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An Objective Study of Chin-Don Therapy for the Cognitively Impaired Elderly: Salivary Cortisol and Immunoglobulin-A Monitoring

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Abstract

Purpose: The effects of chin-don therapy (CDT) on 11 cognitively impaired elderly (CIE) patients and 12 healthy hospital staff of the hospital were examined. **Methods:** Blood pressure, pulse rate and saliva samples (for cortisol and immunoglobulin-A or IgA monitoring) were collected before and after CDT (2 separate sessions), although only saliva was sampled once from healthy reference subjects (Session 1). Participants were allowed to watch the performance and joined in the singing and dancing during each 30-min CDT session. **Results:** Physiological parameters such as the blood pressure and pulse rate were abbreviated in the reference group. The mean scores of mental status NM scale, Nishimura activity of daily living scale (N-ADL), revised Hasegawa Dementia scale (HDS-R), and quality-of-life scale (QLS) found that patients were CIE, and it was difficult for all CIE to follow thorough the 30-min CDT session. In the CIE group, measurements of the systolic/diastolic blood pressure, pulse rate and hormonal parameters did not indicate any significant difference. However, when pre-CDT cortisol and AgI levels of controls per se were compared with post-CDT values, significant decreases ($p=0.05$) in cortisol levels and marked increases ($p=0.003$) in IgA levels were observed in the reference group. **Discussion:** CDT may not have elicited useful outcomes in CIE patients, probably because of extensively variable responsiveness from patients with deficient mental status. Improper parameters and time monitoring were probably used; however, healthy body system in the reference group indicated significant good stress-coping responses in cortisol and IgA levels.

Keywords: deficiently cognitive elderly, healthy subjects, chin-don therapy, cortisol, IgA

1. INTRODUCTION

With an increase in longevity, strata of higher age groups have occupied the upper demographic display of the Japanese population. With an increase in the number, problems of the elderly become more multifaceted and demanding, especially when the number of caregivers is not encouraging adequate.

Elderly of ≥ 65 years accounted for 17.2% of the total Japanese population, and 1.56 million (7.2% of people of ≥ 65 years) CIE were found in Japan in 2000.[1] Furthermore, the number of CIE will reach 2.62 million (8.4% of people of ≥ 65 years) in 2015.[1] Japanese aged 70 years or over without apparent dementia living in an urban community, frequency of thoughts of suicide is estimated to be 4.5%.[2] A recent study has revealed that 2.3% prevalence in a Japanese rural community thought of suicide among the elderly aged 65 years or over.[3] Apart from senility and suicidal behavior, the number of CIE that requires a certain of nursing and support has doubled to 2.5 million in 2015 (versus ca. 1.5 million in 2002).

Additionally, another potentially upcoming CIE group, people with mild cognitive impairment (MCI); ca. 34% with MCI develops Alzheimer disease (AD), a rate 3.1 times higher than those without cognitive impairment.[4] Furthermore, persons with MCI declined significantly faster on measures of episodic memory, semantic memory, and perceptual speed, but not on measures of working memory or visuospatial ability, as compared with persons without cognitive impairment.[4] Although MCI patients (which will be dealt with elsewhere) are of high concern, we focused on the later developmental stage of MCI, or CIE, in our present study.

CIE people do not cope well with livelihood activity and lifestyle; they have poor physical activity, deficient psychological and social activities. All these psychosomatic impairments result in exacerbating their lack of desire to live their lives fully.[5] Caregivers have to therefore provide every possible aid to activate their psychosomatic activity, as adequate and optimal physical and mental activities mimic favorable effects on their

lifestyle as a whole.[6]

Recent approaches to improve psychosomatic health of the elderly by adopting complementary alternative medicine have been focused in order to achieve a higher quality of life (QoL) for them. Apart from oral intake of chemical and natural compounds, Chin-Don therapy (CDT) has been demonstrated to improve QoL of in a multiple-case study.[7] Approaches to influence the body system are taken in consideration of the limits of acoustic, visual and cognitive abilities encountered by the elderly age-groups in the previous study.

There were obviously positive changes in the nervous, endocrine and immunity systems after CDT compared with before exposure. Additionally, facial expression and behaviors during CDT exposure definitely indicated favorable psychological effects on the elderly. Since QoL of the elderly has been improved with CDT,[7] we examined if this method would yield similar outcome using an objective and quantitative approach in this study.

In this study, when we measured physiological and hormonal parameters, CIE patients indicated no significant differences in corticosteroid hormone (cortisol) and IgA levels in saliva after CDT exposure when compared with pre-CDT values. However, significant decreases in cortisol and marked increases in IgA levels were detected in younger naive subjects after CDT compared with values obtained before CDT exposure.

2. METHODS and PARTICPANTS

2.1 Participants

Of a total of 35 CIE patients admitted to Kino Hot-spring Hospital (CIE group), 11 patients (age range: 77 - 95 yr) participated in the study (CIE group). As naive subjects, healthy hospital staff (n=12; age-range: 25–45 yr) of the hospital were enrolled as the reference group. The mean ages of the CIE group and controls were 84.82±7.36 and 34.75±8.17 yr, respectively. The mean length of hospital stay of CIE patients was 234.18±165.13 days, and some were prescribed with hypnotics (n=2) and anxiolytics (n=3). Naive subjects (n=12) serving as a reference group were hospital staff without pre-existing conditions or medication use. Next-of-kin or family members of the CIE group and the reference subjects per se were briefed orally and in written form on the purpose, methods, after-effects and possible outcomes of the study, and written consent was obtained from the 11 CIE patients and 12 reference subjects who decided to participate in the study. The moral and ethic codes of participant treatment for the study were approved by the Ethics Committee of the hospital.

2.2 Methods

2.2.1 Psychological status: mental status of the elderly

Mean scores related to mental states of the elderly were first measured according to the following standard protocol tests: NM scale, Nishimura activity of daily living scale (N-ADL), revised Hasegawa Dementia scale (HDS-R), and quality-of-life scale (QLS).

2.2.2 CDT performance

The 30-min CDT session was performed in the cafeteria of the hospital twice: on August 23 and September 5, 2006. Similar to a previous study,[7] the CDT consisted of typical chin-don tempo and instrumental performance (i.e. 3-prong performance: singing, playing of musical instruments; and dancing).

2.2.3 Physiological assessments and saliva sampling

The blood pressure, pulse rate (times/min) were measured 15 min, while saliva samples (using a sponge) were collected from 11 CIE patients 5 min before CDT and again measured immediately after CDT. Participants were allowed to watch the performance and joined in the singing and dancing during the 30-min CDT sessions. Saliva samples were taken from participants immediately after CDT, followed by (about 15-min rest) measurements of the blood pressure and pulse rate. Although CIE patients has their saliva samples taken on 2 separate sessions (Session 1 and 2), samples were taken only once from healthy reference subjects (Session 1). Moreover, physiological parameters such as the blood pressure and pulse rate were abbreviated in the reference group.

Saliva samples were initially stored in a box containing dry ice, and the cortisol and IgA levels were subsequently measured in a commercial facility.

2.3 Statistical verification

Differences in the data derived from physiological measurements and blood analyses were compared between CDT group and controls, as well as before and after CDT performance within the group per se using the Wilcoxon rank sum test. Differences where $p<0.05$ were considered significant. All calculations were done using statistical analysis software Windows SPSS-15.0.

3. RESULTS

3.1 Participants and psychological status (mental status of the elderly)

As significant differences in the mean age existed

between the CIE and reference groups, group comparisons were not appropriate. However, the reference group was enrolled to monitor if CDT elicited psychosomatic effects on healthy humans. As such, we focused on the objective test of monitoring only the cortisol and IgA levels in the reference group.

The mental status confirmed the 11 patients were mentally impaired and required nursing care. The mean scores of NM scale, Nishimura activity of daily living scale (N-ADL), revised Hasegawa Dementia scale (HDS-R), and quality-of-life scale (QLS) registered 27.2±7.8 (normal: 50-48), 29.55±10.65, 12.36±6.66 (cutoff point: 20/21), and 52.73±8.62 (cut-off point: 20/21) respectively before the study. Accordingly, of the 11 patients in the CIE group (male: 2; female: 9), 9 suffered from AD, and one each had vascular dementia and Lewy body disease.

Due to the above mental status of the DCE patients, some found it difficult to follow thorough the 30-min CDT session, although some occasionally responded to and participated in singing, performance of musical instruments, and dancing during the CDT sessions. Their responses were extensively variable during the CDT sessions. All in all, the participants were subjected to acoustic and visual stimulations with occasional involvement of physical activity (such as singing and dancing) during the CDT sessions.

3.2 Physiological assessments

In the CIE group, measurements of the systolic/diastolic blood pressure and pulse rate (vs post-CDT readings) on session 1 were 126.64±16.13/76.45±25.95 (vs 129.82±20.06/80.73±26.94) mmHg and 83.09±22.61 (vs 82.45±22.63) beats/min, while those of session 2 were 127.64±12.67/66.55±8.94 (vs 127.36±15.35/70.09±10.33) mmHg and 70.55±8.23 (vs 71.18±9.17) beats/min, respectively. All blood pressure values before and after CDT performance did not indicate significant differences.

3.3 Saliva sampling: Cortisol and IgA levels

When exposed to CDT performance, measurements of session 1 indicated no significant differences in cortisol levels (0.51±0.17 vs 0.45±0.12 μg/dL) before and after CDT, although 5 and 4 patients indicated decreased and increased cortisol levels, respectively. Due to deficient salivary secretions, saliva samples could not be obtained from 2 patients after CDT session 1. In measurements of session 2, similar insignificant differences were obtained (0.53±0.29 vs 0.57±0.26 μg/dL), although 4 and 6 indicated decreased and increased cortisol levels after CDT respectively (saliva sample was not obtained in one patient (refer to reason above).

With regard to values obtained from measured values of IgA levels before and after CDT performance in the 2 CDT sessions: mean IgA level measurements 1 and 2 (vs post-CDT values) were 1183.94±1078.00 and 791.475±92.51 (vs 912.63±686.70 and 797.02665.49) μg/dL, respectively.

Despite a significant difference in the mean age between the CIE and reference groups, statistical differences in the blood pressure and hormonal parameters were not established within the CIE group. However, when pre-CDT cortisol and AgI levels of controls per se were compared with post-CDT values, significant decrease (p=0.05) in cortisol levels of 0.31±0.16 (vs post-CDT: 0.22±0.70) and marked increases (p=0.003) in IgA levels of 292.25±149.02 (vs post-CDT: 499.88395.99) μg/dL were observed in the reference group (Table 1).

4. Discussion

Chin-Don therapy (CDT) delivers acoustic and visual stimulations to subjects, and occasionally involves participation of subjects as well. These stimuli, delivered the human body as a form of stress, may be perceived as positive or negative stressors by the relevant subjects.[8,9] For positive stressors, the body system responds with favorable emotional changes such as happy faces, laughter, joy, and appreciation with gratitude; however,

Monitored Indexes	Chin-Don Therapy (CDT)	
	Before	After
Cortisol (μg/dL)	0.31 ± 0.16	0.22 ± 0.70
IgA (μg/mL)	292.25 ± 149.02	499.88 ± 395.99*

Table 1: Cortisol (mg/dL) and immunoglobin A (IgA; mg/mL) levels increased significantly (*: $p<0.05$; **: $p<0.001$) after healthy subjects were exposed to chin-don therapy (CDT), albeit differences before and after CDT were insignificant in the cognitively impaired elderly (CIE).

when perceived as negative stressors, the body reacts otherwise with dislike, anger, anguish feeling, and rejection with possible retaliation.[10] All these emotional changes are accompanied by release of hormonal and endocrine factors inside the body,[11] although cortisol and IgA may respond to acute and chronic stressors differently.[12] As the sample-participants in the present study were of Japanese origin, and were of certain age-groups previously exposed and therefore accustomed to chin-don performance, and they were more likely to perceive CDT as a form of positive stressors, as evidenced in a previous study.[7]

Apart from emotional expressions, stress-responsive physiological changes in a normal healthy subject occur when subjected to stressors, favorable/friendly or unfavorable/unfriendly:[8,9] viz., increases in blood pressure and pulse rate with elevations of certain endocrine factors (e.g. IgA, etc.) accompanied by changes in hormonal factors (e.g. cortisol and other endocrine factors) are normally observed in a transient period.[11,13] Although stimulations were delivered to CIE patients, they appeared not to have any effect on the blood pressure and pulse rate. Apparently, they seemed to enjoy the CDT sessions; however, by the time their cardiovascular parameters were measured, they could have recovered their original levels as a 15-min resting interval elapsed after CDT or before measurements were actually taken. Cardiovascular indexes of the effect of CDT in this group of CIE patients might not be appropriate, as their values were rather near to normal levels. However, the present cardiovascular parameters may be useful in chronically hypertensive or hypotensive patients, as changes could be manifested over a longer interval. A transient effect of the CDT effect might not be able to observe in the present study.

In the present study, not only physiological parameters (such as systolic/diastolic blood pressure and pulse rate) did not markedly change, but the stress-responsive cortisol and IgA levels also did not remarkably change in the CIE group after CDT. One of the deficient factors was the amount of saliva sampled was meager in quantity. These findings demonstrated that the CIE patients probably did not respond to the CDT sessions with the present monitoring indexes and time-intervals.

In the reference subjects, who served as a positive monitoring group, adequate amounts of salivary secretory contents were obtained. As projected, those healthy naive subjects indicated significant decreases in cortisol levels with concurrently remarkable increases in IgA contents when exposed to CDT performance (Table 1). CDT may only be effective in conditioning a responsive body system against stress or coping with unpleasant environmental stimuli, as observed in this investigation and in a previous study.[7] Additionally, because CIE patients are usually affective in their mental status, their lack of expression in cortisol and IgA contents may have been 'masked' by endogenous changes in other vascular factors and neurotransmitters, etc. Although salivary cortisol and AgI changes were not established in the present study using CIE patients, other endocrine factors in blood may have to be measured to clarify the effect of CDT on elderly patients with different pre-existing conditions.

There are several limitations in our study: 1) the CIE patients were not uniformly categorized in their mental status, as some were not appropriately responsive to, while others were enthusiastic about, stimulations generated during the CDT sessions; 2) the CDT sessions might have been too long or inappropriate for recording hormonal changes in the CIE patients; and 3) timing in recording the cardiovascular parameters may need to be reviewed, or different alternative indexes should have been used. Therefore, future studies in CDT may have to take into consideration of mental status of patients for investigating mental aspects, and appropriate indexes should be incorporated for specific groups enrolled in the study. In an upcoming study, we will focus on concurrent changes in blood indexes (e.g. opioids, neurotransmitters, etc.) with facial expressions of more responsive age groups. All in all, the effects of CDT were observed in the reference group, confirming the useful effects of CDT.

In summary, CDT may not have elicited useful outcomes in the cognitively impaired elderly (CIE) probably because of extensively variable responsiveness derived from the deficient mental status of patients or the improper parameters and time-monitoring used; however, healthy body system in the reference group indicated significantly useful stress-coping responses in increasing cortisol and IgA levels, thus confirming previous psychosomatic findings.[5]

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