

CIRCADIAN CORTISOL RHYTHMS AFTER RIGHT AND LEFT TEMPORAL LOBECTOMY



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RATIONALE

The Limbic-Hypothalamic-Pituitary-Adrenal Axis (LHPA) is a neuroendocrine system that has been extensively studied and linked to stress responses. It is believed to exist for the purposes of communication of stress stimuli and the management of daily levels of stress.

A negative feedback loop involving the pituitary gland, hypothalamus, and limbic system (hippocampus, prefrontal cortex, and lateral septum) helps prevent over excitation of the LHPA and overproduction of glucocorticoids. Impairments in these structures are associated with elevated cortisol levels.

The purpose of the present investigation was to examine the role of left and right anterior temporal lobe (ATL) structures on daily circadian cortisol rhythms.

We hypothesized that removal of the medial temporal lobe would increase the intrinsic reactivity of the LHPA axis as measured by morning and evening cortisol levels.

SUBJECTS

8 Left ATL 8 Right ATL 8 Healthy Controls

All ATL patients were left language dominant based on Wada and underwent seizure surgery for treatment of idiopathic temporal lobe epilepsy

Demographic Data

	LATL	RATL	NC
N	8	8	8
Age (mean)	46.8	41.5	51.8
Beck Depression Score (mean)	7.0	6.1	3.2
Months since surgery	61.8	46.9	
# on Anti-depressants	3	4	ns
# on Mood Stabilizing Anticonvulsants	2	3	
# with seizures fully controlled	6	5	
Mean Engel rating	1.25	1.53	ns

PROCEDURES

For three consecutive days, participants provided saliva by free home collection immediately upon awakening and then one, four, nine, and 11 hours thereafter. The diurnal saliva samples were collected across 3 days (Tuesday through Thursday) and analyzed for cortisol by Salimetrics (www.salimetrics.com).

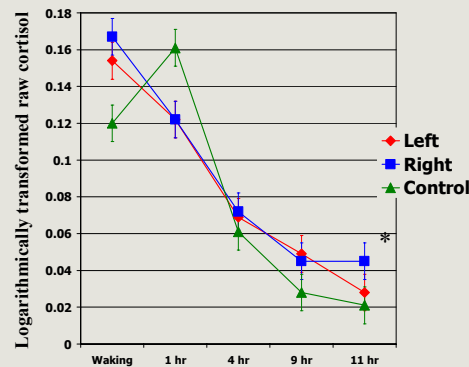
Data Analyses: Cortisol analyses were conducted on trapezoid Area Under the Curve (AUC) values and logarithmically transformed mean raw cortisol levels.

RESULTS

Total AUC by Group

The three groups were statistically equivalent on total AUC (Right ATL = 127.77, Left ATL = 124.98, Controls = 118.26; $F(2, 23) = .14, ns$).

Group by Time of Day Transformed Raw Cortisol Levels

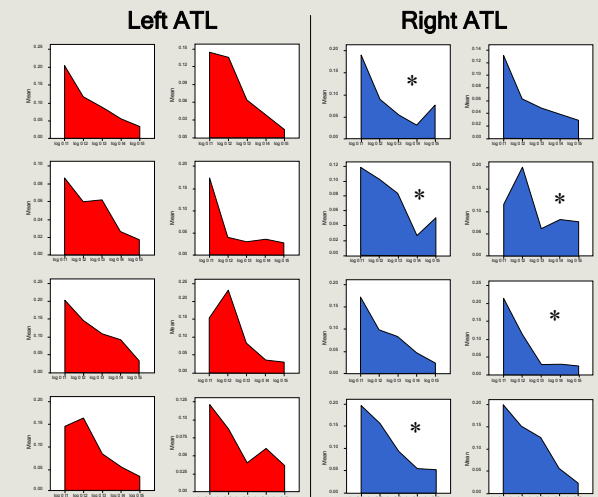


A 3(Group) x 5(Time) ANOVA shows a significant Group x Time interaction [$F(8, 80) = 2.53, p < .05$].

*Planned comparisons were conducted on waking and evening hours only, with significance occurring only for the evening hour (R ATL to L ATL, $p < .05$, R ATL to Control, $p < .005$, L ATL = Control).

RESULTS

Individual Circadian Cortisol Rhythms for Left and Right ATL



*Denotes elevated night cortisol level or failure to decline from 9 to 11 hr. Right ATL = 5/8; Left ATL = 0/8, Control = 2/8, $X^2(2) = 7.66, p < .05$

CONCLUSION

- There was no evidence of abnormal morning reactivity in the Left or Right ATL patients. Thus, despite unilateral removal of the neuroanatomical structures involved with the LHPA axis, the LHPA axis retained its normal wake response.

- These data do provide preliminary evidence, however, that the normal attenuation of the LHPA axis over the course of the day, particularly the evening hours, is altered in Right ATL patients.

- Other studies suggest that Right ATL patients have increased mood variability relative to Left ATL patients (Bowers et al., 2004).

- Together, these laterality effects suggest that the right temporal lobe systems have a special role in influencing stress reactivity and mood.

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