

Role of *Shirodhara* in the Management of Attention Deficit Hyperactivity Disorder (ADHD) in Children

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Abstract:

Attention-deficit hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood. It is a complex disorder of impairment of brain function characterized by triads of Inattention, Hyperactivity and Impulsivity. Its etiology is strongly linked with hereditary and genetic factors triggered by environmental influences. The most common population affected by it are school age children although, it may occur in all age groups. Treatment options in modern medicine for ADHD include mainly stimulant medication and psychotherapies. Ayurveda considers each and every disease arises due to vitiation of either *sharirika* or *manasika doshas* or both. The classical features of ADHD imply vitiation of *vata dosha* in *sharirika bhava* and *raja dosha* in *manasika bhava*. *Shirodhara* is a unique modality of treatment for mental disorder as per *Ayurvedic* literatures. Behavioral disorder like ADHD has close similarity with *manasika vyadhi*. *Shirodhara* can be adopted as one of the best treatment for neurobehavioral disorder.

Keywords: *Shirodhara*, ADHD, Inattention, Hyperactivity, Impulsivity, *Murdha taila*

I. INTRODUCTION:

Processing of any information in the brain depends upon functional arousal, alertness, and attention. An intact anatomic and neurochemical brain system is required for the functional attention to attain. Primary structures involved in the above functioning are brainstem; mainly basal ganglia, the limbic system for example amygdale hippocampus, and the frontal lobes. The neurotransmitter dopamine and its neuronal pathways have been identified as a major chemical modulator of attention. Acquirement of knowledge, its organization, processing of information, and executive functions depends upon the cognitive mechanisms of brain. Children with attention dysfunction comprise a heterogeneous group of population who show various patterns of impairment of above mentioned systems.¹

ADHD is one of the most prevalent chronic health conditions affecting school aged children. It is characterized by inattention, distractibility and impulsiveness. Studies shows that 5-10% of school-aged children are affected, the rates vary considerably according to country. Rates may be higher if symptoms (Inattention, Impulsivity and Hyperactivity) are considered in the absence of functional impairment. The prevalence rate is 2-6% in adolescent samples. Approximately 2% of adults have symptoms of ADHD. It is often under diagnosed in children and adolescents. Many children with ADHD also present with co-morbid psychiatric symptoms, like opposition defiant disorder, conduct disorder, learning disabilities anxiety disorders etc.² Expression of ADHD and other complex brain developmental processes is multifactorial. The prevalence of ADHD is rising since past few years. Challenges to preschool children before their developmental maturity to meet the challenges of fast pace requiring advanced thinking skill is one the reason for high prevalence of the disease. Changes in social structure are another most common contributor e.g., inconsistent parenting, family dysfunction, low involvement of father, poor peer relation are found to be risk factors for the development of ADHD. Children of mothers having toxemia, prolonged labor and complicated delivery are more likely to experience ADHD symptoms in later life. Maternal smoking, alcohol during pregnancy and prenatal or postnatal exposure to lead are found to be linked with attention associated difficulties and further in development of ADHD. There is an association of genetic component to ADHD. Genetic studies have primarily implicated dopamine transporter gene (DAT1) and dopamine 4 receptor gene (DRD4), in the development of ADHD. Abnormal brain structures are linked to an increased risk of ADHD. It is reported that 20% of children with severe traumatic brain injury have subsequent onset of substantial symptoms of impulsivity and inattention. Children with head or other injury and in whom ADHD is later diagnosed might have impaired balance or impulsive behavior as part of the ADHD, thus predisposing them to injury. Structural and functional abnormalities have been identified in children with ADHD without pre-existing identifiable brain injury. Psychosocial family stresses also contribute and exacerbate the symptoms of ADHD.³ Once the diagnosis of ADHD has been established, the parents and child should be educated with regard to the ways ADHD can affect learning, behavior, self-esteem, social skills, and family function. The clinician should set goals for the family to improve the child's interpersonal relationships, develop study skills, and decrease disruptive behaviors. Treatments geared toward behavioral management often occur in the time frame of 8-12 sessions. The goal of such treatment is for the clinician to identify targeted behaviors that cause impairment in the child's life (disruptive behavior, difficulty in completing homework, failure to obey home or school rules) and for the child to work on progressively improving his or her skill in these areas.

Shirodhara is one of the therapeutic methods which come under *Bahya snehana* (external oleation) as per Ayurvedic principle of treatment. *Acharya Charaka* has coined the term *murdhni taila* while *Acharya Vagbhat*⁴ has mentioned a similar procedure called *murdha taila*. *Shirodhara* comes under this category. *Shirodhara* signifies two words '*Shiro*' (head) and '*dhara*' (stream). Thus the literal meaning is pouring of a liquid (*ghrita*, *takra*, *ikshurasa*, *kashaya*, *ksheera* etc) stream over the forehead. The liquid is

allowed to flow over the scalp in a continuous specific rhythm. *Shira* is the seat of mind included under *tri-marma* (three vital organs/points) and *shirodhara* is mainly indicated in *mansika vikaras* originated due to the vitiation of *Raja & Tama doshas*.

II. DISCUSSION

The Researches are going on day by day, in order to understand the exact mechanism of action of the above procedure especially in the treatment of psychosomatic disorders. The probable mode of action of *Shirodhara* can be understood by the inferences derived from the some of the following hypothesis. The physical and physiological basis explained as per Ayurvedic concept employ the theory of *Panchamahabhutas* and *Tridoshas*. When a constant stream of any liquid is poured over the forehead from a fixed height it results in pressure on the skin over the forehead. This pressure stimulates the pacinian receptors or the mechanoreceptors present on the skin, which in turn lead to mechanical deformation of the receptors, which result in the change in the membrane potential of the receptor and a receptor potential is generated. The receptor potential then leads to generation of action potential, which is then passed to the cerebral cortex via brain stem or the RAS (Reticular Activating System). In this way the information from outside finally reaches to the cerebral cortex. The pressure input from the skin over the head region is conveyed by the ophthalmic branch of trigeminal nerve to the reticulospinal neurons via a disynaptic pathway.⁵

When sensory information reaches the cerebral cortex, only a small fraction of that information causes an immediate motor response. Much of the remainder is stored for future control of motor activities and for use in the thinking processes. Repeated stimulus input leads to consolidation of the information, which needs 5 to 10 minutes for minimal consolidation and 1 hour or more for stronger consolidation.⁶ This fact is consistent with duration of *shirodhara* of 30-45 minutes practiced daily. To achieve permanent effect of *shirodhara*, there must be change in response characteristics of different neuronal pathways and to attain this, activation of the second messenger pathway⁷ is needed which might be attained through the process of *shirodhara*.

Since the stimulus reaches the RAS first, stimulated RAS generates L-block waves or the alert response is generated and continuous practice of this process for 15 days may result in some long lasting effects. The process or the mode of action here is similar to that of neuro-feedback or the EEG bio-feedback technique, in which individuals are provided with real time feedback about their brainwave activity and taught to use that information to modulate certain aspects of their mind. Regular or continuous pressure input generates continuous impulse to the CNS thereby continuously stimulating the CNS. Practicing this procedure regularly for 15 days may lead to long lasting stimulation of the CNS. The mechanism is comparable to that of CNS stimulant medications advised to the ADHD patients. In an animal study, it was found that, the responses evoked by stimulation of either the head or the tail were three or four times larger than those elicited by mid body stimulation.⁸ Thus it may be interpreted that same response is true with the man. This point explains why *dhara* on forehead is more effective for mental disorders.

Shirodhara has anxiolytic and ASC (altered states of consciousness) inducing effects, and it promotes a decrease of noradrenaline and exhibits a sympatholytic effect, resulting in the activation of peripheral foot skin circulation and immunopotentiality.⁹ The neurological evaluations that were done showed lower levels secretion of serotonin, adrenalin, noradrenalin and dopamine, all signs of autonomic nervous system balance. During *shirodhara*, sympathetic nervous tone was suppressed while parasympathetic nervous tone was the same as that of the control's supine position. Tactile stimulation of the skin or hair follicles innervated by the first branch of the trigeminal nerves (ophthalmic nerve).¹⁰ The impulses would be transmitted to the thalamus through the principal nucleus and forward to the cerebral cortex (somato-sensory field) or limbic system. These routes would provide the subjects ASC experience and a relief from anxiety. Other routes from the principal nucleus to the reticular formation and posterior region of the thalamus, which is the center of autonomic nervous system, would be possible.

Shirodhara induced bradycardia and the relative suppression of LF/HF (Low frequency: High frequency) power spectrum density, which indicated lowered sympathetic tone. Expired gas analysis showed a decreased tidal volume and CO₂ excretion. The EEG showed the slowing of the α wave, an increase in α and θ activity, and an increase in right-left coherence. These metabolic, ECG, and EEG findings support the reported experiences of relaxed and low metabolic states during *shirodhara*. In the procedure of *Shirodhara*, particular pressure and vibration is created over the forehead. The vibration is amplified by the hollow sinus present in the frontal bone. The vibration is then transmitted inwards through the fluid medium of cerebrospinal fluid (CSF). This vibration along with little temperature may activate the functions of thalamus and the basal forebrain which then brings the amount of serotonin and catecholamine to the normal stage. Pressure has an effect on impulse conduction through tactile and thermo receptors. If prolonged pressure is applied to a nerve, impulse conduction is interrupted and part of the body may go to rest. In *Dhara* therapy, prolonged and continuous pressure due to pouring of the medicated liquid may cause tranquility of mind.

III. CONCLUSION:

Medication alone is not sufficient to treat ADHD in children. The most widely used medications for the treatment of ADHD are the psychostimulant therapy and medications. Stimulant drugs used to treat ADHD are associated with an increased risk of adverse cardiovascular events, including sudden cardiac death, myocardial infarction, and stroke. The condition becomes worse when the patient had an underlying disorder, such as hypertrophic obstructive cardiomyopathy, which is made worst by sympathomimetic agents. Because of patient compliance and effectiveness *Shirodhara* can be developed as first treatment of choice in these cases. There is a need of large scale study and scientific validation to assign it as a treatment of choice for Attention Deficit Hyperactive Disorder.

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