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Euthyroid Sick Syndrome: Role of glucagon

Euthyroid sick syndrome is a manifestation of transient hypothalamic-pituitary dysfunction along with altered thyroid hormone metabolism. It is not prudent to rely solely on a single thyroid test in the evaluation of thyroid function of patients with critical illness, and a careful assessment of multiple tests may be needed. It is reasonable to delay the final diagnosis for several days to weeks, or after recovery from the acute illness, to determine the appropriate thyroid status. Thyroid hormones have been used in the setting of NTI in various settings with T4 and T3 replacement and remain controversial in the absence of prospective studies to demonstrate benefit. Assessing thyroid function in patients with severe illness such as those in the ICU is difficult. Many of them have low serum concentrations of thyroxine (T4), free T4, and triiodothyronine (T3), free T3, and their serum thyrotropin (TSH) concentrations also are frequently low. Thyroid function tests need not be assessed in seriously ill patients unless there is a strong suspicion of thyroid dysfunction. Also, measurement of serum TSH alone is inadequate for the evaluation of thyroid function and, in this scenario, free T4 and free T3 along with TSH are recommended. However, these tests frequently fail to differentiate between euthyroid sick syndrome and central hypothyroidism. Determination of serum reverse T3(RT3) may be helpful since RT3 is almost always elevated in euthyroid sick syndrome while being low in central hypothyroidism. Treating patients with critical illness with low serum T3 and/or low T4 concentrations with no other clinical signs of hypothyroidism is not commonly recommended. Patients may receive thyroid hormone replacement if there is additional evidence to suggest a diagnosis of hypothyroidism (such as a TSH over 20 mU/L with low free T4 and/or history, symptoms, and signs of hypothyroidism), in which case cautious administration of thyroid hormone is appropriate. Therefore, thyroid functions should not be assessed in critically ill patients in the absence of a suspicion of thyroid dysfunction as these abnormalities are not a true reflection of actual hormonal activity at the cellular level and treatment of these patients with thyroid hormones is of little benefit and sometimes may be detrimental. In this presentation, several clinical disorders manifesting altered thyroid hormone levels noted with euthyroid syndrome are described. Moreover, presence of hyperglucagonemia as well as its relationship with thyroid hormone metabolism and hypothalamic pituitary thyroid axis in these disorders is documented. Finally, role of glucagon is established in both altered thyroid hormone metabolism and altered hypothalamic pituitary thyroid axis documented in euthyroid sick syndrome by determination of serum thyroid hormones and TSH concentrations in response to glucagon administration in dogs, normal human subjects as well as subjects with clinical disorders. Moreover, influence of TSH in conversion of T4 into T3 in nonthyroidal peripheral tissues is also demonstrated in athyreotic dogs and human subjects.

Speaker Biography

Udaya M Kabadi is a graduate of Seth G.S. Medical College, the University of Bombay in Bombay, India. He completed his internal medicine residency at KEM Hospital Parel in Bombay and a medicine residency at Jewish Memorial Hospital and Beth Israel Medical Center in New York, He also completed a fellowship in endocrinology and metabolism at VA Medical Center and Beth Israel Medical Center in New York, New York. He is board certified in internal medicine, endocrinology and metabolism and geriatric medicine by the American Board of Internal Medicine. He is a fellow of the Royal College of Physicians of Canada, the American College of Physicians and the American College of Endocrinology. He has been a chief editor, associate editor and member of editorial boards of several medical journals. He is currently an adjunct professor of Medicine at the University of Iowa College of Medicine, Iowa City as well as Des Moines University, Des Moines, Iowa. He has over 200 publications in peer-reviewed journals. He has presentations to his credit, at regional, national, and international arenas. He has been selected as 'Teacher of the Year' many times by students, residents, and fellows in training. He has been involved in research in the area of carbohydrate metabolism and diabetes, thyroid disorders and osteoporosis as well as in clinical practice and education for several years.

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