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Shirodhara: A psycho-physiological profile in healthy volunteers

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ABSTRACT

Background: *Shirodhara* is a classical and a well-established ayurvedic procedure of slowly and steadily dripping medicated oil or other liquids on the forehead. This procedure induces a relaxed state of awareness that results in a dynamic psycho-somatic balance. **Objectives:** The objective of the study is to evaluate the psychological and physiological effects of *Shirodhara* in healthy volunteers by monitoring the rating of mood and levels of stress, electrocardiogram (ECG), electroencephalogram (EEG), and selected biochemical markers of stress. **Materials and Methods:** The study was conducted in the human pharmacology laboratory. The study design was open labeled, comparing the baseline variables with values after *Shirodhara*. The subjects (n = 16) chosen were healthy human volunteers who gave an informed consent. *Shirodhara* was preceded by Abhyanga – whole body massage. The *Shirodhara* method was standardized for rate of dripping with peristaltic pump and temperature was controlled with a thermostat. Mood and stress levels were assessed by validated rating scales. The pre- and post-*Shirodhara* ECG and EEG records were evaluated. **Results:** Student's paired "t" test was applied to the means + SE of the variables to calculate statistical significance at $P < 0.05$. There was a significant improvement in mood scores and the level of stress ($P < 0.001$). These changes were accompanied by significant decrease in rate of breathing and reduction in diastolic blood pressure along with reduction in heart rate. The relaxed alert state, after *Shirodhara*, was co-related with an increase in alfa rhythm in EEG. **Conclusion**: A standardized *Shirodhara* leads to a state of alert calmness similar to the relaxation response observed in meditation. The clinical benefits observed with *Shirodhara* in anxiety neurosis, hypertension, and stress aggravation due to chronic degenerative diseases could be mediated through these adaptive physiological effects.

Key words: Ayurveda, *Shirodhara*, stress

INTRODUCTION

Sushruta has aptly guided us in the sutra:[1]

Ekam shastram adhiyano na vidyat shastranishchaya|
Tasmat bahushrut shastro vijaniyat chikitsakah||

One who knows only one shastra cannot come to any decisive conclusion. That is why one who has learnt from many shastras is indeed a physician.

For a renaissance in Ayurveda, we need to remember and apply the aforesaid *sutra* also to new sciences, which have emerged over the last three centuries. The global impact and importance of Ayurveda, just like yoga, will be spontaneous when unique principles, practices, and products of Ayurveda are understandable in terms of the current life sciences.[2] It is quite likely that akin to the impact of *Rauwolfia serpentina, Benth*, new domains of knowledge would be discovered by the findings of research on *prakriti, pathya-apathya, pragnyaparadha,* and *panchkarma*.[3]

Shirodhara is a classical and a well-established ayurvedic procedure of slowly and steadily dripping medicated oil on the center of the forehead of the patient, resting quietly on a comfortable bed. Other liquids like coconut water, buttermilk, milk, etc. are also used depending on the individual need of the patient. The etymology of *Shirodhara* is from *shira* = head and *dhara* = a steady flow. This procedure induces a relaxed state of awareness,

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which results in a dynamic psycho-somatic balance. A total feeling of wellness, mental clarity, and comprehension is experienced in this process. It is quite recently that Japanese investigators have initiated state-of-the art studies on *Shirodhara* for its effects on psychoneuroimmunology.[4] The same group has also studied the specific effects of the essential oil from *Lavendula angustifolia*.[5]

In India, *Shirodhara* is a common and age-old Ayurvedic practice, and the clinical benefits are being observed by vaidyas in thousands of patients. In Ayurvedic colleges, there have also been several MD dissertations and occasional few research papers on *Shirodhara*.[6] However, there has been less attention on the psychological and physiological effects, along with investigative correlates of electrocardiogram (ECG), electroencephalogram (EEG), and selected biochemical markers like catecholamines.

The present study is a pilot study in that direction.

MATERIALS AND METHODS

Shirodhara Oils

For the preliminary whole body massage, refined til (sesame) oil was sourced from a single outlet. The *Shirodhara* dripping oil was standardized as per Ayurvedic pharmacopoeia containing *Centella asiatica* (*Brahmi*), *Nardostachys jatamansi* (*Jatamansi*), and *Withania somnifera* (*Ashwagandha*) in a proportion of 10 mg of aqueous extract of each/ 100 mL of til oil.[7] The plants used were properly identified as to their pharmacognosy. But, the chemotyping of *Withania somnifera* was not carried out in the present study.

Human Volunteers

Healthy human subjects of the age group 30-60 years, weighing 45-90 kg (within ±15% of the LIC norms) with normal blood pressure and no illness within the last 3 months were studied. There was no history of allergy to oils, heavy tobacco, or alcohol consumption in any of the patients. The project was approved by an Institutional Ethics Committee and a written informed consent was obtained from each volunteer. The sample size for the study was 16 volunteers (10 males and 6 females). The subjects did not take any medication during or before the study.

Instruments and Assays

Blood pressure (BP) and pulse rate (PR) were monitored by a mercury sphygmomanometer and radial pulse count. Well calibrated standard ECG and EEG machines were used. The salivary cortisol and urinary catecholamines were assayed by standard ELISA method and fluorometry, respectively.[8,9] Urinary creatinine and other biochemical/hematological markers were studied by an autoanalyser, which was validated and in daily use. Standard questionnaires - V.A.S. (Visual Analogue Scale) and M.A.S. (Mood Assessment Scale) - were used as the instruments for the assessment of stress and mood both at baseline and post-*Shirodhara*.[10]

EXPERIMENTAL DESIGN AND CONDUCT OF THE STUDY

This was an open-labeled, ambulant, and within-subject study conducted in the milieu of a quiet Human Pharmacology Laboratory (HPL) with comfortable beds and a pleasant ambience of Clinisearch Biotechnologies Ltd., Vashi (New Mumbai). The subjects arrived to HPL early in the morning and were rested adequately before the recording of baseline temperature, BP, Heart Rate (HR) , ECG, and salivary and urinary collections.

In classical *Shirodhara*, a copper vessel (*kumbha*) with a standard size hole at the bottom is used. This is filled up with oil or any other therapeutic liquid at ambient temperature. The rate of dripping is approximate, dependent on the volume of oil and the size of the aperture. As a consequence, there is a substantial variability in the procedure. The modified procedure was as follows:

The subjects, resting in bed, were given a soft, full body massage for 15 min with 50 mL of sesame oil by an Ayurvedic expert. Later, the oil was gently wiped off the body.

A continuous dripping of *Shirodhara* oil was then initiated and maintained for 45 min; the locus of the drip was the recommended spot, between the eyebrows, on the forehead. The rate of the drip was assured with a peristaltic pump at the outlet of the oil reservoir. The temperature of *Shirodhara* oil was kept at 40 ± 1.5°C with a thermostatic control. The eyes were covered with soft and sterile gauze pieces. The subjects stayed supine throughout the study. The patients were not restrained from sleeping. But, they reported that they felt a relaxed state of alert awareness and occasionally mild drowsiness. The stress and mood were assessed carefully with the use of the rating scales; basally, immediately after *Shirodhara* and 3 days later. Adverse events, if any, were recorded during the procedure, after the procedure, and on the third day. Samples of mixed saliva were collected through straw in glass tubes and were kept over ice during the study prior to centrifugation; the supernatant was stored for 1 week at 4°C, before analysis. The urine samples, basally and post-study, were collected in amber coloured bottles with 15 ml of 6 N hydrochloric acid, diluted with 30 ml of distilled water. The bottles were refrigerated for 1 week prior to the analysis of catecholamines and creatinine.

Statistical analysis

Student's paired "*t*" test was applied to the basal and follow-up mean ± SE values of the group. The statistical significance was planned at $P < 0.05$.

RESULTS

After *Shirodhara*, volunteers showed a significant ($P = 0.002$) reduction in the respiratory rate [Figure 1]. The mean diastolic blood pressure also reduced significantly ($P = 0.027$), with a significant ($P = 0.0015$) drop in the mean pulse rate [Figure 2]. ECG confirmed the heart rate reduction, with no other changes in the atrial or ventricular complexes.

In all the 16 subjects, EEG showed an increase in the alfa rhythm after *Shirodhara*. A decrease of beta activity was observed in two subjects, while one subject showed an increase in the central theta activity. The EEG changes are similar to those observed after deep meditation and alert relaxation. The V.A.S. score and M.A.S. score for stress and mood changed significantly ($P = 0.003$).

The mean value of salivary cortisol post-*Shirodhara* was not significantly different ($P = 0.58$) from that of the pre-*Shirodhara* value. However, the individual values showed a decreasing trend. The means of pre- and post-*Shirodhara* urinary creatinine levels did not differ significantly ($P = 0.46$). The means of pre- and post-*Shirodhara* urinary epinephrine levels were not significantly different from each other ($P = 0.62$), as also the means of pre- and post-*Shirodhara* urinary norepinephrine levels that were not significantly different from each other ($P = 0.39$).

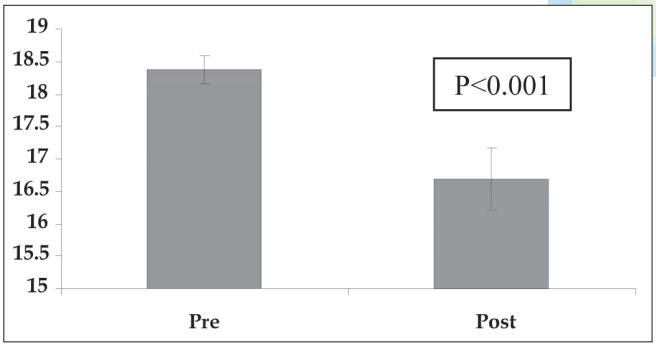

Figure 1: Effect of *Shirodhara* on Respiration: Significant decrease in rate of breathing was observed

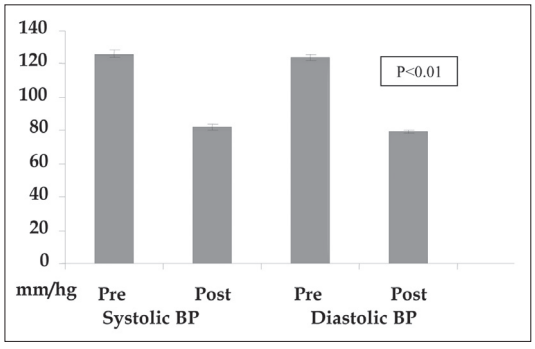

Figure 2: Effect of *Shirodhara* on Blood Pressure: Significant decrease in blood pressure is suggestive of relaxation response

DISCUSSION

Shirodhara is a well-established *upakarma* procedure for centuries. It is widely practiced in India and also in *Panchakarma* centers abroad. Besides its theraputic usage and its *shamana karma*, its general relaxing and calming effects are well-known and worth exploring with modern tools. However, there have been very few studies studies of *Shirodhara* in volunteers employing markers of psychosomatic relaxation.[11] Basavraj *et al*. have recently investigated the effect of *Manasamitra Vataka* (an Ayurveda medication) and *Shirodhara* in patients of generalized anxiety disorder.[12]

Evaluating the effects of *Shirodhara* is a challenge because there is variability of the procedure making interpretations difficult from work carried out in different parts of the country. As a consequence, in the present study, although we have adopted the basic procedure of *Shirodhara* as described by Vagbhat and Kasture, we have standardized the same by adding elements like a peristaltic pump for a steady flow of oil and also a thermostatic control of the temperature of the oil.[13,14] These minimalistic innovations can be adopted to standardize the procedure.

Our primary objective was to study the *Shirodhara*-induced changes in the V.A.S. of stress levels as compared with the baseline levels.[15] The subjects receiving *Shirodhara* treatment showed a reduction in their anxiety levels as per the mood assessment scores. We also explored the changes in vital signs, EEG, ECG, salivary cortisol, and urinary catecholamines as putative correlates of stress. To the best of our knowledge, this is the first volunteer study of *Shirodhara* where all the aforesaid variables have been included. Earlier attempts, in Japan and India, were largely aimed at studying the effects of *Shirodhara* on volunteers and patients and these did not include all the targets mentioned in the study. [16]

The results of the present study show a stress-relieving effect as judged by the mean score on V.A.S., EEG changes, and vital signs. The Japanese workers have also shown an anti-anxiety effect of *Shirodhara*. In their study, massage (*abhyanga*) had not preceded *Shirodhara*, as done in the present study. *Abhyanga* does induce muscle relaxation and a calming effect, which has been demonstrated by other studies in children and adults.[17] Usage of *abhyanga* has to

be a *purvakarma* of *Shirodhara* as per the classic traditions. The enhancement of the relaxant activity is a consequence of the sequential use of both the procedures.

The changes in the EEG records confirmed the subjective relaxant effect scored by the V.A.S. for stress relief. For example, the nature of the EEG waves changed more to alfa, and even theta waves. However, the EEG changes, the baseline values of salivary cortisol and urinary catecholamines were not significantly affected by *Shirodhara* in the fractional samples. There is a need to conduct the programme of several sessions of *Shirodhara* in a group of patients with anxiety neurosis to evaluate the effects on salivary cortisol and urinary catecholamines.

In *Dhara* therapy, prolonged and intermittent stimulation by the dripping oil may provide afferent inputs to the cerebral cortex, leading to a tranquilizing effect. These data suggest a need to explore further the effects of *abhyang – Shirodhara* in human stress models, induced by established methods, e.g. discordant binaural inputs through headphones, arithmetic sums, etc. Even studies in patients with stress, with all these variables, may be worthwhile.

Earlier, Herbert Benson has shown the effect of meditation in relief of stress through what he calls "Relaxation Response."[18] Wallace has shown the effects of long-term practice of transcendental meditation on systolic blood pressure, oxygen consumption, etc.[19] *Shirodhara*, too, seems to induce the relaxation response without meditation. The conjoint effect of meditation along with a series of *Shirodhara* procedures is worth exploring further for stress-induced disorders. It is worthwhile to explore whether neurotransmitters like anandamide may get secreted with such a procedure.[20] A study at NIMHANS of *Shirodhara* coupled with *medhya rasayanas* has been reported in patients of cerebellar ataxia with clinical improvement.[21] The present study was conducted as an experiential stage of reverse pharmacology.[22]

CONCLUSIONS

Shirodhara is deeply relaxing and induces a relaxant state; these effects are mediated by the brain wave coherence, alfa waves, and a down regulation of the sympathetic outflow. The center of the forehead, which was evolution wise related to the third eye, is connected atavistically to the pineal gland. This spot is known as *Agnya Chakra* in the yoga tradition. Focusing on *agnya chakra* with closed eyes during meditation leads to psychosomatic harmony. As the oil drips on the *agnya chakra*, it is proposed that the meditation-like effect is a consequence of stillness of mind leading to adaptive response to the basal stress.

We feel that there is a need to conduct, a frequency-exploring study of *Shirodhara* coupled with a fixed-flexible dosage regimen of *medhya rasayanas in patients*. This may provide therapeutic hits, which can be developed as leads by further exploratory studies. The positive leads may then be investigated for the effects in cognitive decline due to neurodegenerative disorders.

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