

Clinical Studies on Cortisol Secretion and its Metabolism Using Radioactive Cortisol

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Cortisol-4-C¹⁴ was administered intravenously to six normal subjects, fifteen patients with thyroid dysfunction and to nine patients with liver disease. Twenty-four hour urine sample after the injection was collected. Cortisol secretion rate was estimated by isotope dilution method and daily excretion of major urinary metabolites of cortisol, i.e. cortols, cortolones, tetrahydrocortisol (THF), allo-tetrahydrocortisol (ATHF) and tetrahydrocortisone (THE) were calculated by multiplying the secretion rate by per cent dose injected of each radioactive metabolite on paper chromatogram.

In ten patients with hyperthyroidism, cortisol secretion rate and urinary excretion of total glucuronide, THE, ATHF and of cortolones were remarkably increased (26.4±5.7** mg/day, 17.8±1.2*mg/day, 9.2±2.2*mg/day, 1.67±0.53***mg/day, and 5.40±1.69*mg/day, respectively) as compared with those in normal subjects (16.8±1.5 mg/day, 7.0±1.2 mg/day, 3.2±0.4 mg/day, 0.93±0.33 mg/day, and 1.30±0.45 mg/day, respectively). And THE/THF ratio, ATHF/THF ratio and cortolones/cortols ratio were also increased (9.8±4.0*, 1.6±0.3*, and 16.3±6.5**, and 5.3±1.3, respectively), suggesting acceleration of both 11 β-dehydrogenation and 5 α-hydrogenation in cortisol metabolism. These changes were statistically significant (*: p<0.001, **: p<0.01, ***: p<0.05).

In five patients with hypothyroidism, the reverse was observed (secretion rate 8.3±2.3* mg/day, total glucuronide 3.9±1.6***mg/day, THE 1.12±0.46*mg/day, ATHF 0.05±0.02** mg/day, THE/THF 0.81±0.04*, ATHF/THF 0.05±0.07*, cortolones/cortols 2.28±0.43**).

In all patients with liver disease (liver cirrhosis 3, chronic hepatitis 5, acute hepatitis 1), cortisol secretion rate was decreased (11.7±4.1***mg/day, 10.8±1.3**mg/day, and 8.6 mg/day, respectively). And was observed decreased tetrahydro (THF+ATHF+THE)/hexahydro (cortols+cortolones) ratio (1.74±1.0*, 2.10±0.21*, and 0.39, respectively) as compared with normal value (3.85±0.94), suggesting that hexahydro metabolites of cortisol might be produced by both liver and extrahepatic tissues, whereas tetrahydro metabolites were mainly produced by liver.