THE SUPRARENAL FUNCTION IN SOME INTRACRANIAL LESIONS.

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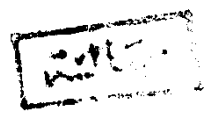

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AIM OF THE WORK

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The adrenal gland is known as an important organ which plays a major role in the deffensive mechanism of the body in the face of stress. Its hormones both cortical and medullary share in this reaction to stress.

It is now established that the adrenal gland activity is influenced by the control of higher centres. Thus the adrenal medulla - which is enbryologically derived from the nervous system - is anatomically and physiologically connected to the autonomic nervous system and its higher centres in the reticular system of the brain stem and further up with the hypothalamus. The adrenal cortex is known to produce 2 varieties of hormones; the gluco-corticoids and mineralocorticoids. Gluco-corticoids secretion is controlled by the activity of the pituitary gland which lies at the base of the brain and is closely connected to the hypothalamus through humeral and nervous pathways. Mineralo-corticoids mainly aldosterone is however controlled only slightly by pituitary activity. Although some higher centres in the mid brain controlling aldosterone secretion has been suggested by some authors, yet its main regulating mechanism is now known to be related to

[illegible] adrenal [illegible] activity in [illegible] [illegible] [illegible] hypothalamic pituitary-adrenal [illegible] was directed [illegible] to try to investigate the adrenal function in some cases with intracranial lesions that may disturb the function of the higher centers of this axis.

Head injury although it acts as a sort of stress that normally result in adrenal over activity, yet with a possible lesion in the hypothalamus or pituitary this reaction on the part of the adrenal would probably be modified.

On the other hand, intracranial lesions of chronic nature with prolonged increase in intracranial pressure or in chronic lesions nearby the hypothalamopituitary area, may be expected to disturb the adrenal function indirectly by causing a dysfunction of its higher controlling mechanism.

The vital role played by the adrenal in conditions of stress including surgical operation emphasizes the value of knowing on demand whether adrenal function is disturbed as a result of an intracranial lesion which itself might need surgical treatment or not.

Another point which stimulated us to do this work is the well-known observation that steroid therapy is valuable in reducing brain oedema that results from brain injury or neurosurgical operations. The mechanism underlying the efficiency of steroids in treatment of brain oedema is still not clear, and so it is worthy of further explanation.

INTRODUCTION

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Physiological Consideration

The adrenal (suprarenal) glands, situated at the upper pole of each kidney, have a combined weight of approximately 7 gm in adults. Each gland is composed of 2 parts which are embryologically, anatomically and functionally distinct. The central medulla, a derivative of the sympathetic part of the autonomic nervous system, produces the pressor amines adrenaline and noradrenaline. The outer cortex, which like the gonad is of mesodermal origin, secretes a number of steroid hormones and is composed of three layers of cells which can be recognised histologically. Nearer to the medulla is the zona reticularis, then the zona fasiculata, and outermost the zona glomerulosa.

The Adrenal Steroids

Three major groups of steroids are now recognised. One typified by aldosterone, is produced by the outer zona glomerulosa at a rate of about 200 µg/day. It exerts well defined effects on electrolyte metabolism. The other two groups, namely the adrenal corticosteroids and the androgen (androstendione) influence, among other things, the metabolism of fats, carbohydrates and proteins. Both groups are produced by the inner zona reticularis, with cortisol, synthesised at a rate of approximately

[illegible] being quantitatively and qualitatively the most important of the adrenal corticoids.

Steroid hormones have a common chemical structure based on a nucleus which consists of three six carbon (A, B, C)rings and one five carbon ring (D), with the position of the carbon numbered as in figure (I). All the adrenocortical hormones have this same basic structure containing a double bond and oxygen atoms are added at various points.

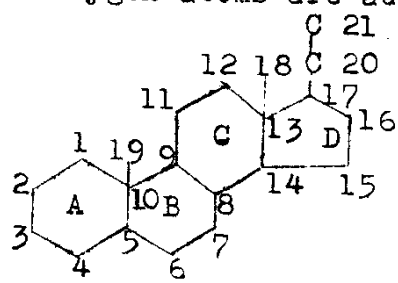

Figure I

The corticosteroids contain 21 carbon atoms where as the adrenal androgen contains only 19.

In Table I and II are depicted the different adrenocorticoids which can be found in blood and urine of man. Some of the compounds recorded in these tables are present in trace amounts only. The adrenocorticoids belonging to the 4-pregnene series are the biologically active ones.

Table 1

Adrenocorticoids and some of their metabolites isolated from human plasma

No.	Compound	Year Isolated	Authors
1	4-Pregnene-11B,17α,21-triol 3,20-dione	1953	Bush and Sandberg
2	4-Pregnene-11B,21-diol-3,20-dione	1953	Bush and Sandberg
3	4-Pregnene-17α,21-diol-3,11, 20-trione	1953	Morris and Williams
4	4-Pregnene-21-ol,3,11,20-trione	1953	Morris and Williams
5	4-Pregnene-11B,17α,21-triol-3,20-dione	1953	Romanoff et al.
6	4-Pregnene 11B, 21-diol-3,20-dione	1953	Romanoff et al
7	4-Pregnene-17α,21-diol-3,20-dione	1995	Eberlein and Bongiovanni
8	Pregnane-3α,17α,21-triol-20-one	1956	Eberlein and Bongionvanni
9	Pregnane-3α,17α,21-triol-11,20 dione	1956	Vermeulen
10	Pregnane-3α, 11B, 17α, 21-tetrol 20-one	1956	Vermeulen
11	Pregnane-3α,21-diol-11,20 dione	1957	Klein et al.
12	4-Pregnene-20-ol-3,20-dione	1958	Tauchstone

No.	Compound	Year Isol.	Authors
13	4-Pregnene 21- acetoxy-3 11, 20-trione	1960	Weichselbaum an Margraf
14	4-Pregnene-11B 17α-diol-21-acetoxy 3,20-dione	1963	Margraf et al.
15	4-Pregnene 11B-ol-21-acetoxy-3,20-dione	1963	Margraf

• Means isolated from adrenal veins

Table II

Adrenocorticoids and some of their metabolites isolated from human urine

No.	Compound	Year Isol.	Authors
1	Pregnane-3α,11B,17α,21-tetrol--20-one (THF)	1940	Callow and Callow
2	4-Pregnene-11B,17α,21-triol-3,20-dione (F)	1948	Mason and Spragne
3	4-Pregnene-17α,21-diol-3,11,20-trione (E)	1950	Schneider
4	Pregnane-3α,17α,21-triol-11,20-dione (THE)	1952	Schneider
5	4-Pregnene-17α,21-diol,3,11,20-trione (DHE)	1952	Schneider
6	4-Pregnene-11B,21-diol-3,20-dione (B)	1954	Touchstone et al.
7	4-Pregnene-6B,11B,21-triol-3,20-dione	1954	Burstein et al.
8	Pregnane-3α,11B,21-triol-20-one (THB)	1954	Engel et al.
9	Allopregnane-3α,11B,21-triol-20-one	1954	Engel et al.
10	Pregnane-3α,21-diol-21,20-dione	1954	Touchstone et al.
11	Pregnane-3α,17α,21-triol-20-one	1954	Touchstone et al.
12	4-Pregnene-21-ol,3,11,20-trione (A)	1955	Touchstone et al.