



## AN AYURVEDIC PERSPECTIVE ON PRIMARY WRITING TREMOR

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### ABSTRACT:

Primary Writing Tremor (PWT) is Task specific Tremor which is seen only in specific task of Writing. PWT is unaccompanied by any other neurological symptoms and does not manifest itself in other activities of daily life. The pathophysiology of this tremor has been controversial, with some proposing a dystonic origin similar to writer's cramp and others suggesting a relationship with Essential Tremor. The aetiology of this tremor is debated, as well as the efficacy of the various treatment modalities used currently. Even though this is one of the most common task-specific tremors seen, there is considerable overlap of clinical features between PWT and writer's cramp which creates difficulty in diagnosing this condition in the conventional modern medicine. Ayurveda is Indian system of medicine which mainly deals about study of Life, which aims at maintaining health of an individual and then explains cure for the diseased condition. Most of the neurological conditions are explained under the disease *Vata vyadhi* where all diseased produced by *Vata dosha* are explained. PWT is a rare form of disorder associated with tremor as a main symptom and one can understand its pathophysiology through Ayurveda, by looking into disorders explained in Ayurvedic classics where we can find tremor as one of the cardinal feature. In ayurvedic classics we find many the disorders of *Vata dosha* associated with tremor like, *Akshepaka*, *Apatantra*, *Apatanaka* and *Kampa vata*. But we can pin point the particular condition of Vata vyadhi to PWT. Based on symptamatology, we can draw a hypothesis on PWT and can adopt the treatment principles which are employed in such disorders.

**Keywords:** - Primary Writing Tremor, PWT, *Kampavata*, *Akshepaka*, Tremor

## INTRODUCTION

Ayurveda the life science of Indian system of medicines dates back thousands of years old. It aims at maintaining the health of a healthy person and to alleviate disease of diseased persons. Ayurveda has described all principles of maintaining good health and remedial methods for diseases. Ayurveda is mainly based on the principles of Tridosha siddhanta i.e, as universe is encircled with *Soma*-Moon, *Surya*-Sun and *Anila*- Air, similarly the body is composed of three humors of life *Vata*, *Pitta* and *Kapha* <sup>[1]</sup>. The body is mainly built with these tridoshas *Vata*, *Pitta* and *Kapha* <sup>[2]</sup>.

Most of neurological and musculoskeletal disorders are explained under the title- *Vata vyadhis* (diseases of *Vata dosha*). The *Vata vyadhis* like *Kampavata* and *Akshepaka* are predominant of symptom like tremor.

Tremor is a rhythmic oscillation of a body part that occurs physiologically in some specific conditions or as a movement disorder. The involuntary, rhythmic, oscillatory movement may affect one or several regions of the body about a joint axis <sup>[3]</sup>. Tremor syndromes are the most common movement disorders encountered in clinical practice, although only a fraction of patients who have tremor seek medical attention. In one epidemiological study it was found that 96% of normal people have a clinically detectable tremor.<sup>[4]</sup> Primary

writing tremor (PWT) is rare form of task specific tremor that appears while performing or attempting to perform a particular task of writing. These tremors are difficult to treat and there is no proper treatment protocol for treating PWT. Information available on PWT is very less in medical books. Even there is no proper protocol for management of PWT.

The pathogenesis of PWT can be understood based on the similar diseases explained in classics. The medical line of treatment in modern medicines like, propranolol, Botulinum toxin or some of surgical interventions are very effective. In case of PWT, the treatment modalities mentioned in *Vata vyadhi* which having similar symptom like Tremor can be adopted in treating PWT. The shodhana treatment like, Virechana , Basti or Nasya karma are to be advocated in patients of PWT. Many medications which are mentioned in *Akshepaka*, *Kampavata* can also be given for PWT.

### **Clinical presentation of Primary Writing Tremor (PWT)**

Primary writing tremor is a condition in which tremor, usually characterized by prominent pronation or supination wrist movements, occurs predominantly or exclusively during writing <sup>[5]</sup>. Usually tremors are not seen during other tasks with the affected hand.

The epidemiology and the natural course of writing tremor have not been fully elucidated. Age at onset of PWT varies. Many cases affected during childhood have been reported. The disorder begins slowly, progresses for years, and later becomes stabilized. Family history is generally unremarkable [6]. The mean age of onset of PWT is 50.1 years. The disorder may be sporadic or have an autosomal dominant pattern of inheritance, and one-third of patients have reported a positive family history of writing tremor [7]. PWT is divided into two types- Type-A and Type-B. Primary writing tremor Type-A appears only during the act of writing and Type-B is present not only during the act of writing but also when hand assumes a writing posture [8].

### **Understanding Pathophysiology of PWT**

The exact Pathophysiology of PWT is unknown. Many opine that it is either variant of essential tremor or a type of dystonia or separate entity. Thus, three hypotheses have been postulated [9].

#### **I. PWT as variant of Essential tremor**

Many researchers argue that PWT is variant of essential tremor. In one of the case study of patient with PWT responded well to alcohol and propranolol, as essential tremor responds well with this medication, so it suggested that this case was likely associated with essential

tremor<sup>[10]</sup>. Both ET and PWT have similar frequencies (between 4 and 8 Hz) [8]. Intracortical inhibition (ICI) is one of the most popular techniques used to study the electrophysiology of the brain in many neurologic diseases. The evidence suggested that reduced inhibition of intracortical circuits could contribute to the development of PWT. It was seen that short latency ICI was reduced in the dominant hand of a patient with PWT [11]. This is similar in some ways to focal dystonia. However, in focal dystonia, this reduction was bilateral, while in PWT it occurred only with respect to the dominant hand.

#### **II. PWT as Type of Focal Dystonia**

In clinical assessment study showed presence of abnormal posturing and presence of a mirror tremor in PWT, similar to mirror dystonia seen in focal hand dystonias<sup>[12]</sup>. Using Transcranial Magnetic Stimulation (TMS), they showed that the motor map corresponding to the first dorsal interosseous muscle in PWT patients before treatment with Botulinum toxin was initially displaced posterolaterally, and returned to a normal position after treatment<sup>[13]</sup>. In another study Improvement in both clinical findings as well as Electromyography studies after treatment with low dose Botulinum toxin A suggested a possible underlying dystonic mechanism<sup>14</sup>.

### III. PWT as separate entity

Based on various studies conducted, clinical and physiological differences are noticed between PWT, Focal dystonia and Essential Tremor (ET). PWT is different from writer's dystonia because disynaptic and presynaptic phases of reciprocal inhibition are normal in PWT whereas presynaptic inhibition is decreased in writer's dystonia<sup>[12, 8]</sup>. Electromyography studies showed overflow activity characteristic in the proximal musculature in writer's dystonia<sup>[15, 16]</sup>. There is no evidence overflow existing for PWT from physiological studies<sup>[8]</sup>.

In one of the study, it is found that intracortical and spinal excitability was abnormal in writer's tremor and essential tremor but it was normal in PWT<sup>[8]</sup>. In another study Showed improvement in Primary Writing Tremor following Levodopa/ Carbidopa, which is not seen in ET and writer's cramp<sup>[17]</sup>. Although the pathophysiological mechanisms of PWT and writer's dystonia share common features, the evidence indicates that PWT is a separate nosological entity and not a variant of focal task-specific dystonia. There are some overlapping as well as key clinical and physiological differences between PWT, writer's dystonia, and essential tremor. However, on the other hand, another study showed that intracortical and spinal

excitability are abnormal in writer's cramp and in some cases of ET, but normal in patients with PWT, suggesting that PWT is distinct from writer's cramp and to a less extent from ET also<sup>[12]</sup>.

### Understanding of PWT based on Ayurvedic concepts.

Most of the neurological conditions are explained under the heading of *Vata vyadhi*. In ayurvedic classics we find many the disorders of *Vata dosha* associated with tremor like, *Akshepaka*, *Apatantra*, *Apatanaka and Kampavata*. Based on symptamatology we can pin point the particular condition of *Vata vyadhi* to PWT. A hypothesis may be drawn on PWT and one can adopt the treatment principles which are employed in management of *Vata vyadhis*. A *Vata vyadhi- Vepathu*, which is also known as *Kampavata* is described as "*Sarvangakampah: shiraso vaayurvepathu samjakah*."<sup>18</sup> In this condition, the tremor which may be seen in *sarvanga* i.e all over the body or over the head. Commentators states that *sarvanga* is all over the body and mainly in upper and lower extremities. Similarly *Akshepaka* is nothing but a disorder of *Vata dosha* causes tremor which affects *panipada* (Upper and lower extremies) which is caused due to shoshana of sira snayu and kandara. The vitiated *Vata dosha* produces disease based on its *Hetu vishesha*

and *Sthana vishesa*<sup>[19]</sup> and based on this, *Vata vyadhi* -PWT has to be understood.

### **Understanding Pathogenesis of PWT in Ayurveda:-**

Avarana i.e, encircling of dosha to dosha or dosha to Dhatu and Dhatukshaya i.e, loss of Dhatu; are the two basic processes which incite Vata while in the process of the Samprapti<sup>[20]</sup>.

Avarana manifests as Ekdeshe Vriddhi i.e. increased function at one site and decrease in other sites such phenomena is evidently seen in PWT, as increased movement (tremor) during the act of writing. Dhatukshaya is another important phenomenon which is constantly involves in the Samprapti of the vata vyadhis. Probably kshaya of Rasa, Shukra, Majja and Ojas were contemplated as the pathological process in PWT.

With the favourable aetiological factors of *Vatavyadhi* like consuming more of food which are having *ruksha guna* (dryness) and *sheeta guna* (cold), eating more of *Laghu ahara*, over exertion, over indulgence in coitus, over swimming, over fasting, more walking, and due to over thinking, over sorrow, withholding the natural urges, more travelling or due to injury to vital points in the body all these factors aggravates *Vata dosha*<sup>[21]</sup>. Susrutacharya explains general pathogenesis as, the aggravated doshas will be

travelling all around in the body, wherever they get obstructed in the channel there produces the disease<sup>[22]</sup>. Similarly in PWT, the aggravated *Vata dosha* get obstructed as per pathogenesis of *Vatavyadhi* i.e, *Dehe srotansi riktaani poorayitva anilo bali*.<sup>[23]</sup> i.e, the vitiated *vata dosha* get lodges in empty channels and produces the disease. Here *vata dosha* gets lodged in *sira, snayu* and *kandaras* of hands and produces PWT during the act of writing. The qualities of vata dosha mentioned in classics are *ruksha, laghu, sheeta, khara, sukshma* and *chala*. Here in PWT, *Chala guna* of *Vata* will be aggravated because of this property, Tremor is seen in patients.

### **Management of PWT in Modern medicine**

On reviewing with many research papers on PWT, though these tremors are relatively difficult to treat, the treatment modalities for PWT can be summarised as;

- (i). Conservative line of treatment
- (ii). Surgical treatment
- (iii). Adaptive strategies.

**(i).Conservative line of treatment:** - Use of propranolol, primidone, and anticholinergic medications are beneficial in management of PWT<sup>[24]</sup>.

Use of Botulinum toxin (BoNT) injection: - It has been found that motor maps in cortex of PWT patients are shifted posteriorly and there is evidence that Botulinum toxin (BoNT) can

reverse this shifting when it is given intramuscularly. It acts at the neuromuscular junction by inhibiting the release of acetylcholine<sup>14</sup>. Singer et al. (2005) also reported a PWT case that was successfully treated with botulinum toxin- A injections<sup>[25]</sup>.

**(ii). Surgical treatment:** - For patients with medication-resistance, oral drugs may not be effective and functional neurosurgery may be suggested<sup>[26]</sup>. Recently, Thalamotomy or Deep Thalamic Brain Stimulation has been advised with some success as a safe and effective treatment<sup>[27, 28]</sup>. Patients have shown improvement in symptoms when deep brain stimulation is placed in the posterior subthalamic area<sup>[29]</sup>. Other surgeries indicated in PWT are Lesional surgery; magnetic resonance guided focused ultrasound, deep brain stimulation<sup>[7, 30]</sup>.

**(iii). Adaptive strategies:-** Use of Writing devices- A writing device has shown to improve the mean handwriting scores for each subject when compared to the scores without the device. In this study, the patients of PWT who had failed medical treatment were asked to write and draw spirals with and without the orthotic devices. Their writing and drawing scores with and without the device were compared and showed excellent improvement<sup>32</sup>.

**Ayurvedic management of PWT:-**

The general principles of treatment which are employed for *Vatavyadhis* are to be adopted in PWT. In classics it is mentioned that *shuddha vataja vyadhi* are *asadhya* or *krichrasadhya*. Based on symptoms the diseases like *Akshepaka* and *Kampavata* which are near comparison to PWT being *shuddha vata vyadhi*, is also considered to be *krichrasadhya* for chikitsa. In charaka chikitsa of vata vyadhi it is mentioned that, “*pratyekam sthaanadooshyadikriyavaishyeshamacharet*”(c ha.chi 28/104) In treatment of *Vata vyadhis*, one should select the treatment by looking into the involvement of specific *Dosha* and *sthana* i.e at which part of the body is affected<sup>[31]</sup>. In pathogenesis of *Akshepaka* it is mentioned about the involvement of Vata dosha and dooshya like sira, snayu and kandara<sup>[32]</sup>. So the treatment of PWT should focus on treatment of *vata dosha* and *dooshya* involved.

Classical modalities- *Shodhana* and *Shamana Chikitsa* are to be adopted for PWT.

**Shodhana (Purificatory procedures):-** *Mridu virechana* with *snehasamyukta oushadhis* is advised in all sorts of *Vatavyadhi*<sup>[33]</sup>. For *mridu virechana*, *Eranda taila* (Castor oil) can be given with milk<sup>[34]</sup>. Virechana gives *bala* to *indriyas*, does *agnideepana* and *koshtashuddhi*.

In classics its also mentioned to give *Snehana* and *swedana* which are also beneficial in *vatavyadhi*<sup>[35]</sup>. So these can be used for the management of PWT.

Acharya Chakradatta and Acharya Vangasena have indicated *Nasya karma* in *Kampavata*. *Nasya* is one of the *shodhana karma*, *Vagbhatacharya* has stated “*nasa hi shiraso dwaram*” i.e. nose is the easiest and closest opening for conveying the potency of medicines to the *shiras* i.e, cranial cavity. The drugs administered through this rout will reach the *shringataka marma* and spread through the *siras* of eye, ear and throat etc., and to the head. The *Nasya dravya* should be oil which is predominant with *Guru* and *manda guna* should be selected so that it

pacifies the *chala guna* present in PWT. And another important *Shodhana therapy- Basti* (Enema therapy) is considered to be the superior therapy for *vata vyadhi* can be useful therapy in the management of PWT.

### Shamana (Palliative treatment)

Some *shamana yogas* are described for *Kampavata* and *Akshepaka* diseases can be used in management of PWT. The herbal drug *Kapikachchu (Mucuna pruriens)* is the front runner drug of choice in *kampavata*, this can be effectively used in PWT.

The *shamana oushadhis* collected from different classical references which are indicated in *Vata vydhis* which are having predominant symptom tremor as clinical feature.

**Table –I showing the Yogas which are used mainly in *Kampavata* and *Akshepaka* like diseases are tabulated which can be used in the management of PWT.**

Type of preparation	Name of the praparation
Kashaya	Arditakshepaka vatahara kashaya also known as Dhanadanayanadi kashaya <sup>[36]</sup>
Rasa yogas Ati/ pill/ Tablet form	Triguna rasa <sup>[37]</sup>
	Gandharva rasa <sup>[38]</sup>
	Vatarakshasa rasa <sup>[39]</sup>
	Kalavidhanasa rasa <sup>[40]</sup>
	Chaturbhujra rasa <sup>[41]</sup>
	Kanaka sundara rasa <sup>[42]</sup>
Taila yogas	Ksheerabala taila <sup>[43]</sup>
	Nakula taila <sup>[44]</sup>

	Vijaya bhairava taila <sup>[45]</sup>
	Rasna taila <sup>[46]</sup>
	Sahacharadi taila <sup>[47]</sup>
	Varuni taila <sup>[48]</sup>

## DISCUSSION

Primary Writing Tremor (PWT) is Task specific Tremor which is seen only in specific task of Writing. It is usually characterized by prominent pronation / supination of wrist movements, occurs predominantly or exclusively during writing. So far, there is no clear cut understanding of pathophysiology of this disease and there is no specific line of treatment in modern science.

PWT is a rare form of disorder associated with tremor as a main symptom and one can understand its pathophysiology through Ayurveda, by looking into disorders explained in Ayurvedic classics where we can find tremor as one of the cardinal feature. In ayurvedic classics we find many the disorders of Vata dosha associated with tremor like, *Akshepaka*, and *kampavata*. Based on symptoms, we can draw a hypothesis on PWT and can adopt the treatment principles which are employed in such disorders.

As Ayurveda advocates Shodhana therapy i.e, Purificatory procedures to eliminate doshas from the root and Shamana chikitsa, where the imbalance in three humors

(doshas) can be made equilibrium status; those can be adopted in management of PWT. Shodhana therapy like *Virechana*, *Basti* or *Nasya* can be adopted which can be done with the drugs which are having qualities like, *Ushna*, *Brihmana* action and the Guna which are opposite to *sheeta guna*, *Chala guna* of *Vata dosha* and to combat the *Vata dosha* particularly *Chalatva* i.e, Tremor of the condition which is seen in PWT. The shamana oushadhis mentioned in classics like, *Chaturbhujra rasa*, *Vatarakshasa rasa* etc are to be used.

## CONCLUSION

The information available about PWT is very minimal. This article is reviewed based on the published articles. Though there is no direct reference for PWT in classics, by looking into similar disorders mentioned in classics should be considered and same line of treatment modalities can be adopted in the management of PWT and which may give fruitful result. If principles of ayurveda are followed properly in treating PWT, the treatment will be successful.

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