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SHORT COMMUNICATION

INFLUENCE OF LATERAL POSTURE ON SWEATING : DOES POSTURE ALTER THE SYMPATHETIC OUTFLOW TO THE SWEAT GLANDS?

J. S. VAIDYA* AND R. A. DHUME

Department of Physiology,
Goa Medical College,
Bambolim, GOA - 403 022

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Abstract: Our unpublished observation that a lateral decubitus posture influences the pattern of sweating was systematically tested by measuring galvanic skin resistance (GSR). Changes in the GSR between two electrodes placed on skin was used to quantify the degree of sweating. In the lateral posture, sweating is inhibited on the lower half and stimulated on the upper half and reversal of the lateral posture induces sweating on the opposite half of the body. This observation suggests that the autonomic nervous system is controlled at least in part, by body posture.

Key words: GSR posture sweating sympathetic system

INTRODUCTION

It is known that sweating is under sympathetic cholinergic control and that a sympathetic chain controls the sweat glands of its side. Based on the fact that profuse intercconnections between the right and the left nuclei exist, it is generally assumed that the hypothalamic control over sympathetic outflow is bilateral. It has not been investigated as to whether lateral decubitus has any influence on the function of autonomic nervous system (ANS) with regard to right or left sided dominance of sweating. However, various yogic postures claim to have variable influences on somatovisceral activities while standing sitting or lying down (2, 3, 4, 5, 6). The present study culminated from our chance observation that when one lies on one side, it is the other half of the body which sweats.

METHODS

Sixteen male subjects of ages between 8 and 50 years were invited to participate in the study. The degree of sweating was assessed by sight, touch and Galvanio Skin Resistance (GSR). The reduction of GSR between two electrodes placed over the skin was used to quantify the magnitude of sweating. Two pairs of silver electrodes were placed 2.5" apart, one pair on the right and the other pair on the left side of the back, equidistant from the spinal column at the level of lower angle of scapula. The subjects were made to lie on a flat surface in a closed room with an ambient temperature of approximately 30°C and average humidity of 70%. This environment was inductive to sweating. In stage 1 of the experiment, each subject was made to lie on side A for 15 min and in Stage 2, he turned to lie on the opposite side, designated as side B, for another 15 min. Visual and tactile monitoring of sweating of whole body from forehead to feet was performed to reconfirm our earlier observation. GSR between each pair of electrodes was measured by a sensitive Ohmmeter (range 0.1 to 100 Ohms). An initial

*Corresponding Author and present address : Department of Surgery, Tata Memorial Hospital, Dr.E. Borges Road, Parel, Bombay - 400 012

reading was taken as soon as the subjects assumed the lateral posture and then at 5 minute intervals. The differences in GSR change were statistically analysed by the t-test.

RESULTS

All subjects began to sweat in the experimental environment. A very sharp line of demarcation between the sweating upper and the non-sweating lower areas was observed at the midline. This demarcation existed along the whole length of the body. Over the period of 15 min during stage 1 of the experiment, the GSR of the upper side decreased significantly more from the initial reading than that of the lower side ($P < .001$) (Fig. 1); in 38% of subjects the GSR of the lower side even increased (Table I).

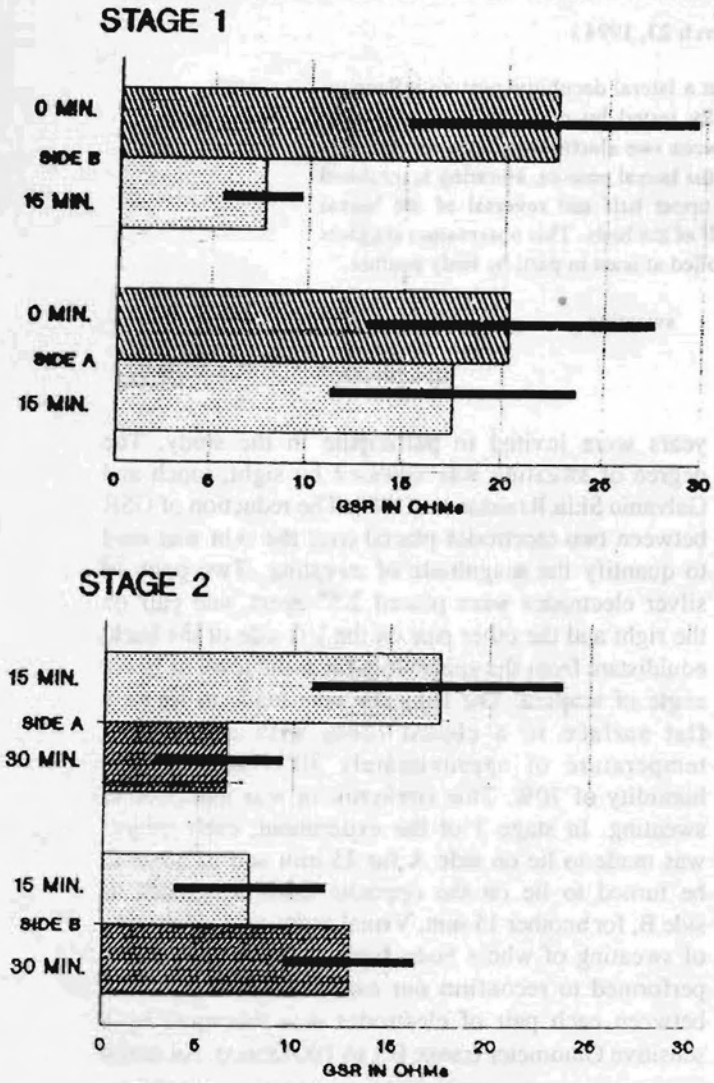

Fig. 1 : In stage 1 (0 min to 15 min), the subject is lying on side A.

In stage 2 (15 min to 30 min), the subject is lying on side B.

On turning (stage 2) the sweat on the now lower side, slowly evaporated and the side became dry to touch and by sight. The upper side now became wet. Relative to the GSR values at the end of Stage 1, the GSR of the now drying lower side (side B) increased while the GSR of the sweating upper side (side A) decreased ($P < .0001$).

DISCUSSION

Our study demonstrates that the lateral decubitus position influences sweating pattern, stimulating sweating on the upper side and inhibiting it on the lower. This observation suggests that lateral posture affects the function of the sympathetic cholinergic outflow and that the effect is differential with respect to side, i.e., the upper side chain is stimulated while the lower side chain is inhibited, indicating functional dichotomy of the sympathetic system. It is likely that the phenomenon is mediated through the proprioceptive recognition of the lateral position by the higher centers controlling the mechanism of sweating. It appears that the vestibulo-cerebellar system, responsible for recognition and reflex regulation of the position of the body in space, has direct or indirect relationship with hypothalamic nuclei with respect to the regulation of sweating. This would indicate that the centers sensing posture modulate the centers regulating temperature. Hypothalamic nuclei have been shown to have profuse interconnections between right and left sides. This study provides a clue that hypothalamus may have a dichotomous functional control of the sweat glands through sympathetic chains.

Another manifestation of this phenomenon might be the differential congestion of the two nostrils in persons suffering from common cold while lying in lateral posture. If this is so, it would imply that even the adrenergic flow of the sympathetic system is dichotomous and influenced by posture.

TABLE I: 0SideA and 1SideB = GSR at the start on side A and B respectively
1SideA and 2SideB = GSR at the end of stage 1 (at 15 min)
2SideA and 2Side B = GSR at the end of stage 2 at 30 min)
(0SideA = 1SideA) -(0SideB-1Side B) = - 11.5 ± S.E. = 2.688 t = 4.28 P < .001
(1SideA = 2SideA) - (1SideB - 2SideB) = 16 ± S.E. = 2.910, t = 5.50, P < .0001

Subject	*Start*		*End of Stage 1*		*End of Stage 2*	
No.	*0Side A*	*0SideB*	*1Side A*	*1SideB*	*2SideA*	*2SideB*
1	11	11	13	5	5	11
2	10	12	13	5	6	12
3	20	20	20	8	7	15
4	6	10	8	6	4	15
5	8	8	8	6	3	8
6	12	18	23	12	9	17
7	11	11	8	5	4	10
8	30	30	50	7	9	16
9	60	60	40	18	14	21
10	20	24	10	4	4	6
11	28	24	8	6	4	9
12	40	40	11	6	6	6
13	18	28	20	13	10	17
14	8	8	7	6	4	7
15	12	12	20	6	6	8
16	30	40	17	11	9	30
Mean	20.25	22.25	17.25	7.75	6.5	13.0

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REFERENCES

1. Affi AK, Ronald BA. Diencephelon. *In Basic Neurosciences A Structural and Functional approach.* Urban and Sahwarzenherg Baltimore-Munich, 2nd edition, 1986; 209.
2. Vaidya JS, Dhume RR, Dhume RA, Gogate MC. Effect of Meditation on muscle excitability revealed by changes in strength duration curve. *Proceedings XXX Annual Conference of APPI. Indian J Physiol Pharmacol* 1984; 28 (5) : 35.
3. Dhume RR, Vaidya JS, Dhume RA, Gogate MG. Correlation of muscle activity (EMG) muscle excitability and autonomic changes (GSR) induced during meditation. *Proceedings XXX Annual Conference of APPI. Indian J Physiol Pharmacol* 1984; 298 (5) : 36.
4. Bhramchari D, Jain SC, Sahani S et al. Scientific Exploration of phenomenon of Nostril dominance in young human females. *Proceedings XXX Annual Conference of APPI. Indian J Physiol Pharmacol* 1984; 28 (5) : 6.
5. Bhramchari D, Jain SC, Sabani S, et al. Induced Right nostril Breathing : effect on Autonomic Function in adult human females. *Proceedings XXX Annual Conference of APPI. Indian J Physiol Pharmacol* 1984; 28 (5) : 7.
6. Maiti AK. Neurophysiological correlates of few yogic postures based on electromyographic study. *Proceedings XXX Annual Conference of APPI. Indian J Physiol Pharmacol* 1984; 28 (5) : 66-68.
7. Guyton AC. Physiology of Gastrointestinal Disorders. *In Text Book of Medical Physiology. W.B. Saunders and Company.* 8th edition 1991; 736.

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(II) The SECOND AGRICULTURAL SCIENCE CONGRESS is being organised by the National Academy of Agricultural Sciences at the Andhra Pradesh Agricultural University Campus at Rajendra Nagar, Hyderabad-500 030 from the 19th to 21st January, 1995. As part of the Congress three symposia will also be organised on (i) National Water Policy, (ii) Vector Biology and (iii) Integrated on-farm and off-farm Employment. Registration fee for participation is Rs. 250/-. Those wishing to participate may ask for details from :

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