration, the extrinsic, or both. Asthma is a neurosis and presents all the caprices of such, and further, it is almost always a diathetic and hereditary neurosis.

"The spasm of the respiratory muscles and the phenomena of vaso-dilatation and vaso-secretion are themselves due to a special condition of the nerves which govern these functions. This state of irritability is sometimes spontaneous or at least apparently so; at other times it is due to a reflex act which starts in the terminals of the sensory nerves which supply the bronchi or the nasal passages."

Thus Dieulafoy, and if one reviews his treatment the drugs used are all those which have an inhibitory action on the vagus.

Now in coming to a logical conclusion as to what is the root mischief at work, wherein has lain our difficulty? As I regard it, the reason is that we have to deal with a condition which apparently is subject to no fixed laws, whether of heredity or environment, germinal origin, seasonal incidence, racial characteristics, or age period. I say "apparently" advisedly, as there is evidence, if we seek it, of some hereditary influence, of some relation to the age of the individual and to his environment. Thus, faced with the initial difficulty of incidence, can we isolate any one condition common to all cases, any one condition subject to the above influences, any one condition of which we could say: "This is the fundamental principle lacking in the human economy of all asthmatics, and this is the cause of asthma, however it as a cause may be produced"? I think we can do so.

The fundamental fault in the incidence of asthma I believe to be *suprarenal inadequacy*, and I propose to advance as briefly as possible evidence in favour of this opinion.

Some months ago the one question knocking at my brain was: Why do so many cases of asthma obtain such marked and definite relief—even though only of a temporary nature—from an injection of adrenaline or some such derivative of the suprarenal medulla? The answer was: This supplies temporarily a deficiency; this has to do with the cause of the condition, and is a manifestation of the specific action of adrenaline in restoring the normal tonus of the bronchial muscles.

On this basis the problem required much wider, more minute, consideration: the first principle involved was the review of the known action of the extract of the suprarenal glands, and the second was how this action could be affected or modified by external influences acting on the glands or by influences on the glands themselves. The actions are familiar, but they will bear recapitulation.

The glands probably have two secretions—one produced by the medulla and one from the cortex—whose action may be supplementary, but probably is antagonistic, to adrenaline. We owe to Langley the important generalization that the action of adrenaline on any part is the same as stimulation of the sympathetic nerves to that part. It will not act on a structure that at no time in its history has been innervated by the sympathetic. Elliott, in extending these observations, has brought forward some facts which suggest that, after excision of the suprarenals, the muscles innervated by the sympathetic cannot be thrown into activity even by electrical stimulation of the nerves.

Adrenaline appears, then, to be a chemical body whose presence is essential to the activity of the sympathetic. Nor is this the only example of such an association, for sympathetic paraganglia and structures such as the carotid body contain paraganglin—a similar but more stable body which does not lose its effect even if left in contact with the stomach wall for twenty-four hours.

Adrenaline constricts cutaneous vessels, but, on the contrary, has a dilatory influence on intramuscular vessels and on those of the heart itself. It has little or no action on the vessels of the lungs or brain. It liberates sugar in the blood. It causes relaxation of intestinal muscles and of bronchial muscles. It contracts all sphincters. It can bring about rapid recovery of the normal irritability of muscle after this has been lessened by fatigue, and this is an inherent property of adrenaline itself and not produced through its influence on the circulation. The glands are innervated by the sympathetic system, and since the secretion stimulates the same activities that are stimulated nervously by this division it is possible that disturbances in the realm of the sympathetic, although initiated by nervous discharge, are automatically augmented and prolonged through chemical effects of the adrenaline solution.

Every one of the visceral changes noted—the cessation of processes in the alimentary canal (thus freeing the energy supplied to other parts), the shifting of the blood from the abdominal organs and skin to the organs mostly in need of them, the lungs, heart,

* Abstract of a paper entitled "Asthma—a phantasy with some facts," read before the Durban Medical Society.