

## RESPONSE OF PINEAL GLAND IN CLINICAL CASES OF PSYCHOLOGICAL STRESS

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### SUMMARY

The present study includes 50 patients suffering from psychological stress disorders like thyrotoxicosis and anxiety neurosis. Biochemical estimation of melatonin was done in all these cases prior to treatment and 3 months after appropriate treatment. A significant increase in the level of melatonin was observed in thyrotoxic and anxiety neurotic cases. In all these cases, after therapy the level of melatonin was found to be within the normal limits. These observations confirm the finding that there is a pineal response to psychic stress.

It has been reported that psychic stress could play an important role in the precipitation of thyrotoxicosis (Gupta, 1978 and Udupa, 1971) where neurotransmitters are considered to be transducer of the various changes in the body following stress. At the same time the pineal hormone has also been reported to be a neuroendocrine transducer (Wurtman and Anton-Tay, 1969) for the various endocrine and metabolic changes in the body. It has been reported that melatonin level and its synthesizing enzyme activity was increased after stress (Singh, 1980 and Lynch *et al.*, 1973). Because of a number of inconsistencies regarding the role of pineal gland in stress, and also in the absence of a relationship between pineal hormone and thyrotoxicosis, it was decided to undertake a study to determine the plasma level of the pineal hormone melatonin in such stressful diseases like thyrotoxicosis and anxiety neurosis having definite history of psychic stress.

### MATERIALS AND METHODS

These clinical cases were collected from the different speciality clinics of Hospital and included 50 cases related to some psychological stress. Out of 50 cases 25 cases of well established thyrotoxicosis (both clinically and by laboratory investigations) having a definite history of psychic stress, were included in this study. In addition to various thyroid function tests like PBI and I<sup>131</sup> uptakes, the blood samples of each patient, of either sex, were collected (between 11 to 11.30 a.m.) before starting the treatment. The samples were subjected to the estimation of melatonin fluorometrically as per standard method of Ozaki *et al.*, (1976).

After advising proper treatments, the patients were asked to attend the clinic at monthly intervals. At the end of 3 months, the patients were re-examined and melatonin levels were correlated with the duration of illness, symptomatology and their gradual improvement from time to time.

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Apart from the cases of thyrotoxicosis, 25 cases of simple anxiety neurosis having a history of similar type of stress, without any involvement of thyroid gland, were also included in this study. In addition to the history and various symptomatology, their blood samples were also collected before starting the treatment and subjected to the biochemical estimation of melatonin by the method mentioned above. All these observations and investigations were repeated at the time of follow up and analysed statistically. Twenty apparently normal individuals were used as control.

## RESULTS

Out of the 25 cases of established thyrotoxicosis included in this study, 13 were females and 12 males. Most of the cases were between the age group of 30-40 years.

The plasma level of melatonin showed an increase in thyrotoxic patients, the level being  $1.90 \pm 0.45$  ng/ml where compared to the normal level of 0.74 ng/ml (Table -1).

The plasma melatonin level in cases of anxiety neurosis i.e. 2.35 ng/ml was found to be significantly higher than the normal control level of 0.74 ng/ml (Table 1).

TABLE 1—Plasma melatonin level in clinical cases (ng/ml) (Mean  $\pm$  S.D.)

	Pre-treatment value	Level after 3 months followup
Thyrotoxicosis (N=25)	$1.90 \pm 0.45^*$	$0.80^a \pm 0.21$
Anxiety neurosis (N=25)	$2.35 \pm 0.43^{**}$	$0.95^b \pm 0.05$

Normal value  $0.74 \pm 0.09$

\* $p < 0.01$  (as compared to normal)

\*\* $p < 0.001$  (as compared to normal)

a= $p < 0.02$  (as compared to pre-treatment value)

b= $p < 0.001$  (as compared to pre-treatment value)

### Response to Treatment :

To establish the role of pineal hormone in such stressful diseases, if at all it is precipitated by stress, the estimation was

repeated in all the cases 3 months after standard treatment. The level of melatonin found increased at the time of starting the treatment was followed by a significant fall, reaching within normal limits within 3 months after standard treatment in cases of thyrotoxicosis and anxiety neurosis i.e. 0.80 ng/ml and 0.95 ng/ml respectively as compared to normal value, i.e. 0.74 ng/ml (Table-1).

## DISCUSSION

The plasma level of melatonin was found increased in both thyrotoxicosis and anxiety neurosis, the level in the latter being higher. It has been reported that there is hypertrophy of the pineal gland and an increase in the level of plasma melatonin after stress (Singh, 1980 ; Miline *et al.*, 1968 and Parvathi Devi *et al.*, 1978). The cases included in this study had psychological stress prior to the development of their respective disorders. Probably the increase in the melatonin level found in this study may be due to this stressor, may be due to the stress of the disease itself or both. The former factor may be more responsible since the level in anxiety neurosis is higher and anxiety neurosis is known to be the first among the psychosomatic disorders to develop after stress. This may latter develop into the rest disorders (Udupa, 1973). The increase in the melatonin level may have a role in the development of thyrotoxicosis since pineal gland is known to influence the thyroid gland (Wurtman *et al.*, 1968). Treatment reduces the plasma melatonin to the normal level. Drugs such as beta-blockers are used which are known antistress drugs. Probably the lowered perception of stress by the individuals may be a factor for the reduced melatonin level after therapy.

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