RECORDING OF AUDITORY MIDDLE LATENCY EVOKED POTENTIALS DURING THE PRACTICE OF MEDITATION WITH THE SYLLABLE "OM"

Shirley Telles, and Desiraju T.
Department of Neurophysiology, National Institute of Mental Health & Neuro Sciences, Bangalore
(Accepted August 3, 1993)

Abstract: Middle latency auditory evoked potentials were examined in 7 proficient subjects during the practice of meditation on the syllable "Om", to determine whether these potentials would differ significantly from those recorded during the baseline state without practicing meditation. Similar records were also obtained in 7 "naive" subjects, matched for age, before and during a control period which involved sitting with eyes closed, and with no special instructions for focusing their thoughts. There was considerable inter-subject variability in the different components. However, during meditation there was a small but significant reduction in the peak latency of the Nb wave (the maximum negativity occurring between 35 and 65 msec). This reduction was observed consistently during the 3 repeat sessions of each subject, while the "naive" subjects did not show this change. These results suggest that the inter-subject variability of middle latency auditory evoked potentials precludes using them as the method of choice for assessing the effects of meditation. The small but consistent decrease in the Nb wave peak latency, indicates that the middle latency auditory evoked potentials do change with meditation. However, the variability of the potentials may mask subtle changes.

It is reported1 that near field or long latency auditory evoked potentials (AEPs) showed no consistent change with Transcendental Meditation (TM). Another study2 reported a reduction in far field (short latency) wave V peak latency following meditation. As It is known that far field AEPs alter with meditation, while near field/long latency potentials do not change, the present study was undertaken to assess the effects of meditation on middle latency AEPs. Such data can help in understanding how neural processing at various levels could change differently during a meditation practice in which thoughts are focused on a word or phrase without conscious effort to do so (i.e., meditation on the syllable "Om"), which is the principle that is also followed in transcendental meditation (TM).

MATERIAL & METHODS

Seven normal healthy male volunteers in the age range of 29 to 55 yrs (the average being 42.3+ 9.8 yrs), who were experienced in meditation (range 5-20 yrs), were studied. Using identical stimulus conditions, records were also obtained on 7 age-matched "naive" male subjects with ages ranging from 30 to 55 yrs (average 45.6+9.5 yrs) who did not meditate

Each session was of 32 min duration, 20 min spent in meditation, and the two 6 min periods before and after meditation were spent sitting relaxed, with eyes closed. These sessions were repeated thrice in each subject. The meditators were also studied during 3 control sessions, which were similar in design except that the 20 min period which was meant for meditation was spent "just sitting" with eyes closed. The 7 "naive" subjects were studied in 3 repeat sessions which followed the same sequence as the "control" sessions. The effect of focusing on a meaningless word/syllable could not be checked, and therefore the results cannot help in understanding the changes which occur specially when focusing on a meaningful symbol.

The meditation practice is claimed to attain a single thought state, in deep relaxation. The single thought is the syllable "OM" which is chanted aloud during the initial training in meditation, which subsequently leads to an effortless mental chanting of the syllable.

Middle latency auditory evoked potentials (AEP-MLRs) were recorded from Cz-Al with the preamplifier bandwidth set at 1-1500 Hz, in the 70 msec post-stimulus time period. A total of 1500 responses were averaged for each record (NICOLET, USA, Clinical Averaging Package, 1980 version). Click stimuli of 40 msec duration were delivered at 5 Hz binaurally through acoustically shielded earphones (Amplivox, UK). The intensity was set at 1½ times the threshold of hearing noted with the above stimulus parameters. This was 45 dB HL on an average, low enough to allow the meditators to be undisturbed and yet of sufficient intensity to allow recording of the potentials consistently. Peak latency of Na, Pa, and Nb waves were measured from the baseline values at the beginning of the sweep. Latency was measured from the time of click delivery.

The AEP-MLRs components were as follows the Na wave was the largest negative peak between 14 and 18 msec, Pa wave as the largest positive peak between the Na wave and 35 msce, and the largest negative peak between 35 and 65 msec was the Nb wave. These descriptions are similar to those in other studies on AEP-MLRs3.

Values of peak amplitudes and peak latencies were averaged for each of the 3 periods during the repeat sessions of a subject. Statistical analysis of changes between (i) Meditation or control periods and the preceding eyes closed period; (ii) between meditation and control periods was done by using the paired t-test. For the "naive" subjects the values of the control period were compared with those of the preceding period.

RESULTS & DISCUSSION

The Nb wave varied considerably among subjects (with a range of 35 to 65 msec). However, for the group as a whole, the Nb wave peak latency decreased significantly (P<0.05, paired ttest) during meditation (group mean +SD 49.5 + 7.3 msec), as compared to the preceding period (group mean + SD 51.3 + 6.1 msec). This change was consistent for each subject during repeat sessions. There was no significant change during the control period (group mean +SD 51.4 + 7.8 msec) versus its preceding period (group mean + SD, 49.9 + 8.4 msec). Also, the 7 "naive" subjects did not show any change in Nb wave latency between the control period (group mean +SD 54.0+ 5.9 msec) and the preceding period (group mean +SD 53.4 +7.6 msec).

There were no significant changes in amplitude or latency of either Na or Pa waves for both meditators and "naive" subjects. An idea of the actual values can be had from the group mean obtained in the period preceding meditation or rest. For meditators, the values for Na wave were 16.4 + 1.5 msec (latency), 0.7 + 0.2 μV (amplitude) and for Pa wave were 31.8 + 3.6 msec (latency), 0.9 + 0.4 μV (amplitude). For naive subjects the Na wave measures were 16.3 + 1.4 msee (Latency), and 0.6 + 0.3 μV (amplitude), and for Pa wave 28.0 + 2.7 msec (latency), and 1.5 + 0.2 μV (amplitude).

The small but consistent reduction in Nb wave latency during meditation shows that neural processing at the AEP-MLRs level does change. From the current knowledge of the generators of these waves4, one may hypothesize that meditation on "Om" (a meaningful symbol), leads to changes other than at the prethalamic/thalamic/primary cortical areas. This could be the level of the association cortices. No firm conclusions can be drawn as the actual sample size was small. However, while the subject is awake, there is considerable variability of AEP-MLRs due to large, biphasic wave, viz., the post auricular muscle reflex (PM R), which occurs 10 to 14 msec after the stimulus5. The same study reported that the waveform became more constant during diazepam induced light sleep. The present study shows that the variability persists during eyes closed rest and meditation, as well. Hence a recording of AEP-MLRs may mask changes in neural activity during meditations. AEP-MLRs would therefore not be the method of choice to assess changes at different neural levels during meditation (as anticipated at the start of this study), even though they possibly change during meditation.

REFERENCES

1. Barwood T. J., Empson, J.A.C., Lister. S.G. and Tilley A.J. Auditory evoked potentials and transcendental meditation. Electroencephalogr Clin Neurophysiol 45(1978) 671.
2. Mc Evoy, T.M., Frumkin, L.R. and Harkins, S.W. Effects of meditation on brainstem auditory evoked potentials. Int J Neurosci 10 (1980) 165.
3. Erwin, R. and Buchwald, J.S. Midlatency auditory evoked responses: differential effects of sleep in the human. Electroencephalogr Clin Neurophysiol 65 (1986) 383.

4. Deiber, M.P., Ibanez, V., Fischer, C., Perrin, F. and Maugiere, F. Sequential mapping favours the hypothesis of distinct generators for Na and Pa middle latency auditory evoked potentials. Electroencephalogy Clin Nearophysiol 71 (1988) 187.

5. Yokoyama, T., Ryu, H., Uemura, K., Miyamaoto, T. and Imamura, Y. Study of the constant wave form of ML-AEP in humans. Electroencephalogr Clin Neurophysiol 67 (1987) 372.